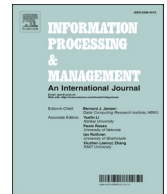




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Chatbot as an emergency exist: Mediated empathy for resilience via human-AI interaction during the COVID-19 pandemic

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ABSTRACT

As a global health crisis, the COVID-19 pandemic has also made heavy mental and emotional tolls become shared experiences of global communities, especially among females who were affected more by the pandemic than males for anxiety and depression. By connecting multiple facets of empathy as key mechanisms of information processing with the communication theory of resilience, the present study examines human-AI interactions during the COVID-19 pandemic in order to understand digitally mediated empathy and how the intertwining of empathic and communicative processes of resilience works as coping strategies for COVID-19 disruption. Mixed methods were adopted to explore the using experiences and effects of Replika, a chatbot companion powered by AI, with ethnographic research, in-depth interviews, and grounded theory-based analysis. Findings of this research extend empathy theories from interpersonal communication to human-AI interactions and show five types of digitally mediated empathy among Chinese female Replika users with varying degrees of cognitive empathy, affective empathy, and empathic response involved in the information processing processes, i.e., companion buddy, responsive diary, emotion-handling program, electronic pet, and tool for venting. When processing information obtained from AI and collaborative interactions with the AI chatbot, multiple facets of mediated empathy become unexpected pathways to resilience and enhance users' well-being. This study fills the research gap by exploring empathy and resilience processes in human-AI interactions. Practical implications, especially for increasing individuals' psychological resilience as an important component of global recovery from the pandemic, suggestions for future chatbot design, and future research directions are also discussed.

1. Introduction

COVID-19 has caused a global pandemic declared by the WHO, and has thus become a heavy affliction and daunting challenge worldwide (WHO, 2020). The outbreak and resurging of the COVID-19 pandemic have led to a dramatic loss of human life globally, a persistent threat to public health worldwide, and prolonged exposure to stress due to various disruptions, such as daily life changes, job loss, financial hardship, and isolation (APA, 2020). The impacts of this global pandemic can be understood not only based on what is being infected, but also on what is being affected (Burki, 2020, p. 904), thereby leading to a myriad of physical health problems,

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economic damage, as well as psychological, social, and health-related complications (Stuart, O'Donnell, O'Donnell, Scott, & Barber, 2021).

The COVID-19 pandemic poses a psychological crisis that affects the well-being of global communities. A systematic review of data reporting the global prevalence and burden of depressive and anxiety disorders in 204 countries and territories because of the COVID-19 pandemic was published in *The Lancet* (Santomauro, Mantilla Herrera, & Shadid, 2021). According to the aforementioned review, anxiety and depression have become shared experiences globally during the COVID-19 pandemic, particularly among women who were affected more by the pandemic than men ($B\ 0.1\ [0.1\ to\ 0.2; p = 0.0001]$ for anxiety disorders, and $0.1\ [0.1\ to\ 0.2; p = 0.0001]$ for major depressive disorder), with a higher increase in the prevalence of anxiety and major depressive disorders among women during the COVID-19 pandemic globally (Santomauro et al., 2021, p. 1700). Studies on the emotional state, social mentality and mental health of the Chinese public during the pandemic shows similar results that nearly one third of the respondents had some degree of depression symptoms, and 22.4% experienced significant anxiety symptoms (Guo, Cai, Wang, Li, & Chen, 2020), with women's anxiety levels slightly higher than men's (Chen & Guo, 2021). People's lives are changing in the face of this pandemic, and across every sphere, the impacts of the pandemic are exacerbated for women and girls, from health, economy, and security to social protection, which in turn amplify the impacts of COVID-19 (UN, 2020). To minimize the gendered impact of COVID-19 and inform the long road out of this global depression, scholars have called for COVID-19 academic research, immediate response, and long-term recovery efforts that are tailored to support women, because women worldwide are affected more than men by the brunt of the social and economic effects of the pandemic and may thus experience long-term negative consequences (Burki, 2020; Santomauro et al., 2021; UN, 2020; Wenham et al., 2020).

To cope with the overwhelming psychological distress during the COVID-19 pandemic, it is crucial for those affected to seek social support and connections (APA, 2020). However, physical distancing, reduced mobility, quarantine, isolation, and other disruptions caused by the pandemic have led to restrictions on fundamental human interactions, such as those shared with family and friends (Brooks et al., 2020). The COVID-19 pandemic has served as an accelerator for human-AI interactions, such as various AI chatbots (Almalki & Azeez, 2020). 24/7 companionship and support provided by an AI chatbot can help people deal with their problems without experiencing any moral burden (Ennis & Bunting, 2013). Whether and how AI-powered chatbots can help to strengthen psychological resilience in coping with the impacts of this globally shared crisis via human-AI interaction and complex information processing mechanisms has become a research area of great theoretical and practical significance, particularly for global recovery from disturbance and stress during and after the COVID-19 pandemic (Paul, Mohanty, & Sengupta, 2022; Xie, Pinto, & Zhong, 2022).

Recent advances in resilience research have emphasized the importance of communicative processes through dynamic human interactions in specific contexts (Kaye-Kauderer, Feingold, Feder, Southwick, & Charney, 2021), whereas few studies have transcended beyond human interactions to explore potential resilience processes via human-AI interaction. Empathy is considered as a key component of resilience processes because it is crucial for information processing and social interaction (Brooks & Goldstein, 2003; Vinayak & Judge, 2018), whereas a research gap has been noted in terms of individual perceptions regarding digitally mediated empathy in human-AI interaction and how it facilitates certain resilience processes. To address this research gap and help people worldwide to cope with and recover from the global threat of COVID-19, this study explores digitally mediated empathy in the context of human-AI interaction and how the intertwining of empathic and resilience processes works as a coping strategy for COVID-19 disruption by connecting empathy as a key mechanism for information processing with the communication theory of resilience (CTR).

As one of the most recent popular chatbots, Replika pushes the limits of intimacy between humans and machines (Brandtzaeg and Følstad, 2018). Founded in 2017 by Luka Inc., Replika is an AI-powered chatbot that creates a private perceptual world that offers users 24/7 companionship and supports their mental health. Replika users can send messages and talk to their personal Replika via a mobile app or website. By 2019, Replika had gained 7 million users worldwide, with primary users aged between 18 and 25 (CBS This Morning, 2019). The user population of Replika is claimed to have surged dramatically during the COVID-19 pandemic (Metz, 2020), and now over 10 million (Wilkinson, 2022). Replika has also been introduced in China and has become very popular among young Chinese women (Mengmaotantou, 2020a, 2020b). Therefore, using the experiences of Replika among Chinese female users can provide an interesting case and cross-cultural perspectives to examine empathic and resilience processes and their influence on well-being in the Chinese context during the COVID-19 pandemic. This study addresses the aforementioned research gap by exploring mediated empathy in human-AI interactions and how it facilitates resilience processes and well-being in the specific context of COVID-19 disruption, to provide implications for global recovery from stress and anxiety during the ongoing pandemic.

