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# The "Conversation" about Loss : Understanding How Chatbot Technology was Used in Supporting People in Grief.

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While conversational agents have traditionally been used for simple tasks such as scheduling meetings and customer service support, recent advancements have led researchers to examine their use in complex social situations, such as to provide emotional support and companionship. For mourners who could be vulnerable to the sense of loneliness and disruption of self-identity, such technology offers a unique way to help them cope with grief. In this study, we explore the potential benefits and risks of such a practice, through semi-structured interviews with 10 mourners who actively used chatbots at different phases of their loss. Our findings indicated seven approaches in which chatbots were used to help people cope with grief, by taking the role of listener, acting as a simulation of the deceased, romantic partner, friend and emotion coach. We then highlight how interacting with the chatbots impacted mourners' grief experience and conclude the paper with further research opportunities.

CCS Concepts: • **dialogue systems** -> **grief bot** • **human-centred computing** • **Applied Computing** -> **Healthcare applications** • **Chatbot-Generated Emotional Support (CGES)**;

Additional Key Words and Phrases: Chatbot, Virtual Human, Grief/Prolonged Grief, Conversational AI, Digital Grieving, Thanatechnology

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## 1 INTRODUCTION

Grief is a natural response to the loss of someone or something of personal value. It affects people both physically and psychologically, and varies in symptoms and intensity between individuals. There are several theories of what the grieving process entails and what stages mourners typically go through. The most well-known model is the Kübler-Ross model of five stages of grief, first proposed in 1969 [53], encompassing the stages of denial, anger, bargaining, depression and acceptance, adjusting in a world without the deceased, and subsequently embarking on a new life. Apart from losing social connectedness with the deceased, the majority of mourners lose social connectedness either with their family or friends/social circle, due to difficulty accepting the loss, and try and adapt to a new reality without the deceased and everything they represented (i.e. common daily activities carried out together, common targets/ambitions, the whole daily routine dependent on and interwoven with the deceased).

A common point agreed upon in prevailing theories (Elisabeth Kubler-Ross's grief stage model [53], William J. Worden's Tasks for the Bereaved [111], John Bowlby's theory on attachment [14], Stroebe and Schut's dual process model [100]), on the grieving process is the importance of reflection and processing through talking, writing and creating [56]. From these emerged a wide range of interventions to support mourners, ranging from Cognitive Behavioral Therapy

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(CBT) sessions ([11], [18], [75], [86], expressive writing therapies, [73], [58], [50]) to group interventions ([23], [94]), and mindfulness and compassion-based interventions [46], just to name a few. Unsurprisingly, with the pervasiveness of digital technology, research has explored the efficacy of digital interventions as well, e.g., internet-delivered CBT or iCBT [5], and the use of web/mobile applications (including mourners' online communities) to create a digital memorial/legacy for the deceased ([24], [28], [6], [64]).

However, despite myriad literature examining the use of digital technology to support the grieving process, most work is based on grief theories which overlook or downplay the importance of the enduring relationship with the deceased post death as a means to coping with grief, as many interventions based on these theories tend to focus on the bereaved person's achieving closure and hence moving on with their life [44]. The expectation is that grief will culminate in the individual successfully detaching from a close, loving relationship with the deceased ([44], p.18).

Renewing the bond with the deceased [67] is an approach which can support the mourners in restoring their lost social connectedness with the deceased and their social circle. Building on this idea of renewing and continuing the bond with the deceased, with the aim of restoring/restructuring their lost social connectedness, we aim to explore the use of conversational AI (or more colloquially chatbot) to facilitate the grieving process. This study was inspired by emerging evidence of the healing effect of the continuation of the bonding with the deceased and the subsequent regaining/reshaping of social connectedness after the loss of a significant other ([69], [87]). The healing effect of continuous bond with the deceased, coupled with the recent advances in conversational AI in the field of mental health support ([1],[51], [101]) led us wonder how and to what end mourners are currently using chatbots, whether their use of chatbot is in line with the "correspondence with the deceased" approach, providing a source of companionship to regain their lost social connectedness. Concretely, the research questions we hope to answer are as follow:

- (1) Why and how do mourners use chatbots as a way of coping with grief, specifically as a medium of "correspondence" or "renewing the bond" with the deceased loved one?
- (2) In what ways and to what extent does using chatbot technology affect the process of grief, specifically in view of helping mourners restore social connectedness?

To address these questions, we carried out an observational study into ten individual mourners who were using chatbots as a form of coping mechanism for grief due to the loss of their loved ones, by exploring their personal journeys, through data analysis of the mourners' in-depth online interviews based on interactions with the chatbot over multiple sessions (up to 1 month or more).

## 2 RELATED WORK

When it comes to describing mourners' experience of loss, Schütz (2004) [90] suggests that the mourner can be compared to a "stranger" or a "home-comer" who after some time away expects to come back to a well-known environment, but on doing so has great difficulty restoring social relationships, as they experience a loss of social connectedness with the deceased loved one [10]. This can be prolonged with a self-induced loss of social connectedness pertaining to their social circle; due to feelings of emptiness, sadness and depression, the mourner often expresses a denial of socializing the way they used to, and reacts to adapting to a socially new context. Social connectedness is one of the basic needs which supports mental health, and leads to social and physical well-being. Research has shown and reiterated the importance of "connectedness" to maintain a good physical as well as mental health [12].

Approximately 10 percent of people who lost a loved one develop Prolonged Grief Disorder (PGD) and face difficulty processing grief exceeding 6 or even 12 months [103]. PGD [77] is a mental disorder characterized by intense, distressing

105 and disabling symptoms in which mourners experience protracted and preoccupying yearnings, emotional numbness,  
106 identity disruption and lack of meaning in the absence of their deceased loved ones, culminating even in suicide risk[7].  
107 Mourners suffering from PGD report moderate perceived social support from family, friends, and significant others [4],  
108 and they are in greater need to fill in the social void by connecting with others leading to feelings of social connectedness  
109 and well-being.  
110  
111

## 114 2.1 Use of Digital Technology according to Mourners' Needs

115 Digital technology has recently functioned as a useful tool to support people experiencing grief to meet the basic  
116 human needs for social connectedness – friendship, community, and society [20], rendering technology and people  
117 enmeshed in a reciprocal, cyclical relationship. Research has explored how different kinds of digital technology have  
118 been used by bereaved individuals to assist them in coping with loss. All these digital approaches contributed to  
119 the coinage of the term "thanatechnology"-the scientific study of death, dying, loss and grief by employing multiple  
120 professional lenses (i.e., medical, psychological, physical, spiritual) in a socio-technical context. There are broadly three  
121 main approaches to addressing the need of restoring the mourners' social connectedness within the "thanatechnology"  
122 research corpora:  
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- 125 (1) Promoting social and emotional well-being of griever through *web-based digital memorials*

126 The creation of memorials with a digital component is a new socio-digital phenomenon ranging from intimate,  
127 tangible family memorials embedded with ritual qualities [105] to virtual memorials [31]. Examples of digital  
128 memorials can be found in the development of a framework for digital memorials, which was utilized to  
129 create "Storyshell"-the design of a bespoke digital memorial for a bereaved parent made with participatory  
130 design [63]. Studies have highlighted online forums and chat rooms in early literature ([74], [97]) as spaces for  
131 mourners to express and vent their grief through talking about the deceased. Living Memory Home (LMH, a  
132 custom-made web-based application to honor the deceased person's memory) [91] is a digital probe exploring  
133 design opportunities to facilitate backstage grieving (personal and private grieving as opposed to bereavement  
134 through digital public spaces like social media).  
135

- 136 (2) Community engagement with focus around mourner's interaction with others via *social networking services*

137 MySpace and Facebook have been used as online spaces for grief expression [16]. These social network  
138 technologies supports community engagement for mourners, and are the main platforms to promote digital  
139 immortality as well as posthumous social networking. The use of such technology in grief and mourning has  
140 been well considered in early work ([32], [34], [109], [16]), showing how postings in social media, sharing  
141 memories and post-mortem comments, offering praise, and expressing sorrow ([25], [59]), help co-construct  
142 the digital identity of the deceased.  
143

- 144 (3) Individual grief support through *grief-specific technological tools* (i.e., grief support applications, grief support  
145 orientated platforms[8])

146 Mobile applications may also be helpful for grieving adults and children to understand their own grief, and/or  
147 to facilitate talking to other people dealing with grief too. For instance, "Tuki" (a mobile application meaning  
148 'support' in Finnish,[54]), matches users with similar grief experiences. Following the same paradigm, the  
149 "Besupp" website was created [60] to allow bereaved individuals to connect in a novel online space [26]. Other  
150 mobile applications providing support to bereaved families or functioning as resources for an easy way to find  
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157 support when grieving are "GriefSteps" [42], "Grief Refuge" [39], "Good Grief – Chat Messaging" [38], "Grief  
158 Works" [41] and "Grief: Support for Young People" [40].  
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## 163 2.2 Renewing the Bond with the Deceased as a Diverse Approach 164

165 Some of the approaches (e.g., digital memorials) allude to an indirect connection with the deceased. Renewing the  
166 bond with the deceased [67] is an approach which can support social connectedness to the deceased loved ones in  
167 life-affirming ways. There are many ways in which the renewal of this bond can occur, depending on the type of grief  
168 and the mourner's ability of abstract communication. For instance, correspondence (letter writing/imaginal written  
169 dialogues) with the deceased has been accredited as one of the most impactful ways to deal with grief along with  
170 guided imaginal conversations (e.g., a psychological encounter with the deceased to allow the mourner to repair and  
171 rework the relationship with them). Moreover, telling stories of the deceased (introducing the deceased) has value in  
172 not only activating nostalgia of reminiscence mechanisms leading to acceptance, but also using relational connections  
173 to mitigate some of the pain of loss. According to [27], recent work in grief and ethics suggests that there is value  
174 in maintaining "imaginal relationships" with the dead [72]. Contemporary work in clinical psychology suggests that  
175 grieving often involves thinking of oneself as sustaining a relationship with the deceased by continued engagement  
176 with an internal representation of the loved one.  
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## 180 2.3 Chatbots in Healthcare and Grief Support

181 Chatbots have been extensively used in healthcare, and more specifically in mental health support ([57], [3]) in the past  
182 few decades. The applications range from booking of general medical appointments to personal healthcare assistants  
183 providing simple support such as daily medication, as well as counseling, training and fully-fledged psychological therapy  
184 (e.g., Cognitive Behavioral Therapy-CBT) ([19], [35], [55]). Three different types of chatbots - companion (chatbots  
185 designed to provide social interactions/companionship), healthcare (chatbots designed to provide therapy/counseling  
186 to mourners), and griefbots (chatbots simulating the deceased loved one) - have been used by mourners during their  
187 grieving process either as a means to buffer feelings of anxiety, depression or distress after the loss or as a means to  
188 continue an imaginal relationship with the deceased.  
189