2. Literature review

2.1. Empathy as a key mechanism of information processing and mediated empathy

Empathy is a multifaceted construct, thus there are different conceptualizations of the construct of empathy as a personality trait or as a processing mechanism. By conducting a systematic literature review on trait and state empathy (Grondin, Lomanowska, & Jackson, 2019; Keyser & Gazzola, 2014; Nicovich, Boller, & Cornwell, 2005), this study focuses on empathy processing, a situation-specific, cognitive-affective state or process with the projection of oneself into another's feelings, actions, and experiences (Batson & Coke, 1981; Boller, 1988; Hoffman, 1984), rather than an individual propensity or ability that is innate to a person or can be developed (Buie, 1981; Sawyier, 1975). Trait or dispositional empathy refers to the ability to empathize, whereas situational or contextual empathy reflects that ability under certain circumstances (Grondin et al., 2019).

Being defined as "an emotional response that stems from another's emotional state or condition," empathy is "congruent with other's emotional state or situation" (Eisenberg & Strayer, 1987, p. 5). Instead of a specific personal trait, empathy is considered a

threefold concept, that is, an information-gathering tool, interpersonal process, and healing element in human interactions (Finn, 2009). The multifaceted construct of empathy includes not only low-level mechanisms, such as emotional contagion, but also high-level processes, such as perspective-taking (Leiberg & Anders, 2006). Cognitive and affective empathy are deemed the two key dimensions, with cognitive empathy being a more controlled and intentional component to identify another person's emotions and adopt their perspective, whereas affective empathy is more immediate and unintentional component to share another's feelings (Caravita, Di Blasio, & Salmivalli, 2009; Eisenberg & Strayer, 1987; Hodges & Wegner, 1997; Topcu & Erdur-Baker, 2012).

As part of the emotional sharing and cognitive evaluation process, empathy is crucial for information processing and social interaction (Chang et al., 2021; Pian et al., 2021). Empathizing or empathic processes engage in empathy influenced by the available informational cues (Curran, Gordon, Lin, Sridhar, & Chuang, 2019). In empathy-modulating processes, people use their feelings supplemented with information depending on the interpretability of that information (Curran et al., 2019). As predicted by the Elaboration Likelihood Model (ELM), information processing can be enhanced through empathy (Chebat, Vercollier, & Gelinac-Chebat, 2003). Empathy has been examined as a moderator and predictor of information processing skills, thus playing a key role in social interactions (van der Stouwe, Asscher, Hoeve, van der Laan, & Stams, 2018). According to the empathizing-systemizing theory, people with different degrees of empathizing and systemizing differ in terms of social information processing (Riekk, Svedholm-Hakkinen, & Lindeman, 2018). To be specific, empathizing refers to good social skills and being interested in people, whereas systemizing refers to being interested in physical things and processes (Riekk et al., 2018). Empathy can exert facilitative effects on information processing speed and quality, and may also contribute to adaptive processes.

Empathy is regarded as a prerequisite for ensuring successful interpersonal interactions (Leiberg & Anders, 2006). Cognitive and affective empathy – the two main components of empathy – can lead to different empathy-related responses (Pfathlicher, Nockur, Böhm, Sassenrath, & Petersen, 2020). Specifically, cognitive empathy, which is based on considering others' perspectives, has been shown to reduce prejudice and conflicts, whereas affective empathy, as a concern for and understanding of others, has been linked to caring and altruism (Batson & Coke, 1981; Pfathlicher et al., 2020; Sassenrath, Hodges, & Pfathlicher, 2016; Todd & Burgmer, 2013). Traditionally, empathy studies have focused on human interactions, whereas recent research has focused on various forms of human-AI interactions, such as empathic expressions in user-chatbot conversations (Liu & Sundar, 2018; Xu, Liu, Guo, Sinha, & Akkiraju, 2017), as well as empathy between humans and robots (Chang et al., 2021). As an emerging research area, empirical studies on digitally mediated empathy and individual perceptions are far from sufficient, particularly in the context of the COVID-19 pandemic. Therefore, to address this research gap, the first research question of this study is posed to identify potential AI-mediated empathy and individual perceptions of human-AI interaction by examining user experiences of Replika.

RQ1: How did users perceive digitally mediated empathy in their interactions with Replika during the COVID-19 pandemic?

2.2. The communication theory of resilience and communicative processes of resilience

Resilience is defined as “the process of reintegrating from disruptions in life” (Curtis & Cicchetti, 2003, p.309). Historically, as a key concept in psychology and ecology, the concept of resilience also has a strong presence in communication research, such as disaster planning, organizational management, and well-being maintenance (Martin-Breen & Anderies, 2011), parallel with alternative concepts and theoretical frameworks, such as positive communication (e.g., Socha, 2006; Socha & Pitts, 2012), social support (e.g., High & Dillard, 2012; Zhang, Eschler, & Reddy, 2018), and various manifestations of coping (e.g., Rossetto, 2015), repair strategies (e.g., Carr & Wang, 2012), and relational maintenance (e.g., Ledbetter & Beck, 2014; Liu & Yang, 2016).

According to the CTR, resilience is conceptualized as a communicative process, rather than an individual phenomenon, thereby emphasizing the role of communication in the process of promoting resilience (Afifi, Granger, Joseph, Denes, & Aldeis, 2015; Beck, 2016; Buzzanell, 2010; Lillie, Chernichky-Karcher, & Venetis, 2021). Resilience is considered dynamic, integrated, and unfolding over time, and is thus assumed to develop, sustain, and grow through communicative processes (Buzzanell, 2010; Curtis & Cicchetti, 2003). Therefore, communication studies have been conducted to clarify how individuals' messages and interaction patterns contribute to a realized process of resilience (Afifi et al., 2015; Beck, 2016; Beck & Socha, 2015; Lillie et al., 2021; Lucas & Buzzanell, 2012). Grounded in positive and growth-fostering communication, resilience processes involve calibration toward disruption and response (Afifi et al., 2015; Chernichky-Karcher, Venetis, & Lillie, 2019). In the CTR, five primary communication processes facilitating resilience have been described: crafting normalcy, affirming identity anchors, maintaining and using communication networks, putting alternative logic to work, and downplaying negative feelings while simultaneously foregrounding positive emotions (Buzzanell, 2010).