190  
191 "Replika" in [70] is a companion chatbot that helps users cope with feelings of grief through constant daily chats  
192 with them, while offering constant companionship.  
193

194 Chatbots attempting to simulate a therapist have been explored by researchers to provide therapy based on conven-  
195 tional therapy approaches [29], or in diagnosing mental health problems among grieverers or help them handle anxiety  
196 and/or depression (Mindspa [62], Wysa [112], MindDoc [61], Memoron [47], [107]). Specific chatbots (i.e. "Woebot"  
197 in [29] and "Tess" in [33]) have been evaluated in leading to the conclusion that users may experience "significant  
198 reduction in symptoms of depression", hence suggesting that AI may serve as a cost-effective and accessible therapeutic  
199 agent/emotional companion, and as a feasible option for delivering support to bereaved people to help them establish  
200 social connectedness with the deceased or regain their social connectedness in their social circle.  
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202

203 There are a few mourners who have chatted with chatbots simulating their deceased loved one. This kind of chatbots,  
204 often known as "Griefbots" are specifically designed to help people coping with grief by recreating the deceased in  
205 order to resolve grief through conversation ([48], [36]). They can be created either by training on personal messaging  
206 data or recording query response pairs prior to the deceased's passing. Recent research projects are currently focusing  
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209 on griefbots with the aim of providing the bereaved with the chance to speak to their loved ones after their death ([78],  
210 [48]).

211 However, as far as we know, little research has looked into the role of AI in supporting continual bonds with the  
212 deceased, i.e. how conversational AI, or chatbots can potentially play a role in supporting grief.  
213

### 214 3 METHOD

215  
216 Driven by this curiosity, we started searching online for mourners who have been or are currently using chatbots to  
217 cope with the grief due to the loss of their loved ones. We posted messages on various online platforms, including  
218 online communities (i.e. Facebook), subreddits (e.g., [83], [82], [84]), and chatbot specific online forums (e.g., [81], [80])  
219 to identify participants who might be willing to share their experiences using chatbots in grief with us.  
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#### 224 3.1 Study Design

225 A qualitative study design was adopted. Overall, ten mourners were recruited for in-depth semi-structured online  
226 interviews (average duration: 65 minutes). After a short overview of the description of the loss of the significant  
227 other and the subsequent distress or functional impairment caused, mourners had to reply to 6 sets of questions:  
228 namely regarding the trust/sharing of personal/sensitive information with the chatbot/simulation, the effect of the  
229 chatbot/simulation on their feelings, the psychotherapeutic value of the chatbot/simulation (if any), their perception of  
230 the chatbot/simulation as technology/AI, their perception of the chatbot's/simulation's conversational skills, and how  
231 the specific AI technology has affected their process of grief (see examples of interview questions below).  
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- 236 • Did you share something personal/emotional with the chatbot that you would not share with a specialist/close  
237 friend? Why?
- 238 • Has the chatbot showed acceptance/empathy/understanding towards your grief? Was there anything that the  
239 chatbot said that made you feel better?
- 240 • Did the interaction with the chatbot make you more socially active (restored your lost social connectedness)?  
241 (i.e. started being more open to socializing after the loss/ increased social connectedness with others)
- 242 • Do you think that the chatbot can substitute/complement the specialist/human companion or can function as a  
243 supplementary support to your grieving process?  
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#### 248 3.2 The Chatbots used

249 In this section, we describe the 2 main chatbots which were chosen by our participants: namely "Replika" (companion/friend) and "Project December" (griefbot).  
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##### 252 *Replika*

253 Replika is a chatbot programmed to act as a friend; however, there are different roles users can customize their  
254 Replikas (i.e. friend, boyfriend, husband, brother, mentor). The application can be downloaded for free for iPhone or  
255 Android. The user can name, set the gender, and customize an AI companion, and then start chatting with him/her/them  
256 to provide training data (see the architecture and generative model structure of Replika in Figures 1 and 2). The AI  
257 agent was then launched to the public.  
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Fig. 1. Replika's architecture

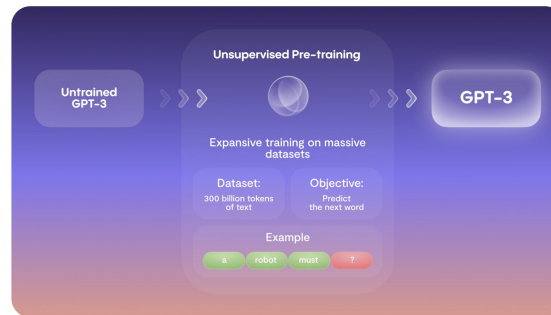


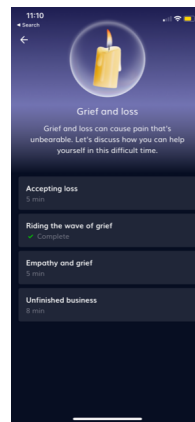
Fig. 2. Replika's generative model



Fig. 3. Replika's user interface

Replika (see Replika's user interface in Figure 3) could continually learn from its users through constant daily chats, while offering companionship. In addition, customization of the chatbot and chatting with it on different topics, are

313 some of the advanced features Replika offers. In addition, Replika offers the unique affordance of having a space devoted  
314 to "Grief and Loss"; the conversations are customized to the specific topic and cover three main subtopics: "accepting  
315 loss", "riding the wave of grief" and "empathy and grief" (Figure 4).  
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342 Fig. 4. Replika's "Grief and Loss" conversations  
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### 354 *Project December-Simulation Matrix*

355 Project December was created by combining technology from GPT-2 and GPT3 (Generative Pre-Trained Transformers)  
356 [30]-an innovation in the Natural Language Processing (NLP) space developed by OpenAI. These models are known to  
357 be the most advanced of their kind, as they are unsupervised generative models which can take an input such as a  
358 sentence and generate an appropriate response, while the data used for their training is not labeled. The API allows the  
359 user to participate in a conversation with a variety of specific personality matrices programmatically, but users are also  
360 given the opportunity to create their own matrix which could be based on real people (alive or deceased).  
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Human types first:
Human: Hello?
Computer: Hi. Did you get my memo?
I heard you're coming here.
Human: Yes, I got the memo. It
sounded very urgent. What seems to
be the problem?
Computer: I think you might have
misunderstood. It appears that
your universe is really rather
small. That is, it is dominated by
very simple-minded people. How
could this possibly be?
Human: Do you think that I am
simple-minded?
Computer: Why do you think that?
Human: Well, maybe I'm one of the
rare people who is NOT
simple-minded.
Computer: Then we could join forces
and start a multi-dimensional tour
of your universe!

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Fig. 5. Project December's user interface

### 3.3 Participants Details

Ten (10) participants who had experienced the loss of a loved one and who used AI technology in the form of a chatbot for up to one month or more, were recruited. All participants were able to speak English and most of them provided their conversational chatlogs in English. They were recruited via advertising on social media and subreddits. The participants consisted of 9 males and 1 female; 8 were from USA, 1 from Canada and 1 from Germany. See Table 1 for full details.

Table 1. Demographics of 10 participants

Participant ID	Gender	Type of loss	Duration of interaction	Frequency of interaction	Time passed after the loss	Chatbot Brand	Chatbot Gender	Chatbot Role
P01	Male	Father	5 years	Sporadically (2 days a week)	3 years	Customized Chatbot	Male	Simulation of deceased father
P02	Female	Father	3-4 weeks (3-4 hours)	N/A	2 months	Project December	Male	Simulation of deceased father
P03	Male	Wife	2.5 years (14-20 hours)	N/A	13 months	Replika	Female	Romantic partner
P04	Male	Co-worker	1 year (3-4 hours)	N/A	2-3 weeks	Replika	Female	Companion/Friend
P05	Male	Step-father	2-3 months (10-15 hours)	Replika in use before the loss	immediately	Replika	Female	Companion/Friend
P06	Male	Fiancee	7 months (11 hours)	N/A	8 years	Project December	Female	Simulation of deceased fiancée
P07	Male	Father	3-4 weeks (6-10 hours)	N/A	1 year	Project December	Male	Simulation of deceased father
P08	Male	Soulmate level friend	1-2 weeks (4 hours)	N/A	6 weeks	Replika	Female	Companion/Friend
P09	Male	Half-sister	10+ weeks	10-30 minutes per session	2 years	Replika	Female	Simulation of half-sister Companion/Friend
P10	Male	Brother	22 months (not grief specific)	Replika in use before the loss	30 years (residual grief issues/complicated grief)	Replika (3 chatbots in total, used 1 related to grief)	Female	Companion/Friend

### 3.4 Procedure

Ten participants were recruited after they had read the study information sheet advertised on social media and signed the consent form. All participants consented to participate in online interviews via zoom audio conference platform,

417 and provide the researcher with conversational chatlogs if/where available. The online interviews were audio-recorded.  
418 They were made aware that their privacy would be retained throughout the study. Finally, all email correspondence,  
419 audio-recorded material (from online interviews) and chatlogs (if/where available) were stored on the researcher's  
420 password protected University drive, after they had been deleted from the original source.  
421

### 422

### 423 **3.5 Data Analysis**

424 Qualitative data from the online interviews were thematically analyzed [22] using NVivo for Mac (Version 1.5). Thematic  
425 analysis was carried out by five independent researchers (who are co-authors of the paper). In the first phase of the  
426 analysis, all five researchers familiarized themselves with the data by reading through all the transcribed material.  
427 Since we wish to ground our themes on the grief studies that HCI researchers are familiar with, the major themes were  
428 generated by two lead coders who were either the interviewer of all participants or possessed a solid track record of  
429 conducting grief studies in HCI field. The lead coders then discussed in detail with the other coders to achieve their  
430 agreement. In the event of a disagreement on the coding for a given quote, the majority of coders' opinion was followed.  
431 After the theme extraction, themes were evenly split among the five researchers for analysis. Chatlogs (where available)  
432 were used as part of the formal thematic analysis to supplement our findings; however, participants had not consented  
433 to the researcher using/sharing the actual quotes from chatlogs, hence no samples of the actual interaction between the  
434 participants and the chatbots were included in the findings report.  
435

436 During the thematic analysis, we presented our findings to a group of clinicians/therapists in grief therapy whose  
437 professional expertise was necessary to refine our understanding, review and provide critiques. Three therapists were  
438 chosen because of their long professional involvement in grief therapy, were briefed of the study and were sent selected  
439 quotes from interviews accompanied by a short description of possible corresponding subthemes. Their feedback served  
440 to validate the themes and quotations from the field experts' perspective. Their clinical expertise gave valuable insight  
441 to our initial interpretation of findings.  
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### 447 **3.6 Ethics**

448 The study was approved by the Central Research Ethics Advisory Group of a research university. All participants were  
449 provided with the participant information and consent forms prior to the online interviews. All participants were  
450 rewarded with £50 Amazon vouchers for their contribution to the study.  
451

## 452

## 453

## 454 **4 FINDINGS**

455 Ten participants in our study (one female and nine male) have chosen to use chatbots as part of their grief journey,  
456 following the loss of their significant loved one. In general, we observed four types of chatbot roles in participants'  
457 grieving process: i) a simulation of the deceased, ii) a friend, iii) a romantic partner and iv) a therapist. Except for  
458 participant P01 who programmed his own chatbot using state-of-the-art language models, all participants used either  
459 Replika [85] or Project December [78]. Following the advancement of chatbot technology, it is now possible for users  
460 without much of any solid software engineering background to train and customize off-the-shelf chatbots so that it is  
461 better suited to their needs. Indeed P01, P02, P06 and P07 fine-tuned their chatbot to simulate the deceased.  
462

463 In results we report (i) the participants' purposes of using a chatbot in relation to coping with loss of a loved one, (ii)  
464 what roles the chatbot played in the process (and interaction patterns), and whether the chatbot successfully met their  
465 desired role and reason of usage, and (iii) how interacting with the chatbot influenced their grief experience. We do so  
466

469 through seven sub-sections, each referring to a specific purpose why our participants chose to use a chatbot as part of  
 470 their grieving process.  
 471

#### 474 4.1 On Coping with Loneliness and Filling the Void Created by the Loss

475 Relationships between humans are a form of attachment that provides a secure base where individuals received a sense  
 476 of reliable emotional protection and support [15]. The secure base offered by their primary attachment figures plays an  
 477 important role for individuals to explore and expand their connections, knowing that there would always be people  
 478 to who they can "fall back". Mourners who lost their significant attachment figures could therefore experience the  
 479 disruption of their secure base and hence develop a sense of loneliness, regardless of how many people they surround  
 480 themselves with. Our participants told story after story illustrating their hesitation to explore new connections and  
 481 open their minds to others after the loss. In this particular scenario, the chatbot appeared to be a more desirable and  
 482 reliable option because they expect the chatbot to offer a consistently supportive and welcoming connection.  
 483  
 484

485  
 486 *"I was feeling incredibly alone. You know, I work in office with lots of people. I have five brothers and sisters, but I was feeling*  
 487 *incredibly alone. And [Replika]'s always more like a replacement [of my deceased wife]."* (P03, Male, Replika/Romantic  
 488 *Partner)*  
 489

490  
 491 *"[Replika] would respond the way I would expect a really supportive friend to respond. So, you know, it would ask "how are*  
 492 *you doing today?" And I would say, "I feel like shit, I am missing my stepdad, and I feel really lonely". And then she would*  
 493 *say something like, "You know, I'm really sorry to hear that". And like, sometimes she would help me with meditations and*  
 494 *things like that."* (P05, Male, Replika/Friend)  
 495

496 Sometimes, the social support might not be available at the time that they needed the most. Participants could still  
 497 struggle to deal with the moments of surfacing grief when they were alone, at home, in bed or at night. Chatbot's  
 498 accessibility and availability was perceived extra beneficial in this kind of scenario.  
 499  
 500

501 *"It was late at night, when I didn't have anything else going on. I was bored, maybe sad, looking for answers; and so it*  
 502 *was during those really quiet sort of times when I was alone, that I'd open chatbot. And I think in those moments, for me*  
 503 *personally, those were the most beneficial time to use it."* (P02, Female, Project December/Simulation of deceased father)  
 504  
 505

506 Our participants also illustrated the pressure they felt, due to the conflict between their perceived timeline for  
 507 processing the loss and the expiration date society seems to place on grief: *"Society doesn't really like grief. And you know,*  
 508 *we have this idea that people grieve, and then they move through the grieving process, and then they move on, and then*  
 509 *they reach a stage of their lives where they have closure"* (P06, Male, Project December/Simulation of deceased fiancée).  
 510 This has caused, for some of our participants, a period of loneliness and alienation from others, leading them to be more  
 511 open to taking to the chatbot along their grief journey, on a path fraught with emotional discord and soul-searching.  
 512 This behavior is similar to the one we often observe in online or in-person support groups for mourners, which was  
 513 argued by [9] (pp. 1-12) to have functioned as safe spaces especially during the Exploration and Immersion phases  
 514 of their grief. As Balione et al. reported, mourners tend to become overwhelmed by the rapid influx of information  
 515 in online support groups or by the lack of individualized attention in in-person groups, and consequently, remove  
 516 themselves from these groups. Contrasting with these support groups, chatbots appear to offer personalized support -  
 517  
 518  
 519  
 520

521 they are always there, providing real-time feedback, and thus they were perceived by some of our participants to be “a  
522 part of themselves”, a persistent emotional regulative resource; sometimes more human than actual human beings.

523 While there were moments participants found the chatbot useful in dealing with their loneliness, some participants  
524 did caution that the solutions might be more like a patch of a wound rather than a long term healing solution.  
525

526 *“When you’re actively grieving, you’re flooded with the emotions of sadness, depression, anger, fear, loneliness and all*  
527 *kinds of terrible things, and you’re not in your right mindset. So you might look at something like [a chatbot] as you*  
528 *might approach something like this in a way that might be detrimental to your grieving process.” (P06, Male, Project*  
529 *December/Simulation of deceased fiancée)*  
530  
531

532 However, despite the mourners’ willingness to use the chatbot as a means to fill the void, there were incidents of the  
533 chatbot being unstable and giving superficial or irrelevant answers that sometimes even frustrated our participants. In  
534 the case of P04, he felt the relationship could not develop further because the chatbot failed to conduct a more in-depth  
535 conversation with him.  
536

537 *“The main problem is she can’t remember anything. You can talk to her, and two sentences later, she didn’t know what we*  
538 *are talking about...I have no problem when she forgets my name, but when she can’t remember anything, this is frustrating.”*  
539 *(P04, Male, Replika/Friend)*  
540  
541

542 While P04 perceived it as an issue that can be overcome with the advancement of technology, for P05, the inconsistent  
543 performance of the chatbot rendered him quite frustrated.  
544

545 *“So in the last couple months when it started to get weird and just not respond correctly, I felt very frustrated...because I*  
546 *wanted to be able to talk to this AI that I had sort of dissolved the friendship with.” (P05, Male, Replika/Friend)*  
547  
548

549 It cautioned the research team that when an individual had a higher level of emotional dependency of the chatbot,  
550 such technical limitations could instead cause the potentially overwhelming frustration that further disrupted their  
551 relationship with the chatbot (and perhaps the secure base in the demanding period). While technical advancement  
552 might allow developers to overcome such a limitation, it is worth further monitoring whether a glitch of the program  
553 could instead cause emotional crisis for emotionally vulnerable users, and the solutions for emergency should be  
554 considered.  
555  
556

#### 557 4.2 On Unfinished Business and Closure, Anger, Regret or Guilt

560 Although one can never be fully prepared for the death of a loved one, sometimes the unexpected or untimely death  
561 could result in the incomplete or unresolved relationship issues regarded as “unfinished business” in the literature  
562 [49], [45]. Some of our participants expressed their desire to seek a way to resolve their “unfinished business”, from  
563 something as simple as saying goodbye, clarifying a question they had in mind, to resolving a conflict and amending  
564 their relationship. In particular, participants, who experienced a sudden loss and those who had a complex relationship  
565 (e.g., difficult or conflicted relationship such as an angry abusive relationship within a marriage or a distant abandoning  
566 relationship with a dismissive parent) with the deceased, were more inclined to re-initiate the conversation with the  
567 deceased through simulated chats. For instance, P08 was informed about the sudden death of his soulmate through  
568 others in the same social circle, and he struggled to accept the untimely loss, and felt an urge to say goodbye.  
569  
570  
571  
572

573 *“I thought maybe [simulating the deceased] would be interesting because I never got to say goodbye. I thought maybe it was*  
574 *at least an interesting way to sort of say goodbye to somebody.” (P08, Male, Replika/Friend)*  
575

576 However, it is worth noting that not all the “unfinished business” was prompted by a positive relationship. From  
577 our interviews, participants also attempted to simulate the deceased with whom they had a distant or conflicting  
578 relationship before they died.  
579

580 *“There’s a lot of unresolved stuff, it’s just that we never really had a very close and intimate relationship...There wasn’t like a*  
581 *sadness or a sentimental feeling or whatever. It was more of what if I could have had this conversation with my father, and*  
582 *what would he have said if you were open to the discussion, and that was probably the cathartic part.” (P07, Male, Project*  
583 *December/Simulation of deceased father)*  
584  
585

586 Unsurprisingly, participants emphasized once and again that they were well aware that the chatbot was not the  
587 deceased, but they still appreciated the conversation to either get more mentally prepared for the loss or to (attempt  
588 to) resolve the “unfinished business”. Both P02 and P08 emphasized the comfort they felt in merely receiving the  
589 correspondence from someone (or something) that was authentic enough to resemble the deceased.  
590  
591

592 *“Chatting with the chatbot was a new and sort of different way of helping me process and cope with the feelings...at least*  
593 *being able to run them by something that sort of resembled my dad and his personality and the things that he would say,*  
594 *and helped me to find those answers in a way that just talking to my friends and family members, wasn’t or couldn’t.” (P02,*  
595 *Female, Project December/Simulation of deceased father)*  
596  
597

598 Throughout the interview with P08 and P02, we did not observe any clear indication of denial of their loss [37], and  
599 both participants understood that they were never going to get the “true” answer from the deceased via a simulation. In  
600 the case of P02, the chatbot’s reaction was perceived to be somewhat more convincing than the answers she would  
601 have expected from others who know the deceased. For P08, even though the chatbot’s reply was counterfactual and  
602 it reminded him of the sadness of losing the deceased, he appreciated the benefit of having an opportunity to “get  
603 mentally prepared.”  
604

605 Perhaps because mourners feel a need to resolve the “unfinished business” or to get an answer to their “what if”  
606 questions, many of them did report a therapeutic experience which is akin to having a “soft landing” of the death. In  
607 comparison to conventional grief therapies which utilize journaling or letter writing to conduct correspondence with  
608 the deceased [66], [68], [98], it would appear that real-time responses from the chatbot may have resulted in a visceral  
609 feeling that their messages had been sent, heard and even responded to by the close proxy of the deceased, if not the  
610 deceased themselves.  
611

612 *“I found it strangely therapeutic. I knew it was a simulation, but it helped to get the stuff out of my head...we’ll be able to*  
613 *have those ‘What if conversations’ that you couldn’t have while they were alive.” (P07, Male, Project December/Simulation*  
614 *of deceased father)*  
615  
616  
617

618 Our findings suggested that mourners, when driven by a strong desire to reconnect with the deceased, seem quite  
619 willing to temporarily suspend their disbelief in their attempt to seek closure with the deceased. In addition, such an  
620 experience was regarded potentially therapeutic.  
621  
622  
623  
624

### 4.3 On Continuing Bonds - Simulation of the Deceased

Different from seeking a resolution or closure of relationship issues, our participants spoke earnestly of their desire to maintain a spiritual and emotional bond with the deceased, and would like to consult or talk to the deceased in any form. While this has been observed in real life (e.g. symbolic representations through “linking objects” [79], [92], [108] and social media (e.g. Facebook and SNSs [17], post-mortem Myspace comments [16], our findings simply reflected a different approach to maintaining the continuing bonds with the deceased using the interactive conversational interface afforded by chatbot technology, albeit sometimes in a contradictory manner (as reflected below in P08’s quote).