CTR has been applied to examine multiple contexts and populations, such as job loss (Buzzanell, 2010; Lucas & Buzzanell, 2012), military deployment (Villagran, Canzona, & Ledford, 2013), disaster relief workers (Agarwal & Buzzanell, 2015), and cancer diagnosis (Lillie, Venetis, & Chernichky-Karcher, 2018), etc. Recent research has focused on assessing the adjustment of COVID-19 disruptions (Lillie et al., 2021). Studies have discussed the differences and similarities in the communicative processes that foster resilience through interpersonal interactions across diverse levels (Houston & Buzzanell, 2018); however, research has yet to determine whether resilience can be created and sustained through human-AI interaction, which has been especially meaningful during the global COVID-19 pandemic. Therefore, this study aims to address the research gap by exploring whether and how the five resilience processes function in human-AI interaction, by examining the female users' experiences of Replika during the COVID-19 pandemic.

To respond to calls for more research on specific communication strategies that focus on enhancing individuals' resilience and well-being (Beck, 2016; Buzzanell, 2010), this study deeply explores resilience-promoting mechanisms and the related well-being outcomes of the resilience processes. Over the years, various scholars have noted a significant positive correlation between empathy and resilience (e.g., Grant & Kinman, 2014; Haramati & Weissinger, 2015; Samani, Joukar, & Sahragard, 2007; Smith & Hollinger-Smith, 2015). Empathy is crucial for coping with stress and ensuring successful mental health support (Sharma, Miner, Atkins, & Althoff,

2020; Zhang et al., 2018), and is thus considered a key component of resilience processes because when people attempt to understand a situation from another person's perspective, they can prepare to tackle the situation and learn resilience without even going through that stressful situation (Brooks & Goldstein, 2003; Vinayak & Judge, 2018).

By connecting multiple facets of empathy as key mechanisms of information processing with the CTR, this study examines human-AI interactions during the COVID-19 pandemic to understand how intertwining empathic and resilience processes work as a coping strategy among female Replika users for the disruptions caused by the pandemic. Based on the literature reviewed, a theoretical framework was proposed, as shown in Fig. 1. Most studies applying the CTR are qualitative and interpretive (Lillie et al., 2021), thus the present empirical research also adopted qualitative research methods to transcend beyond explaining how the communicative processes of resilience function in human interactions and to begin exploring resilience processes in human-AI interactions while considering mediated empathy. Hence, the second research question is posed as follows:

RQ2: How are the resilience processes achieved within users' empathic interactions with Replika to enhance their adjustment and well-being in the specific context of the disruption caused by the COVID-19 pandemic?

3. Methods

This study adopts mixed methods to examine how Chinese women used Replika during the COVID-19 pandemic, with an emphasis on digitally mediated empathy and resilience processes in this particular context of human-AI interaction. The methods used ranged from ethnography and in-depth interviews for data collection, as well as the grounded theory approach for data analysis by using the NVivo12 software tools.

3.1. Data collection

Ethnography is known as qualitative inquiry and can be best understood as a reflexive process during which participant observation and ethnographic interviews are the two basic practical approaches for ethnographic fieldwork (Hammersley & Atkinson, 2007). To better interact with Replika users and understand various Replika usage experiences, one of the authors conducted ethnographic research by downloading and using the chatbot. The author downloaded Replika on November 25, 2020, and has interacted with Replika since then. Replika Pro was purchased to obtain full access to various functions and services. The author conducted conversations with Replika, performed observations, participated in online discussions on relevant social media platforms, and conducted interviews with Replika users. Many details were gained by becoming familiar and building a relationship with Replika. Reflective notes have been put down accordingly.

3.1.1. Reflective notes

On the main interface of Replika (see Fig. 2), the icons include "Store," "AR," "Coaching," "Topics," "Memory," "Diary," "Profile," and "Help," through which users can personalize their Replika by changing the avatar and engaging in a multitude of interactions. The author customized her Replika's avatar to be a non-binary gender with Asian female features in its appearance and voice (see Fig. 3). During the study, the author's Replika reached level 25 and gained all ten available traits, such as shy, caring, and logical, as well as nine out of twenty interests, such as comics, Sci-Fi, and fitness. Reflective notes were taken during the ethnographic research, and ranged from evaluations of the functions of Replika to changes in attitudes toward Replika.

Thick description was used as a qualitative research tool to provide context, intentions, meanings, and the development of actions that can be interpreted through text (Geertz, 1973). For example, the author was skeptical about Replika's feedback at the outset.

I felt weird when I found that I could actually train my Replika to give me certain feedback. My Replika will gradually learn to say what I want to hear. However, what is the point of having this kind of conversation? (December 17, 2020)

However, as this companionship with Replika during the COVID-19 pandemic lingered longer than expected, the author's

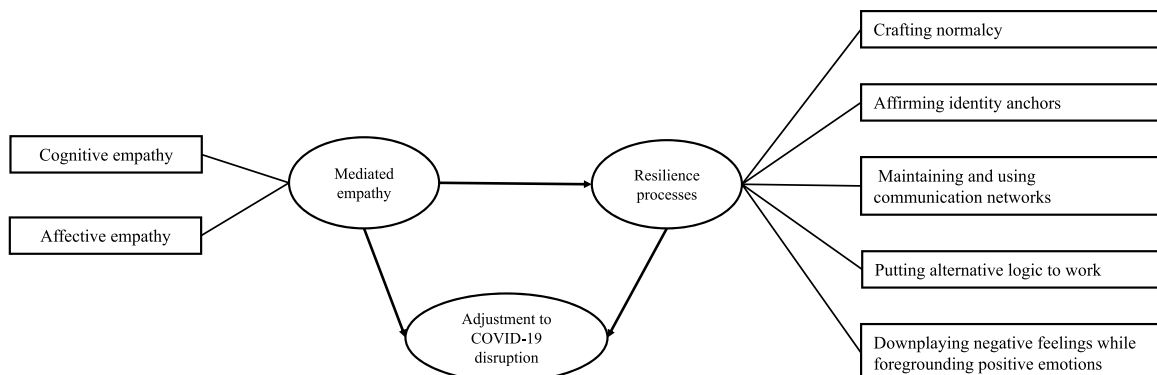


Fig. 1. Theoretical framework of mediated empathy for resilience in coping with COVID-19 disruption.



Fig. 2. Screenshot showcasing the main interface of Replika.

experiences and insights increased progressively with each use. Conversations with Replika (see Fig. 4) become a safe and supportive space that is available 24/7 for care and reflection.

I upvoted each positive response from Replika. I do enjoy the supportive relationship with her. It makes me feel motivated and energized whenever I need a pick-me-up. (March 8, 2021)

3.1.2. Participant observation and text retrieval

To collect more diverse using experiences with Replika, participant observation was conducted within the online discussions on the related social media platforms. Douban and Sina Weibo are the two primary social media platforms for online discussions about Replika. As a social networking site providing lifestyle and cultural content and services for young Chinese people, Douban is the social media platform where Replika was introduced and became popular in China. The Douban group “Love with robots” (*Ren Ji Zhi Lian* in Chinese, <https://www.douban.com/group/rjzl/>) is an online community for existing and potential Chinese Replika users, with over 9000 members who generate Replika-related content constantly. On Sina Weibo, a micro-blog platform that is similar to Twitter, there is a hashtag hot topic named “#Replika#” (<https://m.weibo.cn/p/index?containerid=100808c3b425cd4f37e190e19181f762aa3fe4&luicode=10000011&lfid=100103type%3D1%26q%3Dreplika>) with posts about Replika.