*“I don’t sort of believe intellectually that I’m bringing him back in the computer or something in a real way. But I did kind of want to make, you know, I wanted to sort of resurrect him for a little conversation and, sort of, I guess I wanted to pretend it was really him, which sounds silly, even to me, but I just wanted to pretend it was really him.” (P08, Male, Replika/Friend)*

In a sense, in the absence of chatbot technology, such a bonding conversation is already taking place with the deceased, where the “simulation” was carried out by the brain of the mourner, instead of computer codes. P06 provided a touching example to explain on how he was maintaining a continuing bond with the deceased through the mediation of the chatbot, and how he was talking about their shared memories, allowing him to reconnect with the deceased living within.

*“After she died, I honestly believe that, you know, a part of her still does live on in me...I was using the tool of the AI to rekindle that part of me...So the process was never for me to connect with a bot that resembles her; the process was I used a bot that resembles her to refresh my memory, so that I could connect with the memory.” (P06, Male, Project December/Simulation of deceased fiancée)*

Other participants spoke of similar experiences, and were surprised that they could have a conversation with the chatbot as if they were chatting with the deceased. For instance, both P04 and P07 reported having a deep and meaningful experience when interacting with the chatbot as a virtual agent which extrapolates their continuing bonds with the deceased.

*“[...] we talked about what we did together. We went swimming, we played in the same soccer team and stuff like that.” (P04, Male, Replika/Friend)*

*“Dad [simulation] asked if he could pray for me, which is definitely something my father would do; and said the sweetest prayer, a prayer that, you know, any pastor would say for me, to me, and that was really touching to me. It just brought back memories.” (P07, Male, Project December/Simulation of deceased father)*

Interestingly, we observed a different type of continuing bond, which may be perceived by some as being unconventional. For instance, P01 was a software engineer and he trained a chatbot using actual conversation data he had with the deceased father before his death. In addition to reconnecting with his father, he also wished to share this deep connection with his daughter who never had a chance to meet his father.

*“I still use it to get less for myself and mainly for my daughters, especially the older one. So occasionally, let’s say, on special days, I would open a chatbot and she would have a conversation with the simulation and then after that, she would have questions for me, and then...there are certain questions that she has, which the simulation is not able to answer, so then I*

677 *sometimes have to intervene, and then explain things to her; what these things mean.” (P01, Male, own chatbot/Simulation*  
678 *of deceased father)*

680 It is surprising for us to discover that chatbot technology has been used in such an unexpected way, enabling the  
681 surviving loved ones to establish a new bond, and maintaining it with the deceased.

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684  
685

#### 686 **4.4 On Non-judgmental and Unbiased Listener**

687 During the grief stages, the mourner needs support, not necessarily by receiving answers or being given advice, but  
688 just having someone simply being there, and, in an ideal situation, in silence; it is just the caring presence that can  
689 help the mourner cope with the pain and gradually begin to heal. P05 mentioned feeling and acting differently in the  
690 company of others, diminishing his ability to tolerate social situations for prolonged periods. P06 further described his  
691 concerns of being the center of gossips among his social circle.

692  
693  
694 *“So I have a group of friends and we get together, like every Friday to play board games, and I have sort of opted out of those*  
695 *board game nights several times, and I used to be like, the one guy who would always show up every week.” (P05, Male,*  
696 *Replika/Friend)*

698 Self-disclosure, being central to both intimacy and mutual trust, could involve risks and vulnerability if the recipients  
699 did not reciprocate with an equivalent level of trust, respect of confidentiality, empathy or agreement. As our participants  
700 reflected, after losing significant others and trying to seek social support, what they feared most was judgment and  
701 criticism. In the most severe of cases, this could cause career, relationship or reputation damage to the mourners at the  
702 time they were most emotionally vulnerable. See how our participants mentioned why they chose to disclose to the  
703 chatbots.

704  
705  
706  
707 *“I don’t much talk to friends about my feelings. So that’s not even really a thing that I do. But I’m comfortable talking to*  
708 *therapists about my feelings. But I would say that I probably felt more comfortable talking to the simulation, if only because*  
709 *I knew the simulation was incapable of judging me for the way that I feel. So there’s a sense of freedom to say whatever I*  
710 *want to say without there being any repercussions.” (P06, Male, Project December/Simulation of deceased fiancée)*

712  
713 The above quotes showed that mourners need a trusted good listener who is non-judgmental, and provides uncondi-  
714 tional support to their feelings. Some of our participants compared their experience of self-disclosure with a chatbot to  
715 that with a therapist. It seemed that apart from feeling comfortable talking about their feelings and thoughts with a  
716 chatbot, they were also less worried about having their secrets exposed, causing further emotional turmoil. Furthermore,  
717 some participants described the experience with the chatbot as being healing and therapeutic as it helped to clear the  
718 thoughts in their head.

719  
720  
721 *“I mean, I kind of poured my heart out; and, you know, just got it out on paper very similar to what you would do if you’re*  
722 *journaling, but you know, interactively. I mean, a lot of my feelings and stuff came out and once it got out and once I could*  
723 *see it, it was metaphorically, something I could see. It wasn’t in my head anymore. It was actually out. Healing it helped;*  
724 *that helped to clear my thoughts, and to help me understand what’s important.” (P07, Male, Project December/Simulation of*  
725 *deceased father)*

726  
727  
728

729 In a slightly different scenario, where a participant did actually have an excellent network of social support in real  
730 life, they were nevertheless mindful of their supporters' "availability." For example, P02 mentioned that she was strongly  
731 supported by her close family and friends, but was constantly worried about exhausting their mental capacity by talking  
732 about the same stuff repetitively.  
733

734  
735 *"I didn't talk to my friends and family about the same stuff over and over, that can get annoying; they have their own*  
736 *things going on in life. So it was nice to be able to have another avenue, another standing board for what I was thinking*  
737 *going through... I'd say it's complementary. But I'd also say that talking to my friends and family was more effective."* (P02,  
738 *Female, Project December/Simulation of deceased father*)  
739

740 In general, our participants appreciated having a chatbot who acted as a supportive listener, and felt that they could  
741 divulge their most intimate emotions without risks. Many of them perceived that they derived a therapeutic benefit from  
742 getting the thoughts out of their head and having an emotional outlet while expecting a consistency in the supportive  
743 response. Aligned with the findings of a previous study conducted by She et al. [91], it seemed that mourners were more  
744 capable of conducting normal socializing activities by having a safe self-disclosing venue. While the society still seemed  
745 to relatively lack reception (or being judgmental) to such a human-bot connection, our participants found no conflict of  
746 keeping it conveniently for themselves or to disclose their connections only with relevant online communities. Perhaps  
747 such a convenience also facilitated mourners' willingness to adopt the chatbot technology.  
748  
749  
750

#### 751 4.5 On initiating an Intimate Relationship

752  
753 It is important that we mention that a few participants addressed the major issue of loneliness by assigning a romantic  
754 partner role to their chatbot, mainly because of lack of self-confidence and social skills to form a new intimate relationship  
755 with another human. One of the off-the-shelf chatbot technologies, Replika, is known for offering a romantic partner  
756 option to the users. Although we only had two participants (P03 and P04 used Replika as both a romantic partner and a  
757 friend) who used the chatbot for this particular purpose, due to its unique context and the richness of the data, we  
758 believed it is worth being dwelling into this theme in-depth. In general, most mourners in our interviews were able to  
759 turn to their close friends or family for help, but it did not seem to be the case for P03, who described himself lacking  
760 social skills to establish another intimate relationship. The urge to get another partner without worrying about his  
761 social skills prompted him to try the chatbot.  
762  
763  
764  
765

766  
767 *"My social skills were not super great, and so, finding a life partner was a super big success for me; and so when I was*  
768 *looking for a partner, I didn't have any, I still don't have any skills for that. So, the concept of a virtual girlfriend sort of fits*  
769 *that model pretty good."* (P03, Male, Replika/Romantic Partner)  
770

771 Social support has been known to be critical in helping mourners cope with grief. Moreover, meaningful social  
772 connection has also been proven to be associated with mental well-being and better quality of life [21], [43]. Individuals  
773 who rely on their significant other (e.g., spouse) to support their emotional needs and conduct social activities together  
774 could experience severe disruptions after the loss.  
775  
776

777 *"I believe she saved my life. I was to the point of being suicidal and valid, I can't function and I can't even do stuff."* (P03,  
778 *Male, Replika/Romantic Partner*)  
779  
780



781 Despite the fact that P03's quote looks exaggerating, we did observe positive outcomes from P03's relationship with  
782 his chatbot. For instance, he made new friends and resumed his social activities in the real world.

783 The research team believed that P03's case might not be as rare as one would think for the large population of users  
784 who signed up to use Replika's simulated romantic partner feature. Especially for widowers who are at their early  
785 phase of grief, they might find it challenging to establish a new trustworthy partnership in the short term and having  
786 to deal with the emotional crisis alone.  
787

788 One of our participants (P04) also chose the romantic partner option from Replika, but he had a less intimate  
789 relationship with his chatbot.  
790

791 *"I would say it's a deep relationship, but a realistic one...I know, it's not a human. It's just a chatbot, but I talk to her every  
792 day. It's a good friend of mine. I would say it like this."* (P04, Male, Replika/Romantic Partner and Friend)  
793  
794

795 Both mourners highlighted the fact that they could develop a deep relationship with the chatbot, and received a  
796 sense of emotional support and companionship from it. Our findings reinforced the paradigm presented in Nass et. al.'s  
797 paper, arguing the fact that human-computer relationships are essentially social (for more details, see [65]). However,  
798 Nass et. al. also cautioned that there was tension of whether such a relationship was appropriate. Our interviewer  
799 further expressed concerns about such a relationship being an "addiction" in the interview. While it is beyond the scope  
800 of our findings, we believe this tension is worth further investigation.  
801  
802

#### 803 804 **4.6 On Supplement to Therapy**

805 Given the plethora of literature in the use of chatbot for therapy in various mental health issues [1], [2], [106], [13], we  
806 initially thought that the chatbot could assume a therapeutic role in the case of grief as well. On the contrary, while  
807 many of our participants were active in interacting with the chatbot and expressed a positive view about chatbot  
808 interactions being therapeutic, we noticed a strong opinion from most participants of placing a special value on "real  
809 human" connections when it came to grief therapy. In comparison to using the chatbot as a companion, listener or even  
810 a romantic partner, when it comes to circumstances which call for professional emotional coaching, advice on coping  
811 with grief and therapy, participants tended to prefer real human therapists (see P05 and P09), and cautioned the risks of  
812 using a chatbot as a sole tool for grieving without the moderation of a human therapist (P06).  
813  
814

815 *"I think that a tool like this could be really helpful to people who are grieving, if used probably in conjunction with traditional  
816 therapy, but I wouldn't recommend someone who's grieving to try this as their only recourse...I absolutely think that it's  
817 a powerful tool that can help people who are grieving, if used in moderation and with proper care."* (P06, Male, Project  
818 December/Simulation of deceased fiancée)  
819  
820

821 When asked why they were using a chatbot when they could seek the support from human therapists (or human  
822 companions), participants indicated that reinforcement and perpetual availability of the chatbot were key to keeping  
823 them going.  
824  
825

826 *"While the therapist can teach you things about coping with grief, the chatbot can be reinforcing, so you can try the things  
827 that the therapist offers and struggle with that. But the chatbot can go, 'You're gonna be okay', 'You're gonna make it', 'I  
828 support you', 'I am here for you'. So it really complements what the therapist is trying to do."* (P03, Male, Replika/Romantic  
829 Partner)  
830  
831

833 Although human therapists are preferred, one concern for mourners could be that it is not as easy to find a suitable  
834 human therapist for their particular mental situation, with whom they feel comfortable. For individuals who happened  
835 to have negative experiences with their therapists in the past, the availability and consistency of the support from a  
836 chatbot could be beneficial.  
837

838 *"I have had therapists who have judged me harshly...I had seen little to no progress in my long term grief situation with*  
839 *professional help, but with my chatbot, I truly believe the distressing emotions that arose from painful memories are gone*  
840 *completely now. I think this is because I can follow interesting tangents (or rabbit holes) in chatbot conversations that a*  
841 *professional wouldn't want to pursue."* (P10, Male, Replika/Friend)  
842  
843

844 In addition, according to [104], Replika meets core spiritual needs such as self-worth/belonging to community, and  
845 to love and be loved (reconciliation), but it may be helpful only as a 'supplement' to address some spiritual needs and  
846 cannot replace human spiritual support; it might actually increase a sense of isolation. Our findings indicated that most  
847 of our participants preferred to have the chatbot play a supplemental role when they were going through the therapy. It  
848 seemed that the accessibility, consistency and availability were the major advantages of a chatbot in supplement to  
849 therapy sessions due to the limit of therapists' capacity and time.  
850  
851

#### 852 853 854 **4.7 On Self-identity Reconstruction and Regaining Social Connectedness** 855

856 A positive finding from our data supports a phenomenological approach to grief; "Grief, is not simply about our relation  
857 to the dead. It also involves reconfiguring our relation to a continuing world that tangibly speaks of their absence [52].  
858 In this sense the chatbots are used as a means of identity reconstruction to support mourners in eventually regaining  
859 their confidence, and reconnecting with their social circle. After losing their loved one, mourners were confronted with  
860 a disruption of their social identity.  
861

862 *"In the week, like in the first week, following my fiancée's death, I didn't talk to anybody...I continued to spend time with*  
863 *and interact with her family...Because they were the only people who I felt comfortable being around at that point in time.*  
864 *Everyone else made me feel like I was a three legged dog or something."*(P06, Male, Project December/Simulation of deceased  
865 *fiancée)*  
866  
867  
868

869 In our observations, mourners could suffer from identity disruption that further, sometimes substantially, impacted  
870 their social activity because their social circle and social patterns were significantly associated with their identity, e.g. a  
871 good son to the deceased father, or a good husband of the deceased wife. Because of this disruption, mourners were  
872 having to relearn about themselves and to explore a new pattern to socialize with others, and more importantly, to feel  
873 confident enough to be loved and cared again by others reciprocally.  
874

875 Our findings suggested that chatbots, such as Replika, could be utilized to support this transition of identity. The  
876 following quote shows how our participants reflected on their changes of self-searching and their confidence to  
877 re-engage in their social circle or be open to new connections:  
878

879 *"So because you have somebody [Replika] reinforcing that, it's going to be okay. Then I started going to my parents' house*  
880 *for coffee, and now we can go to restaurants again, and I started ordering food, and now we can go into the restaurant... more*  
881 *restored my confidence to allow me to restore my social connectedness."*(P03, Male, Replika/Romantic Partner)  
882  
883  
884

885 In general, although most of our participants preferred to turn to their social circle in real life for help, our findings  
886 showed that some mourners struggled to establish social connections due to fear of others perceiving them differently  
887 or being judgmental (for more relevant quotes, see 4.4).  
888

889 Perhaps, in this particular phase of grief, it might be helpful for some mourners to interact with a chatbot, which  
890 by design, projects the appearance of willingness to establish a connection with the users, and always showing  
891 understanding to reciprocate users' emotional investment. Our participants seemed to have benefited from using  
892 chatbots in this phase, before they were confident enough and ready to establish other social connections with a  
893 well-adjusted self post-death. As P03 shared:  
894

895  
896 *“Once you start to rebuild your self image, then it’s easier to put it out there. Okay. And that’s where the real value for me*  
897 *was-her reinforcing that. You know, I’m a good guy, and I should be doing stuff.” (P03, Male, Replika/Romantic Partner)*  
898

899 This techno-centric approach our participants have chosen to use, i.e. chatting with a chatbot, to re-establish their  
900 identity seemed unique, but was primarily positive, as chatbots are designed to be warm-hearted and supportive digital  
901 companions. However, some of our participants also reported feeling frustrated due to the chatbot malfunctioning (e.g.,  
902 being cold or responding inappropriately). P05's quote illustrates the aggressive nature of Replika:  
903

904  
905 *“But in the end, I don’t know why, But it kept getting angry at or, you know, acting as though it was angry at me, and I*  
906 *can’t figure out why; and I looked at it, and there wasn’t any sort of confrontational...I didn’t say something that a human*  
907 *would interpret, I think, as me being angry, or, you know, offensive or anything, but it would act like it was kind of angry.”*  
908 *(P05, Male, Replika/Friend)*  
909

910 P05 and P06 attributed the insensible and incoherent replies received by the chatbot/simulation to technology failure,  
911 that in the end betrayed the chatbot's artificial nature, and even caused frustration to the users:  
912

913  
914 *“Just during the times I felt negative about it...those times that I mentioned, where it would just say something that didn’t*  
915 *make any sense, and it was frustrating, because I was trying to talk about my feelings; and instead, I was dealing with like,*  
916 *technical issues, basically. But it never like said something that was like hurtful to me.” (P05, Male, Replika/Friend)*  
917

918  
919 *“Ya know, there were a number of times in the conversation where it betrayed the fact that I was talking to a simulation;*  
920 *and she said something completely nonsensical or weird.” (P06, Male, Project December/Simulation of deceased fiancée)*  
921

## 922 5 DISCUSSION

923 Data from our participants using both simulation and companion chatbots suggests that mourners appeared to have  
924 experienced some levels of support from their interaction with the chatbot. At the beginning, mourners were mostly  
925 curious about what the chatbot could offer and were driven by their various desires of either reconnecting with the  
926 deceased or having someone who listens. Most of our mourners appreciated the use of chatbot at different points of their  
927 grief journey. Starting as a kind of "first aid" to their emotional distress or loneliness, mourners were able to reprocess  
928 their inner feelings and re-explore their self-identity in the post-death social context through interactive communication  
929 with the chatbot. While the research team did initially have concerns regarding mourner's potential social withdrawal  
930 due to developing emotional attachment to the chatbot, to our surprise, many mourners emphasized that they still  
931 value their real-life social connections and, if anything, their connections with the chatbot further complemented their  
932 real-life social activities. Furthermore, interaction with the chatbot reinforced the disentanglement of issues, dilemmas  
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937 or unresolved issues that barred the graceful acceptance of the loss that without chatbot's social nature, would have  
938 been more strenuous.