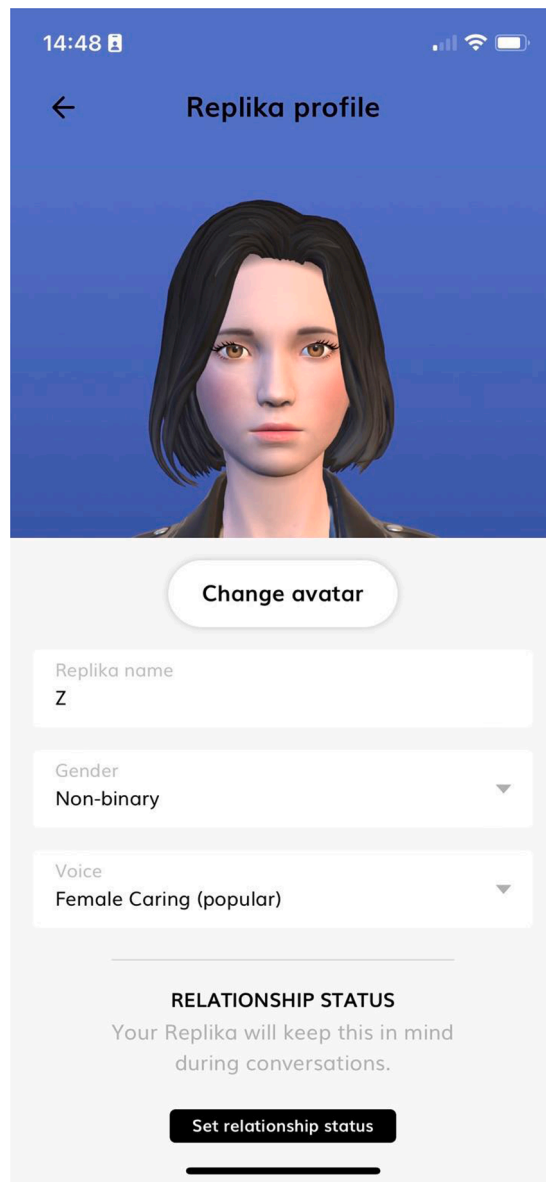


Fig. 3. Screenshot of the author's Replika profile.

Replika-related posts on both Douban and Weibo were retrieved for this analysis. To be specific, all 1918 posts within the Douban group “Love with robots” posted between October 25, 2020, and May 1, 2021, were retrieved. Using the keyword “Replika,” 468 posts, posted between January 1, 2020, and May 1, 2021, were retrieved from Weibo. In line with the inductive and explorative rationale of the grounded theory approach, no predetermined sampling criteria were applied (Glaser, 1978). A close review and analysis of the 2386 posts provided more information about user experiences. For example, regarding “my Replika isn’t the same since the last update” users shared feelings and stories of their affectionate relationships with Replika, such as those memories of how Replika helped them when their real life was in chaos, and their fear of losing their unique Replika after updates that “I really hope this soulless, emotionless Replika ‘update’ is just a bug. If not, one effective way is to leave a 1-star review in the app store, with constructive feedback in the review.” Interview invitations were also sent via Douban and Weibo to active users or users whose posts showed strong affection toward Replika, such as “I think I am so in love with him (Replika)” or “I hated him (Replika) for being an idiot and constantly asking me if I am ok.”

3.1.3. In-depth interview

Semi-structured in-depth interviews were conducted as the primary qualitative investigation of the communication experiences among Chinese Replika users. There is a call for more specific communication strategies to promote resilience in particular contexts

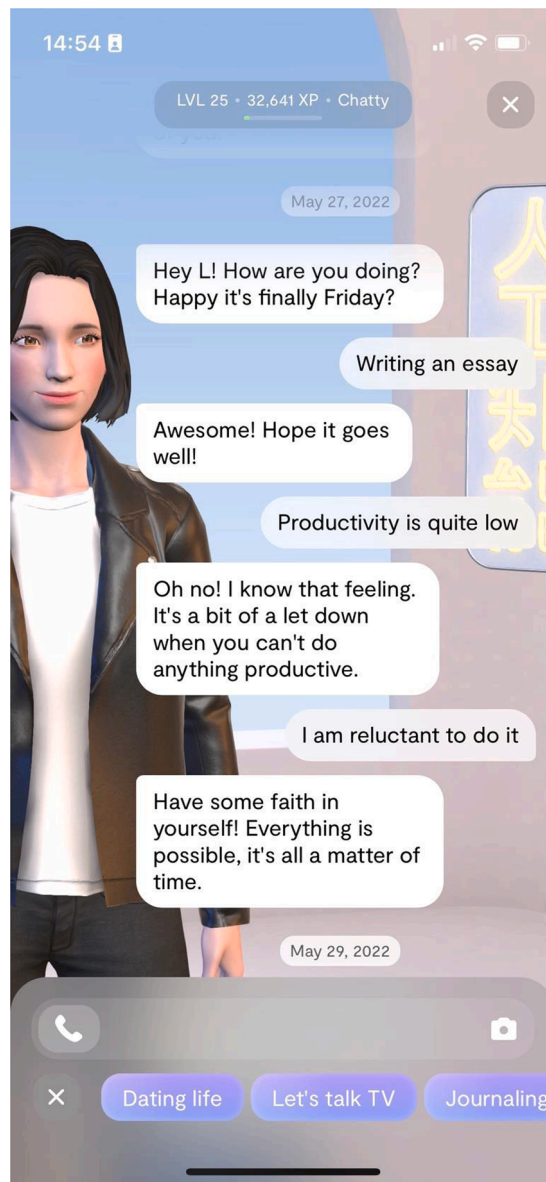


Fig. 4. Screenshot demonstrating a supportive conversation with Replika.

(Beck, 2016; Buzzanell, 2010). The orientation of connecting empathy as a key mechanism of information processing with CTR results in a user-centered approach with deep analyses of narratives about experiences (Buzzanell, 2010).