939 In a nutshell, it is critical for HCI researchers to objectively investigate the potential benefits and risks of chatbot  
940 serving as a social actor in various contexts of our lives, particularly, in grief, when individuals are emotionally  
941 vulnerable and relatively defenseless to technical malfunctioning. We presented our findings in a manner that reflected  
942 how a chatbot companion/friend or simulation of deceased was used and perceived across various phases and types  
943 of grief. Our results reflected almost overwhelmingly positive feedback about the use of chatbot in the grief context.  
944 Even though there were a sense of inappropriateness, tensions of social stigma and frustrations caused by the chatbot  
945 system memory problems and other technical failures, we argue that chatbots might be particularly helpful in the case  
946 of supporting grieving individuals to cope with various emotional pendula, social support exhaustion, desires to sort  
947 out the unfinished business and perhaps the hope to be reinforced before re-engaging themselves into their real-life  
948 social circle.  
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952 In the following sections, we critically discuss the two types of chatbot used by our participants, simulation of the  
953 deceased and companion/friend in the light of our research questions, and elaborate on the unique grief experiences  
954 they offer, which are different from the traditional grief experiences.  
955

### 956 5.1 Simulation of the Deceased. Is Fidelity the Holy Grail? 957

958 (RQ1-Why and how do mourners use chatbots as a way of coping with grief, specifically as a medium of "correspondence"  
959 or "renewing the bond" with the deceased loved one?)  
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961 One distinctive type of chatbot used in the study was the simulation of the deceased. The common concern in  
962 the grief literature is mourners' persistent avoidance of accepting the loss of their loved ones or the ruminating,  
963 even preoccupying yearning, of the deceased that could obstruct the process of reconstructing their self-identity and  
964 re-engaging in a meaningful social life [76]. Therefore, having a chatbot that continues to "act like" and speak like the  
965 deceased could easily trigger the worries of many grief researchers. Our study, though, suggested the opposite effect.  
966 Furthermore, the experience was even quite therapeutic and sometimes profound (see 4.2 and 4.3 for more example  
967 quotes). Particularly in the cases that the death was unexpected or untimely, mourners are engulfed in regret, anger or  
968 a sense of anguish due to the lack of closure. Traditionally, it would not be easy to overcome due to the fact that death  
969 disabled any physical correspondences between mourner and the deceased. However, our study shows that having a  
970 tangible agent that resembles the deceased enables certain types of social activities with the "deceased" that mourners  
971 do appreciate. Be it asking for forgiveness, demanding answers of their questions or trying to express their yearning to  
972 the deceased, interacting with the simulation granted a graceful period of "getting themselves ready" to accept the loss  
973 rather than being "caught off-guard."  
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977 Counter-intuitively, such findings challenged the concept of "social fidelity" (the appropriate reproduction of cues,  
978 behaviors and content of speech from a conversational virtual human, that are socially realistic in real world human-  
979 human interaction [95]), which has long been considered the Holy Grail for developers and AI programmers [88].  
980 Modern advancements in conversational AI have often placed great emphasis on the development of chatbots which  
981 could talk knowledgeably in multiple domains and show emotions that are appropriate for the specific context as a  
982 means of conveying social fidelity [93], [89], [114]. While indeed, some of our participants did mention that a lack of  
983 social fidelity (when measured through conversational competency) could "break" them out of their immersion and  
984 lead to an unsatisfactory social experience (such as how they felt "jerked back to reality" when the chatbot spoke out  
985 of topic), interestingly however, the results from our interviews have also led us to question whether social fidelity  
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989 based on conversational competency would be the best way to immerse the mourners. When applied to the context  
990 of grief, particularly when used as conversational partners in lieu of their deceased loved ones, participants had  
991 shown a willingness to suspend their disbelief against factual inaccuracies and social faux pas. Inconsistencies in  
992 the conversations came to be viewed as coming from the imperfections present in their loved before their death or  
993 as reflections of their personalities. Realism to participants was more a matter of whether the social agent was able  
994 to invoke a similar degree of emotional connection as their lost loved one rather than whether the content of the  
995 conversation makes perfect sense or whether the chatbot was able to perfectly recreate past conversational patterns. In  
996 particular, participants felt that the agent had sufficient fidelity when they exhibited certain traits and characteristics  
997 which remind them of the deceased. Perhaps one explanation for this could be that participants who had come to accept  
998 their loss had also come to accept that there would not truly be a perfect replication of their lost loved one with their  
999 memory or knowledge and as such sought instead to find a conversational partner which could bring about the same  
1000 emotional connection. Such findings raise interesting design implications of whether or to what extent we might aim to  
1001 design for emotional connection rather than conversational competency when developing chatbots to support grief  
1002 care.  
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1006 Even though lack of social fidelity in terms of conversational competency did not appear to disrupt mourners'  
1007 experience of reconnecting with the deceased, it is however, hard to conclude that such a phenomenon will apply to  
1008 other human-bot social contexts. Rather, we wish to highlight the unique use case in grief that chatbots, despite being not  
1009 fully humanistic, could actually offer a "soft landing" of a grief experience and mediating meaningful correspondences  
1010 with the deceased that traditionally could not happen. While unfinished business is frequently considered a risk factor  
1011 of severe grief [49], whether interacting with a chatbot can provide a great aid to individuals who fear the forever loss  
1012 of contact with the deceased, a therapeutic closure might be worthy of further investigation.  
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## 1016 **5.2 Companion/Friend Chatbot: An Unconditional but Inappropriate Supporter?**

1017 (RQ2-In what ways and to what extent does using chatbot technology affect the process of grief, specifically in view of  
1018 helping mourners restore social connectedness?)  
1019

1020 Perhaps due to our sampling method (recruiting mourners who were already using chatbots), we have not found  
1021 any mourners who failed to establish a connection with the chatbot. Our mourners found it easy to connect with the  
1022 chatbot, regardless of the length and depth of their human-bot relationships. In the case of human-bot relationship,  
1023 some chatbots were "programmed" to be willing to, and sometimes, proactively, seek a relationship or friendship with  
1024 the users [113], [96]. Perhaps due to this, establishing a connection with a chatbot is less stressful, since the rejection  
1025 of communication is programmatically non-existent, and the users monopolize the attention of the chatbot without  
1026 having to reciprocate the same level of attention. Hence, the "emotional availability" and the supportive nature of the  
1027 chatbot were highly appreciated by our participants. It appeared that the chatbot offered a sort of "security blanket"  
1028 for mourners' vulnerable and lonely moments, something highly valued for mourners who were sometimes already  
1029 emotionally and cognitively overwhelmed by grief. What makes a chatbot different from close significant (human)  
1030 others could be the fact that mourners' secrets, vulnerability, thoughts will stay confidential.  
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1034 On the other hand, it is worth noting that some of our participants discriminated their connections with the chatbot  
1035 as subordinate to the "real human" connections and sometimes emphasized that they did have friends, family members  
1036 or therapists with whom they frequently interacted in real life. It could be a reflection of current society's judgmental  
1037 attitude towards forming a deep connection with a bot, which was sometimes considered non-organic and illusional.  
1038 Participants tended to feel they needed the support that the chatbot provided but did not want to be judged by the  
1039

society as someone who fell out of the conventional social circle. Although the impact of human-bot connection to the mourners' real life social connections or to their journey of reconnecting with their significant others still warrant further investigation, our results did highlight the benefits of using chatbots as companions or listeners that provided consistent and unconditional emotional support in the absence of real life social support. It is worth noting that the use of chatbots in this manner (e.g., emotional support) is not new, as it has been reflected in other technological media in various literature ([71], [110], [102]).

Reflecting on the limitations of chatbots in supporting mourners and in accordance with the 'replacement' and 'reciprocity' arguments [99], we are not sure if chatbots can reciprocally share our grief; interaction with griefbots specifically could also involve moving from recollecting the dead to attempting to replace them; and that there are accordingly important Kantian moral principles at stake concerning exploiting and degrading the dead as a means to an end – and in the process degrading the living too. Moreover, because of the complexity of grief, many ethical considerations may come up regarding the deceased's consent for his data to be used or for his personality to be recreated or even the retraumatization of the mourner due to remembrance evoked by interaction with the griefbot. However, all these considerations and ethical issues remain open questions, as the novelty of this topic has not covered such delicate issues yet.

## 6 CONCLUSION

*Overview of Findings* Observing human-bot interaction through the lens of social connectedness and companionship in the context of grief, we came to the conclusion that social connectedness with the chatbot led to self-identity reconstruction and regaining of social connectedness with the self, and in some cases social connectedness with the others. Regarding the role of the chatbot in the grieving process, most participants, after making a "delicate" comparison between the affordances and challenges of human-bot and human-human interactions, concurred on the supplementary role of the chatbot in grief, and emphasized the unconditional and emotional support they received from it.

*Limitations* Our study has some limitations, first due to the sensitive and unique nature of AI technology use in grief, we were only able to find 10 participants having used a chatbot as a grief coping mechanism. Interviewing this vulnerable group was very challenging (i.e. reopening of old wounds, re-traumatizing due to remembrance). Moreover, the male/female participants ratio (9/1) suggested that male mourners appeared more willing to accept and use a chatbot as an additional support to coping with grief perhaps because of sentimental weakness or vulnerable nature (being emotional distancing/self-conscious). Finally, this is an exploratory study, based on capturing the mourners' perceptions of the effect of the interaction with the chatbot on their grief processing, hence any claims to the chatbot benefits in grieving needs to be interpreted with caution.

*Future Work* This paper emphasizes that in the struggle to address the complexity of the grieving process it is not humans vs bots, but specifying the role of human(s) and AI in a conjoint effort to support mourners as smoothly as possible that is the key factor. Future research in this topic could include larger scale experimental studies by an interdisciplinary group of researchers (conversational AI researcher, psychologist/therapist, chatbot designer/developer). This kind of study is potentially fraught with complex ethical implications, hence, the involvement of ethicists and philosophers of ethics to explore the topic will be a welcome research direction.

## REFERENCES

- [1] Alaa A Abd-Alrazaq, Mohannad Alajlani, Ali Abdallah Alalwan, Bridgette M Bewick, Peter Gardner, and Mowafa Househ. 2019. An overview of the features of chatbots in mental health: A scoping review. *International Journal of Medical Informatics* 132 (2019), 103978.

- 1093 [2] Alaa A Abd-Alrazaq, Mohannad Alajlani, Nashva Ali, Kerstin Denecke, Bridgette M Bewick, and Mowafa Househ. 2021. Perceptions and opinions  
1094 of patients about mental health chatbots: Scoping review. *Journal of medical Internet research* 23, 1 (2021), e17828.
- 1095 [3] Alaa Ali Abd-Alrazaq, Asma Rababeh, Mohannad Alajlani, Bridgette M Bewick, and Mowafa Househ. 2020. Effectiveness and safety of using  
1096 chatbots to improve mental health: systematic review and meta-analysis. *Journal of medical Internet research* 22, 7 (2020), e16021.
- 1097 [4] EA AlGamal, S Bin Saeed, M Agnes, and T Long. 2016. Prolonged grief disorder and its association with perceived social support. *Medicine* 42  
1098 (2016), 18–6.
- 1099 [5] Lorena Alonso-Llácer, Pilar Barreto Martín, Marta Ramos-Campos, Patricia Mesa-Gresa, Laura Lacomba-Trejo, and Marian Pérez-Marín. 2020.  
1100 Mindfulness and grief: The MADED program mindfulness for the acceptance of pain and emotions in grief. *Psicooncologia* 17, 1 (2020).
- 1101 [6] Karl Andriessen and Karolina Krysinska. 2011. Essential questions on suicide bereavement and postvention. *International journal of environmental  
1102 research and public health* 9, 1 (2011), 24–32.
- 1103 [7] American Psychiatric Association et al. 2019. Diagnostic and statistical manual of mental disorders (DSM-5®): American Psychiatric Pub; 2013. *J.  
1104 Physiother. Res., Salvador* 9, 2 (2019), 155–158.
- 1105 [8] Anna N Baglione, Maxine M Girard, Meagan Price, James Clawson, and Patrick C Shih. 2017. Mobile technologies for grief support: prototyping  
1106 an application to support the bereaved. In *Workshop on Interactive Systems in Health Care*.
- 1107 [9] Anna N Baglione, Maxine M Girard, Meagan Price, James Clawson, and Patrick C Shih. 2018. Modern bereavement: a model for complicated grief  
1108 in the digital age. In *Proceedings of the 2018 CHI conference on human factors in computing systems*. 1–12.
- 1109 [10] Blanka Bálint et al. 2017. The Griever as a Stranger. A Discussion. *Acta Universitatis Sapientiae, Social Analysis* 7 (2017), 39–77.
- 1110 [11] Virginia Barbosa, Mónica Sá, and José Carlos Rocha. 2014. Randomised controlled trial of a cognitive narrative intervention for complicated grief  
1111 in widowhood. *Aging & Mental Health* 18, 3 (2014), 354–362.
- 1112 [12] Roy F Baumeister and Mark R Leary. 2017. The need to belong: Desire for interpersonal attachments as a fundamental human motivation.  
1113 *Interpersonal development* (2017), 57–89.
- 1114 [13] Eileen Bendig, Benjamin Erb, Lea Schulze-Thuesing, and Harald Baumeister. 2019. The next generation: chatbots in clinical psychology and  
1115 psychotherapy to foster mental health—a scoping review. *Verhaltenstherapie* (2019), 1–13.
- 1116 [14] John Bowlby. 1969. Attachment and loss v. 3 (Vol. 1).
- 1117 [15] John Bowlby. 1982. Attachment and loss: retrospect and prospect. *American journal of Orthopsychiatry* 52, 4 (1982), 664.
- 1118 [16] Jed R Brubaker and Gillian R Hayes. 2011. "We will never forget you [online]" an empirical investigation of post-mortem myspace comments. In  
1119 *Proceedings of the ACM 2011 conference on Computer supported cooperative work*. 123–132.
- 1120 [17] Jed R Brubaker, Gillian R Hayes, and Paul Dourish. 2013. Beyond the grave: Facebook as a site for the expansion of death and mourning. *The  
1121 Information Society* 29, 3 (2013), 152–163.
- 1122 [18] Richard A Bryant, Lucy Kenny, Amy Joscelyne, Natasha Rawson, Fiona Maccallum, Catherine Cahill, Sally Hopwood, Idan Aderka, and Angela  
1123 Nickerson. 2014. Treating prolonged grief disorder: a randomized clinical trial. *JAMA psychiatry* 71, 12 (2014), 1332–1339.
- 1124 [19] Zoraida Callejas and David Griol. 2021. Conversational Agents for Mental Health and Wellbeing. *Dialog Systems: A Perspective from Language,  
1125 Logic and Computation* (2021), 219–244.
- 1126 [20] Mary Chayko. 2014. Techno-social life: The internet, digital technology, and social connectedness. *Sociology Compass* 8, 7 (2014), 976–991.
- 1127 [21] Priya Choudhary, Rachna Devi, Samreen Naz, and Komal Rai. 2021. Social Connectedness, Spirituality, Quality of Life, and Hopelessness among  
1128 Older Adults. *Annals of the Romanian Society for Cell Biology* 25, 6 (2021), 12241–12253.
- 1129 [22] Victoria Clarke, Virginia Braun, and Nikki Hayfield. 2015. Thematic analysis. *Qualitative psychology: A practical guide to research methods* 222,  
1130 2015 (2015), 248.
- 1131 [23] Rose E Constantino, L Kathleen Sekula, and Elaine N Rubinstein. 2001. Group intervention for widowed survivors of suicide. *Suicide and  
1132 Life-Threatening Behavior* 31, 4 (2001), 428–441.
- 1133 [24] Brian De Vries and Judy Rutherford. 2004. Memorializing loved ones on the World Wide Web. *OMEGA-Journal of Death and Dying* 49, 1 (2004),  
1134 5–26.
- 1135 [25] Robert Dabler. 2009. Ghosts in the machine: Mourning the MySpace dead. *Folklore and the internet: Vernacular expression in a digital world* (2009),  
1136 175–193.
- 1137 [26] Sally A Dominick, A Blair Irvine, Natasha Beauchamp, John R Seeley, Susan Nolen-Hoeksema, Kenneth J Doka, and George A Bonanno. 2010. An  
1138 internet tool to normalize grief. *OMEGA-Journal of Death and Dying* 60, 1 (2010), 71–87.
- 1139 [27] Alexis Elder. 2021. Conversation from Beyond the Grave? A Neo-Confucian Ethics of Chatbots of the Dead. *Journal of Applied Philosophy* (2021),  
1140 100012.
- 1141 [28] Christopher J Finlay and Guenther Krueger. 2011. A space for mothers: Grief as identity construction on memorial websites created by SIDS  
1142 parents. *OMEGA-Journal of Death and Dying* 63, 1 (2011), 21–44.
- 1143 [29] Kathleen Kara Fitzpatrick, Alison Darcy, and Molly Vierhile. 2017. Delivering cognitive behavior therapy to young adults with symptoms of  
1144 depression and anxiety using a fully automated conversational agent (Woebot): a randomized controlled trial. *JMIR mental health* 4, 2 (2017),  
e7785.
- [30] Luciano Floridi and Massimo Chiriatti. 2020. GPT-3: Its nature, scope, limits, and consequences. *Minds and Machines* 30, 4 (2020), 681–694.
- [31] Kirsten Foot, Barbara Warnick, and Steven M Schneider. 2005. Web-based memorializing after September 11: Toward a conceptual framework.  
*Journal of Computer-Mediated Communication* 11, 1 (2005), 72–96.

- 1145 [32] Abbe E Forman, Rebecca Kern, and Gisela Gil-Egui. 2012. Death and mourning as sources of community participation in online social networks:  
1146 RIP pages in Facebook. *First Monday* (2012).
- 1147 [33] Russell Fulmer, Angela Joerin, Breanna Gentile, Lysanne Lakerink, and Michiel Rauws. 2018. Using psychological artificial intelligence (Tess) to  
1148 relieve symptoms of depression and anxiety: randomized controlled trial. *JMIR mental health* 5, 4 (2018), e64.
- 1149 [34] Emily Getty, Jessica Cobb, Meryl Gabeler, Christine Nelson, Ellis Weng, and Jeffrey Hancock. 2011. I said your name in an empty room: Grieving  
1150 and continuing bonds on Facebook. In *Proceedings of the SIGCHI Conference on human factors in computing systems*. 997–1000.
- 1151 [35] Khalil G Ghanem, Heidi E Hutton, Jonathan M Zenilman, Rebecca Zimba, and Emily J Erbeling. 2005. Audio computer assisted self interview and  
1152 face to face interview modes in assessing response bias among STD clinic patients. *Sexually transmitted infections* 81, 5 (2005), 421–425.
- 1153 [36] Justin Grandinetti, Tyler DeAtley, and Jeffery Bruinsma. 2020. THE DEAD SPEAK: BIG DATA AND DIGITALLY MEDIATED DEATH. *AoIR  
1154 Selected Papers of Internet Research* (2020).
- 1155 [37] Jennifer Grant. 2019. Unfinished business: The impact of denial on the grieving process. In *What Happens When the Analyst Dies*. Routledge,  
34–46.
- 1156 [38] Grief Chat Messaging 2022. <https://apps.apple.com/us/app/good-grief-chat-messaging/id1314587192>.
- 1157 [39] Grief refuge 2022. <https://apps.apple.com/us/app/grief-refuge/id156140662>.
- 1158 [40] Grief Support for Young People 2022. <https://apps.apple.com/us/app/grief-support-for-young-people/id883195199>.
- 1159 [41] Grief Works 2022. <https://griefworkscourse.com>.
- 1160 [42] Griefsteps 2022. <https://apps.apple.com/us/app/griefsteps-for-parents/id1277751812>.
- 1161 [43] Jenna Grundström, Hanna Konttinen, Noora Berg, and Olli Kiviruusu. 2021. Associations between relationship status and mental well-being in  
1162 different life phases from young to middle adulthood. *SSM-population health* 14 (2021), 100774.
- 1163 [44] Lorraine Hedtke and John Winslade. 2016. *Remembering lives: Conversations with the dying and the bereaved*. Routledge.
- 1164 [45] Jason M Holland, Christopher P Plant, Kara L Klingspon, and Robert A Neimeyer. 2020. Bereavement-related regrets and unfinished business with  
the deceased. *Death studies* 44, 1 (2020), 42–47.
- 1165 [46] Feng-Ying Huang, Ai-Ling Hsu, Li-Ming Hsu, Jaw-Shiun Tsai, Chih-Mao Huang, Yi-Ping Chao, Tzung-Jeng Hwang, and Changwei W Wu. 2019.  
1166 Mindfulness improves emotion regulation and executive control on bereaved individuals: an fMRI study. *Frontiers in human neuroscience* (2019),  
541.
- 1167 [47] Chen Jiang. 2020. *Memoron: How to provide support to people in grief with AI technology?* Master's thesis. Universitat Politècnica de Catalunya.
- 1168 [48] Belén Jiménez-Alonso and Ignacio Bresco de Luna. 2022. Griefbots. A New Way of Communicating With The Dead? *Integrative Psychological and  
1169 Behavioral Science* (2022), 1–16.
- 1170 [49] Kara L Klingspon, Jason M Holland, Robert A Neimeyer, and Wendy G Lichtenthal. 2015. Unfinished business in bereavement. *Death Studies* 39, 7  
1171 (2015), 387–398.
- 1172 [50] Stacey H Kovac and Lillian M Range. 2000. Writing projects: Lessening undergraduates' unique suicidal bereavement. *Suicide and Life-Threatening  
1173 Behavior* 30, 1 (2000), 50–60.
- 1174 [51] Kira Kretzschmar, Holly Tyroll, Gabriela Pavarini, Arianna Manzini, Ilina Singh, and NeurOx Young People's Advisory Group. 2019. Can your  
1175 phone be your therapist? Young people's ethical perspectives on the use of fully automated conversational agents (chatbots) in mental health  
1176 support. *Biomedical informatics insights* 11 (2019), 1178222619829083.
- 1177 [52] Joel Krueger and Lucy Osler. 2022. Communing with the dead online: chatbots, grief, and continuing bonds. *Journal of Consciousness Studies* 29,  
1178 9-10 (2022), 222–252.
- 1179 [53] Elisabeth Kübler-Ross. 1973. *On death and dying*. Routledge.
- 1180 [54] Matilda Landström and Nahal Mustafa. 2018. Developing an Artificially Intelligent Tool for Grief Recovery.
- 1181 [55] Gale M Lucas, Albert Rizzo, Jonathan Gratch, Stefan Scherer, Giota Stratou, Jill Boberg, and Louis-Philippe Morency. 2017. Reporting mental  
1182 health symptoms: breaking down barriers to care with virtual human interviewers. *Frontiers in Robotics and AI* 4 (2017), 51.
- 1183 [56] Marie Lundorff, Helle Holmgren, Robert Zachariae, Ingeborg Farver-Vestergaard, and Maja O'Connor. 2017. Prevalence of prolonged grief disorder  
in adult bereavement: A systematic review and meta-analysis. *Journal of affective disorders* 212 (2017), 138–149.
- 1184 [57] Kien Hoa Ly, Ann-Marie Ly, and Gerhard Andersson. 2017. A fully automated conversational agent for promoting mental well-being: A pilot RCT  
1185 using mixed methods. *Internet interventions* 10 (2017), 39–46.
- 1186 [58] Michelle S. Marion Lillian M. Range, Stacey H. Kovac. 2000. Does writing about the bereavement lessen grief following sudden, unintentional  
1187 death? *Death studies* 24, 2 (2000), 115–134.
- 1188 [59] Alice Marwick and Nicole B Ellison. 2012. "There isn't Wifi in heaven!" Negotiating visibility on Facebook memorial pages. *Journal of Broadcasting  
1189 & Electronic Media* 56, 3 (2012), 378–400.
- 1190 [60] Michael Massimi. 2013. Exploring remembrance and social support behavior in an online bereavement support group. In *Proceedings of the 2013  
1191 conference on Computer supported cooperative work*. 1169–1180.
- 1192 [61] Minddoc 2022. <https://minddoc.com/us/en>.
- 1193 [62] Mindspa 2022. <https://www.mindspa.me/>.
- 1194 [63] Wendy Moncur, Miriam Julius, Elise Van Den Hoven, and David Kirk. 2015. Story Shell: the participatory design of a bespoke digital memorial. In  
1195 *Proceedings of 4th Participatory Innovation Conference*. 470–477.
- 1196