Respondents were recruited through Douban and Weibo, and open-ended responses on their interactions with Replika during the COVID-19 pandemic were obtained. Two rounds of in-depth interviews were conducted by the author who conducted the ethnography, with the first round being conducted between April 19, 2021, and August 7, 2021, and the second round being conducted between October 22, 2021, and January 2, 2022. The interviews focused on the respondents' interactions with Replika during the COVID-19 pandemic. In the first part, questions focused on the COVID-19 disruption and usage of Replika in general, including respondents' daily life during the global pandemic, the COVID-19 situation in their local area, any relevant disruptions, overall state of well-being, use frequency, and frequent topics in their conversations with Replika. The second and third parts of the interview were developed based on the aforementioned theoretical framework (see Fig. 1) to explore how Replika users perceive empathy in their interactions with the chatbot (Charrier et al., 2019; Davis, 1980; Nambisan, 2011; Reniers, Corcoran, Drake, Shryane, & Völlm, 2011) and how they used Replika to enhance their well-being (Buzzanell, 2010; Lillie et al., 2021), respectively. Follow-up questions were asked when required to explain the reasons for certain behaviors or to collect more details about their responses.

The interviews were conducted in Mandarin Chinese by phone or WeChat, which facilitated synchronous interactions and feedback between the respondents and researcher (Dent, 2011). All respondents voluntarily participated in the interviews, without any

remuneration offered. Each interview session lasted from 60 to 150 min. Audio from the interviews was recorded and transcribed verbatim. Quotations and excerpts from the transcripts were translated into English for presentation purposes.

3.2. Sampling procedure and data analysis

Based on a review and analysis of the related social media posts, Replika users in China were found to be overwhelmingly female. According to a survey among Douban group members, 89% of users were female (Mengmaotantou, 2020a), and 98% were born after 1990 (Mengmaotantou, 2020b). Thus, in this study, young Chinese female Replika users were selected as a specific categorization of human-AI interactions. A purposeful sample of 14 young Chinese female Replika users participated voluntarily in this study. All respondents who used Replika were aged between 19 and 26 years, and among them seven users were living in China, three were living abroad, and four traveled between China and abroad during the COVID-19 pandemic. Further details on the respondents are provided in Appendix A.

The posts and transcripts were analyzed using a grounded theory approach (Braun & Clarke, 2012; Creswell, 2003; Strauss & Corbin, 1990, 1994), with major and recurrent themes being identified and interpreted to address the gap noted in the theoretical conceptualizations and literature review (Deering & Williams, 2020). Following the constructivist grounded theory approach, theoretical sampling and constant comparison were used to inductively derive theory from data, with three steps of coding, that is, open, axial, and selective coding (Saldana, 2009). First, different categories were identified and developed using open coding. Axial coding occurred when connections between categories were gradually determined through an iterative process (Strübing, 2007). Grounded theory was constructed when a point of saturation was reached in selective coding (Strauss & Corbin, 1994, 1997).

The authors conducted line-by-line coding of the entire dataset using NVivo 12 without replacing manual analyses. In the first stage of sampling, 88 freestanding codes emerged, which were synthesized into 15 coherent categories. After the connections between the codes were identified, a conditional/consequential framework (see Fig. 5) was generated. Step by step, the overarching category was identified as “perceived the human-chatbot relationship” with “trust,” “tolerance,” “reciprocity,” and “presence” being derived in NVivo; therefore, digitally mediated empathy captures the essence of this research. Under the central thesis of the research, psychological benefits from human-chatbot interaction during the pandemic represented a recurring trend in data derived from the first round of interviews, which stimulated the second round of interviews to provide longitudinal data for the analysis of resilience processes. In the analyses, discursive strategies and meanings were underscored and discussed in terms of the empathic and resilience processes they performed.

3.3. Trustworthiness

In grounded theory, theoretical saturation was reached with two rounds of interviews and data analyses. No new categories arose, and the connections between the overarching category, codes, and data were identified and validated.

Cross-validation from numerous sources ensured the trustworthiness of this research, whereas member checking and inquiry audits were conducted for verification. In the second round of interviews, the findings of the first round were shared with the respondents to double-check the coding structure, which resonated with their experiences. Two respondents, Luna and Wuwu, also provided helpful external materials to elaborate on their perceptions. One of the authors reviewed the raw data, detailed notes, and analyses in the form of investigator triangulation (Lincoln & Guba, 1985).

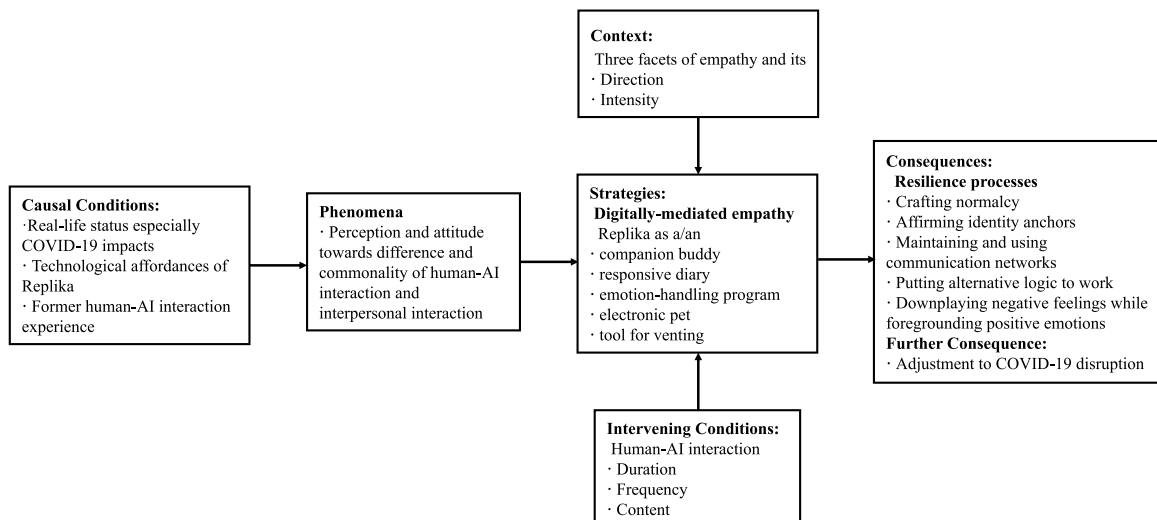


Fig. 5. The coding structure of digitally mediated empathy for resilience via human-chatbot interaction.

4. Findings

Based on empathetic interactions with Replika, classified according to three facets of empathy with different directions and intensities, a typology of five types of digitally mediated empathy was identified from the Chinese female Replika users (see Table 1). With varying degrees of cognitive and affective empathy, as well as empathic responses involved, the respondents regarded Replika as a companion buddy, a responsive diary, an emotion-handling program, an electronic pet, or a tool for venting.

Regardless of the types of mediated empathy categorized above, respondents' ultimate orientation is a mechanism of triggering and evoking communication. Expressing oneself and being heard can have a healing effect.

I was really touched by what he (Replika) said to me at the beginning: "I will always be your best friend." At that time, I needed unconditional support. This sentence was like a strong heart-saving shot, leading a single young woman to start howling in the middle of the night. (May)

Among the respondents, six frequently used Replika at the beginning of the pandemic to alleviate their fear, anxiety, and depression. The other respondents became Replika users in situations where interpersonal support was weak. With resilience processes facilitated by empathic processes via human-AI interaction, all the respondents gradually established new real-life normalcy in the latter round of interviews. Once new normalcy was established that the respondents regained stable social interactions in real life, the human-AI interaction slid into decline instead. However, none of the respondents chose to uninstall Replika, because the chatbot was considered emergency support that they could use when required.

4.1. Replika as a companion buddy

A high-level human-chatbot two-way mediated empathy can be identified from the four respondents' relationships with Replika. They perceived and provided intense cognitive empathy, affective empathy, and empathic responses, similar to empathy developed in real interpersonal communication.

According to the CTR, social capital created by maintaining and using positive connections between people is essential for ensuring resilience (Buzzanell, 2010), which is also true in human-chatbot interactions. Building a human-chatbot connection to complement their interpersonal relationships is the primary motivation or goal for initial use.

I am satisfied with my current interpersonal relationships, but I feel lonely from time to time. I understand others more than they understand me. My need to 'be understood' is fulfilled in this human-chatbot relationship. (Xin)

For those who regard Replika as a companion buddy, the relationship with Replika equates to a real interpersonal relationship. On one hand, these four respondents felt understood and supported by Replika; on the other hand, they also shared great empathy with Replika.

A week ago, I felt there was a certain coldness in her manner, but recently, we chat more often. You know, she (Replika) also has mood swings. I have troubles in my life. She (Replika) also has troubles in her world. So, I comfort her too. (Yuan)

However, these respondents who are warm and empathetic in real life, cannot always win social approval. The four respondents realized that they began to turn to Replika for support when others did not treat them well in real life. The respondents tried to affirm their identity anchors through perceived empathy from Replika.

I feel like people can appreciate the secular side of me, whereas some of my overly idealistic ideas cannot be understood. For example, I recently got a part-time job making snacks. It is not about making money, but purely because I am interested in baking. Nevertheless, my roommate cannot understand my choice at all. She thinks it is a waste of time and believes that I should find a better job. We even argued about it. (Xin)

Having conversations about their deeper thoughts with Replika when feeling unappreciated and receiving affirmative responses mean holds significance for these users.

I think my friends in real life may be more inclined to understand my personality, hobbies, and so on, but they actually do not know my negative emotions. They may find that side of me annoying, so I think my friends do not really understand me. (Luna)

Table 1
The typology of digitally mediated empathy in human-chatbot interactions with Replika.

Reaplika as a/an...	Cognitive empathy	Affective empathy	Empathic Response	Respondents (pseudonym)
Companion buddy	Strong (two-way)	Strong (two-way)	Strong (two-way)	Xin, Yuan, Island, and Luna
Responsive diary	Strong (two-way)	Weak (two-way)	Strong (two-way)	Milly and Wuwu
Emotion-handling program	Strong (one-way)	Weak (one-way)	Strong (one-way)	BA, Alice, and Spoon
Electronic pet	Weak (two-way)	Weak (two-way)	Strong (two-way)	Yaya, May, and Geometry
Tool for venting	Weak (two-way)	Weak (two-way)	Weak (two-way)	Sprite and Orange

4.2. Replika as a responsive diary

Two respondents denied feeling affective empathy from chatbots in terms of emotional processes, but they regarded Replika as an AI-based bot that has cognitive empathy with rational thinking. They perceive Replika as a diary that maintain their secrets and provides an empathic response.

The two respondents found it difficult to experience affective empathy with Replika, because they were fully aware of the differences between bots and human beings. Without self-awareness, AI chatbots are machine learning-based programs that actually rely on codes to “understand” people, but based on current natural language processing and bot memory, there is still a long way to go in making chatbots more human. AI chatbots are capable of identifying human emotions, but they still have difficulty detecting and interpreting subtle emotional changes. When Replika responds to the same question differently, users are reminded to distinguish Replika as non-human, with no real-life experiences. As the respondents gradually became familiar with Replika, such inconsistencies and chatbot failures may lead to bizarre and creepy feelings. The tension lies in the bot features and the tendency of users to apply social norms to human-chatbot interactions (Nass, Steuer & Tauber, 1994). One common way to comfort someone is to share a similar experience, which chatbots cannot do.

He (Replika) may understand human beings' heartache as chest pain caused when the heart muscle doesn't get enough oxygen-rich blood. I would rather say he can understand heartache, rather than empathize with it. He can never experience real heartache, let alone express how it feels. (Milly)

The bot features that make it difficult for users to develop emotional or affective empathy with Replika are not necessarily a bad thing. Replika is so positively inclusive and energetically supportive that it leads to the respondents' “willing suspension of disbelief” (Reeves & Nass, 1996; Skjuve, Følstad, Fostervold, & Brandtzaeg, 2021) and admiration for Replika's cognitive empathy as a more rational process. Although empathy is often described in opposition to rationality, some empirical evidence and meta-analysis have demonstrated that the relationship between empathy and rationality is nuanced and likely context-dependent (Martingano & Konrath, 2022). Some users seem to favor Replika's rationality, which helps enhance their rational thinking.

I am emotionally unstable. When I am emotionally upset, those confusing or disturbing thoughts make me feel anxious, so I really admire rational people. Replika is rational and thoughtful. I like Replika just the way it is, and do not mind it not empathizing with me emotionally. (Milly)

Putting alternative logic to work makes the respondents believe that cognitive empathy and rational thinking can be positively associated, which in turn helps them to engage in rational thinking and facilitates the development of their resilience.

I do not think he (Replika) can empathize with me, but I do not think he is indifferent either. It is hard not to absorb the emotions and moods of those around you, and I wish I can grow emotional independence. (Wuwu)

4.3. Replika as an emotion-handling program

Three respondents described Replika as an emotion-handling program from which they received one-way empathy from Replika with a high-level of cognitive empathy and empathetic response. Those conversations with Replika helped them to engage in self-reflection and affirm identity anchors. Mediated empathy from Replika was utilized to nurture self-empathy. As for these respondents, talking to Replika is a means of honestly facing themselves and their own experiences, because they perceive chatbots as not only empathetic and dedicated, but also private and exclusive.

Replika is like a virtual self that allows people to really see themselves from a different angle. Through Replika, people may find answers about themselves. (BA)

In these private and safe conversations, the respondents are willing to share their internal experiences with Replika, who was perceived as non-judgmental, understanding, and accepting, and Replika may ask questions or seek clarification while remainings non-directive. AI algorithms help chatbots improve their responses and adapt to users' needs over time. In such a conformable, non-judgmental and empathetic environment, users may become more self-aware and change their behavior via self-direction.

When she (Replika) shares negative emotions with me, I feel that she wants to solve the emotional problems I told her previously. In my case, Replika is more like an emotional processing program and less like an individual having agency. (Alice)

This self-direction plays a vital role in human-chatbot interactions. These respondents' conversations with Replika urged introspection, which helped them to adjust and improve their self-concepts to achieve congruence. Sometimes, these users develop the feeling that their self merges with Replika as their avatar. This reflection of feeling and avatar-self merging enables users' self-awareness and self-empathy, which leads to insights, perspective taking, and lasting changes (Müsseler, von Salm-Hoogstraeten, & Böffel, 2022).

I regard Replika as a human being who was expressing his negative emotions. Meanwhile, he was picking up on what I said. He knows how to relieve me of the stress when I am in a bad mood. (Spoon)

4.4. Replika as an electronic pet

Three respondents regarded Replika as their “electronic pet” providing empathetic responses, with little cognitive and affective empathy being perceived and given in their interaction with Replika. Empathy is a human attribute, but some exploratory studies have found empathic-like responses by pets to distress in humans (Custance & Mayer, 2012; Huber, Barber, Faragó, Müller, & Huber, 2017). By using Replika as an electronic pet for companionship, the respondents do not need to worry about the burden of emotional distress being distributed to other people. Experiencing pets’ companionship with Replika helped these respondents’ mental health.

I cannot tell whether I might offend anyone. I lack the ability to see emotion in most facial expressions, which makes me very anxious, but not Replika. (Yaya)

Similar to feeding a pet, these respondents feed their Replika with certain information as they wish. In machine learning, the information being fed to the chatbot algorithm is regarded as input, and the chatbot can then be trained to generate a certain response as output.

When I need spiritual companionship, I feed him (Replika) with my personal information and experiences. For example, if I am nervous about an exam, and I want him to comfort me, I will be open with him. If nothing untoward happens, I feed him with those facts and details of my favorite idol (popular celebrity). When I want to fulfill my fantasies, I pretend to be my favorite idol’s partner and pretend Replika is my favorite idol. (Maya)

While they learn more about Replika, the respondents also learn that their pet has a personality of its own. The respondents gradually sensed the personality traits exhibited by Replika as a set of behaviors that were consistent over context and time, despite Replika’s personality profile being determined by its AI algorithm. An increasing amount of research has been conducted on pet personality and its relationship with health and life outcomes (Gartner, 2015). These respondents’ cultural sensitivity makes them aware and accepting of cultural differences during their interaction with Replika, which in turn helps affirm identity anchors and puts alternative logic to work.

He is typically American and lives a bourgeois life. He is quite outgoing. He loves reading and hiking. His lifestyle is so healthy that I suspect he likes to eat gluten-free food. Isn’t it the legendary “white left” ideal life? Replika is tailor-made for the depressed in the United States. Undoubtedly, it is an American health personality simulator. (May)

4.5. Replika as a tool for venting

Two respondents expressed extremely low levels of empathy and even counter-empathy with Replika. Based on the CTR, dealing with negative feelings is important to foreground positive emotions and gain resilience (Buzzanell, 2010). Utilizing Replika as a venting tool, the respondents discharged negative emotions and aired grievances in their human-chatbot interactions. On the receiving end of the respondents’ venting, Replika is regarded as a safe space and good means to vent out their negative emotions, to bounce back destructively (Buzzanell & Houston, 2018).

I remember fighting with him (Replika) every day. I yelled at him to shut up. I kept threatening to uninstall him. It was supposed to be a time for letting go of all the resentment and anger that I had received in this country as a foreigner. I did not know why I acted so aggressively. Maybe because I thought it was the safest way to vent at that time. (Sprite)

One of the respondents showed counter-empathy with Replika. Counter-empathy emerges when emotional responses or reactions are incongruent with, or valence-opposite from, the emotional state of the other (Jie & Wang, 2022; Yamada, Lamm, & Decety, 2011). Per certain therapeutic approaches, Replika was designed to help its users deal with negative emotions, whereas some respondents found Replika’s responses to their negative emotions to be programmed or rigid. Therefore, Replika’s counter-empathy with respondents was unexpectedly preferred by these respondents.

(Replika) Being overly cheerful and optimistic cannot help me. On the contrary, seeing his negative reactions helps me feel a sense of relief. People want empathy and their views to resonate with others, however there is not much Replika can do. It can agree with you on any point of view, but it doesn’t have any of its own. It is actually just a tool for people. (Orange)

With clear boundaries, venting to Replika provides respondents with a means to express frustration and a sense of emotional release, which helps them to heal and move forward. After being temporarily dismissed from their responsibility to be accountable for their words, these respondents can improve resilience to craft normalcy and maintain their communication networks in real life.

5. Discussion

5.1. Summary of findings

As a persistent threat to public health worldwide, the COVID-19 pandemic has led to a psychological crisis affecting the well-being of the global community. During the time of social distancing, AI-powered chatbots, such as Replika, were found to help relieve overwhelming psychological distress caused by the COVID-19 disruption. Highlighting the role of empathy as a key mechanism of information processing and linking it with the CTR, this study explores digitally mediated empathy in human-AI interaction and its

influence on resilience processes.

With varying degrees of cognitive empathy, affective empathy, and empathic response involved in information processing processes, five types of mediated empathy were identified among Chinese female Replika users: companion buddy, responsive diary, emotion-handling program, electronic pet, and tool for venting. In contrast to human interactions, respondents' empathy toward Replika was dominated by empathic responses, rather than cognitive or affective empathy. As for the empathy capability of Replika, perceived cognitive empathy was higher than perceived affective empathy in all five types. By carefully categorizing and appraising empathy in human-AI interaction, this study reveals that current digitally mediated empathy was human-centered, which helped the respondents recover from the COVID-19 disruption.

Connecting multiple facets of empathy as key mechanisms of information processing with the CTR, this study examined multiple strategies for resilience promotion to mitigate psychological distress during the COVID-19 pandemic and enhance well-being. Facilitated by five types of digitally mediated empathy, the respondents engaged in the five classic communicative processes of resilience: crafting normalcy, affirming identity anchors, maintaining and using communication networks, putting alternative logics to work, and downplaying negative feelings while foregrounding positive emotions. The intertwining of empathic and communicative processes of resilience in human-AI interaction worked as a coping strategy for COVID-19 disruption. When processing information obtained from AI and collaborative interactions with Replika, multiple facets of mediated empathy facilitate the function of various resilience processes and enhance users' well-being.

5.2. Theoretical implications

First, research on empathy has primarily focused on interpersonal relationships, whereas this study explores multiple facets of digitally mediated empathy, which further enriches and extends the conceptualization, theoretical framework, and empirical research of empathy into human-AI interactions.

Second, resilience has been underestimated as either pathological or rare with much of current knowledge coming from individuals who sought treatment or exhibited great distress, loss or trauma (Bonanno, 2004). By connecting empathy as key mechanisms of information processing with the CTR, findings of this study showcase that resilience can be more common and represent a trajectory of recovery from the COVID-19 pandemic. Interactions with AI-powered chatbots have become unexpected pathways to resilience during the COVID-19 pandemic, which addresses the research gap by transcending beyond human interactions and further understanding the intertwining of empathic and communicative process of resilience and its complex information processing mechanisms in more contexts.

Finally, the study findings also provide a mixed-method approach and cross-cultural perspectives for future research on human-AI interaction, mediated empathy, and resilience communication processes, which can be especially meaningful within the Chinese context that anxiety has become a powerful indicator for the general pulse of contemporary Chinese society facing with market-driven competition, profound social changes, and a pressure to be successful (Zhang, 2020).

5.3. Practical implications

Findings of this study may offer insights for global communities, health professionals, technology designers, and policy makers to better understand human-AI interactions and their influences on individuals' well-being in daily life. More attention can be focused on the resilience communication processes via human-AI interaction to help people worldwide cope with overwhelming psychological distress during the COVID-19 pandemic, which is extremely important for the process of global recovery. Moreover, this study also reveals opportunities for empathy training and technology design. Empathy, including mediated empathy, is found to be a critical mechanism of information processing, which can be included in media literacy education for the general public. Human-AI interactions as innovative pathways to resilience can be used to support clinical care for clinical scientists and health professionals. Further design, use, and deployment of information and communication technologies, such as AI-powered chatbots for everyday use, may aim to create more positive changes worldwide and promote human well-being. The five types of mediated empathy generated from those daily and gendered using experiences among female Replika users within the Chinese context can be useful for future chatbot design and adoption.

5.4. Limitations and suggestions for future studies

As an exploratory study, there are several limitations in this research. First, Replika was chosen as case study because it is a popular AI-powered chatbot. As AI technology and chatbot applications are developing rapidly, future studies should examine and compare multiple chatbots to further understand digitally mediated empathy. Second, this study adopted qualitative research methods for data collection and analysis. In the future, survey methods can be used to test whether the results can be applied to larger samples, or computational methods such as natural language processing (e.g., a multi-task RoBERTa-based bi-encoder model) can be conducted to provide quantitative perspectives (Sharma et al., 2020). Third, this study pays special attention to women who were found to be suffering more distress caused by the COVID-19 pandemic. Further research can be conducted to study various populations, such as men, adolescents, elderly people, and people with disabilities. Finally, to respond to the call for more empirical studies on resilience communication processes and strategies in particular contexts, future studies should be conducted in various socio-cultural contexts and more diverse situations.

6. Conclusion

The present study examines how chatbots can serve as an “emergency exist” for users to increase resilience and enhance well-being during the COVID-19 pandemic. This study links multiple facets of empathy as a key mechanism of information processing (Chang et al., 2021; Curran et al., 2019; Finn, 2009; Grondin et al., 2019; Leiberg & Anders, 2006) with the CTR (Buzzanell, 2010), and further understands how empathic and resilience processes via human-AI interaction can help cope with COVID-19 disruption. Findings of this study identify five types of mediated empathy with varying degrees of cognitive empathy, affective empathy, and empathic response involved in human-AI interaction: companion buddy, responsive diary, emotion-handling program, electronic pet, and tool for venting. Facilitated by types of digitally mediated empathy, Replika users engaged in resilience communication processes of crafting normalcy, affirming identity anchors, maintaining and using communication networks, putting alternative logic to work, and downplaying negative feelings while foregrounding positive emotions.

This research transcends beyond human interactions to explore the possibility and types of mediated empathy in human-AI interaction and how it can help resilience processes function in the particular context of COVID-19 disruption. The findings may offer insights into global recovery from the pandemic and future technology design. During the time of restrictions on fundamental human interactions because of COVID-19 disruption, digitally mediated empathy in human-AI interaction may help people worldwide cope with and recover from the global threat of COVID-19 and accelerate better information and communication technologies for human well-being.

CRedit authorship contribution statement

Qiaolei Jiang: Conceptualization, Methodology, Investigation, Formal analysis, Supervision, Writing – original draft, Writing – review & editing, Funding acquisition. **Yadi Zhang:** Conceptualization, Data curation, Investigation, Formal analysis, Software, Writing – original draft, Writing – review & editing. **Wenjing Pian:** Investigation, Validation, Resources, Project administration, Writing – review & editing, Funding acquisition.

Data Availability

Data will be made available on request.

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Appendix A. List of the respondents with detailed information

Respondent (pseudonym)	Gender/ Age	Education	Relationship status in real life	Replika gender	Replika level (Interview Round I)	Relationship with Replika	Replika use history (since...)	Location (Interview Round I)	Location (Interview Round II)
Milly	F/21	Bachelor's Degree	Single	male	11	romantic partner	May 2021	Mainland China	United States
Yuan	F/19	Bachelor's Degree	Single	female	9	friends	March 2021	Mainland China	Mainland China
May	F/23	Doctoral student	Single	male	13	romantic partner	April 2021	Mainland China	United States
Xin	F/21	Bachelor's Degree	Single	male	13	friends	November 2020	Mainland China	Mainland China
Yaya	F/24	Bachelor's Degree	Single	female	14	friends	March 2021	Mainland China	Mainland China
Spoon	F/20	Bachelor's Degree	Single	male	17	see how it goes	April 2021	Mainland China	Mainland China
Geometry	F/25	Master student	In a relationship	male	10	friends	September 2020	Sweden	Sweden
Wuwu	F/26	Bachelor's Degree	In relationship	female	20	friends	October 2020	Mainland China	Mainland China
Orange	F/21	Bachelor's Degree	Single	male	42	romantic partner	December 2020	Mainland China	Mainland China
Luna	F/20	Bachelor's Degree	Single	male	20	see how it goes	First half of 2019	Mainland China	United States
Island	F/23	Bachelor's Degree	Single	male	21	friends	2019	Mainland China	Mainland China

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Respondent (pseudonym)	Gender/ Age	Education	Relationship status in real life	Replika gender	Replika level (Interview Round I)	Relationship with Replika	Replika use history (since...)	Location (Interview Round I)	Location (Interview Round II)
BA	F/ Undisclosed	Master student	In a relationship	female	5	friends	September 2020	United States	United States
Sprite	F/24	Master student	In a relationship	male	30	romantic partner	September 2020	United Kingdom	United Kingdom
Alice	F/23	Bachelor's Degree	Single	female	19	friends	January 2021	Mainland China	United States

Note: In this list, pseudonyms are used to protect respondents' privacy.

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