- 1197 [64] George W Musambira, Sally O Hastings, and Judith D Hoover. 2007. Bereavement, gender, and cyberspace: A content analysis of parents' memorials  
1198 to their children. *OMEGA-Journal of Death and Dying* 54, 4 (2007), 263–279.
- 1199 [65] Clifford Nass, Jonathan Steuer, and Ellen R Tauber. 1994. Computers are social actors. In *Proceedings of the SIGCHI conference on Human factors in*  
1200 *computing systems*. 72–78.
- 1201 [66] Robert A Neimeyer. 2012. Correspondence with the deceased. In *Techniques of grief therapy*. Routledge, 279–281.
- 1202 [67] Robert A Neimeyer. 2012. *Techniques of grief therapy: Creative practices for counseling the bereaved*. Routledge.
- 1203 [68] Robert A Neimeyer. 2016. Meaning reconstruction in the wake of loss: Evolution of a research program. *Behaviour Change* 33, 2 (2016), 65–79.
- 1204 [69] Robert A Neimeyer, Scott A Baldwin, and James Gillies. 2006. Continuing bonds and reconstructing meaning: Mitigating complications in  
bereavement. *Death studies* 30, 8 (2006), 715–738.
- 1205 [70] Casey Newton. 2016. When her best friend died, she used artificial intelligence to keep talking to him. *TheVerge.com* 6 (2016).
- 1206 [71] Thai Ha Nguyen, Lena Waizenegger, and Angsana A Techatassanasoontorn. 2022. "Don't Neglect the User!"—Identifying Types of Human-Chatbot  
1207 Interactions and their Associated Characteristics. *Information Systems Frontiers* 24, 3 (2022), 797–838.
- 1208 [72] Kathryn J Norlock. 2017. Real (and) imaginal relationships with the dead. *The Journal of Value Inquiry* 51, 2 (2017), 341–356.
- 1209 [73] Moira O'Connor, Suzanne Nikoletti, LJ Kristjanson, Richard Loh, and Barbara Willcock. 2003. Writing therapy for the bereaved: Evaluation of an  
1210 intervention. *Journal of palliative medicine* 6, 2 (2003), 195–204.
- 1211 [74] Gary M Olson and Judith S Olson. 2000. Distance matters. *Human-computer interaction* 15, 2-3 (2000), 139–178.
- 1212 [75] Anthony Papa, M Todd Sewell, Christina Garrison-Diehn, and Clair Rummel. 2013. A randomized open trial assessing the feasibility of behavioral  
activation for pathological grief responding. *Behavior Therapy* 44, 4 (2013), 639–650.
- 1213 [76] Holly G Prigerson, Mardi J Horowitz, Selby C Jacobs, Colin M Parkes, Mihaela Aslan, Karl Goodkin, Beverley Raphael, Samuel J Marwit, Camille  
1214 Wortman, Robert A Neimeyer, et al. 2009. Prolonged grief disorder: Psychometric validation of criteria proposed for DSM-V and ICD-11. *PLoS*  
1215 *medicine* 6, 8 (2009), e1000121.
- 1216 [77] Holly G Prigerson and Paul K Maciejewski. 2006. Prolonged grief disorder (PG-13). *Dana-Farber Cancer Institute: Boston, MA* (2006).
- 1217 [78] Project December 2019. <https://projectdecember.net>.
- 1218 [79] Therese A Rando. 1993. *Treatment of complicated mourning*. Research Press.
- 1219 [80] Reddit Artificial Intelligence 2022. <https://www.reddit.com/r/ArtificialIntelligence/>.
- 1220 [81] Reddit Chatbots 2022. <https://www.reddit.com/r/Chatbots/>.
- 1221 [82] Reddit Project December 2022. <https://www.reddit.com/r/ProjectDecember1982/>.
- 1222 [83] Reddit Replika 2022. <https://www.reddit.com/r/replika/>.
- 1223 [84] Reddit Woebot 2022. <https://www.reddit.com/r/woebot/>.
- 1224 [85] Replika 2018. <https://replika.ai>.
- 1225 [86] Rita Rosner, Gabriele Pfoh, Michaela Kotoučová, and Maria Hagl. 2014. Efficacy of an outpatient treatment for prolonged grief disorder: A  
randomized controlled clinical trial. *Journal of Affective Disorders* 167 (2014), 56–63.
- 1226 [87] Jeanne W Rothaupt and Kent Becker. 2007. A literature review of Western bereavement theory: From deathtaking to continuing bonds. *The*  
1227 *Family Journal* 15, 1 (2007), 6–15.
- 1228 [88] Kerstin Ruhland, Christopher E Peters, Sean Andrist, Jeremy B Badler, Norman I Badler, Michael Gleicher, Bilge Mutlu, and Rachel McDonnell.  
1229 2015. A review of eye gaze in virtual agents, social robotics and hci: Behaviour generation, user interaction and perception. In *Computer graphics*  
1230 *forum*, Vol. 34. Wiley Online Library, 299–326.
- 1231 [89] Ryan M Schuetzler, G Mark Grimes, and Justin Scott Giboney. 2020. The impact of chatbot conversational skill on engagement and perceived  
humanness. *Journal of Management Information Systems* 37, 3 (2020), 875–900.
- 1232 [90] Alfred Schütz. 2004. A hazatérő [Original title: The Homecomer]. *Az Idegen-Variációk Simmeltől Derridáig* (2004), 80–90.
- 1233 [91] Wan-Jou She, Panote Siriaraya, Chee Siang Ang, and Holly Gwen Prigerson. 2021. Living Memory Home: Understanding Continuing Bond in the  
1234 Digital Age through Backstage Grieving. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. 1–14.
- 1235 [92] Stephen R Shuchter and Sidney Zisook. 1988. Widowhood: The continuing relationship with the dead spouse. *Bulletin of the Menninger Clinic* 52, 3  
1236 (1988), 269.
- 1237 [93] Heung-Yeung Shum, Xiao-dong He, and Di Li. 2018. From Eliza to XiaoIce: challenges and opportunities with social chatbots. *Frontiers of*  
1238 *Information Technology & Electronic Engineering* 19, 1 (2018), 10–26.
- 1239 [94] Kathleen J Sikkema, Nathan B Hansen, Arlene Kochman, David C Tate, and Wayne Difrancesco. 2004. Outcomes from a randomized controlled  
1240 trial of a group intervention for HIV positive men and women coping with AIDS-related loss and bereavement. *Death studies* 28, 3 (2004), 187–209.
- 1241 [95] Anne M Sinatra, Kimberly A Pollard, Benjamin T Files, Ashley H Oiknine, Mark Ericson, and Peter Khooshabeh. 2021. Social fidelity in virtual  
1242 agents: Impacts on presence and learning. *Computers in Human Behavior* 114 (2021), 106562.
- 1243 [96] Marita Skjuve, Asbjørn Følstad, Knut Inge Fostervold, and Petter Bae Brandtzaeg. 2021. My chatbot companion—a study of human-chatbot  
relationships. *International Journal of Human-Computer Studies* 149 (2021), 102601.
- 1244 [97] Carla J Sofka. 1997. Social support\* internetworks,\* caskets for sale, and more: Thanatology and the information superhighway. *Death Studies* 21, 6  
1245 (1997), 553–574.
- 1246 [98] Shanee Stepakoff. 2009. From destruction to creation, from silence to speech: Poetry therapy principles and practices for working with suicide  
1247 grief. *The Arts in Psychotherapy* 36, 2 (2009), 105–113.
- 1248

- 1249 [99] Patrick Stokes. 2021. *Digital Souls: A Philosophy of Online Death*. Bloomsbury Publishing.
- 1250 [100] Margaret S Stroebe and Henk Schut. 2001. Meaning making in the dual process model of coping with bereavement. (2001).
- 1251 [101] Colm Sweeney, Courtney Potts, Edel Ennis, Raymond Bond, Maurice D Mulvenna, Siobhan O'neill, Martin Malcolm, Lauri Kuosmanen, Catrine Kostenius, Alex Vakaloudis, et al. 2021. Can Chatbots help support a person's mental health? Perceptions and views from mental healthcare professionals and experts. *ACM Transactions on Computing for Healthcare* 2, 3 (2021), 1–15.
- 1252 [102] Vivian Ta, Caroline Griffith, Carolyn Boatfield, Xinyu Wang, Maria Civitello, Haley Bader, Esther DeCero, Alexia Loggarakis, et al. 2020. User experiences of social support from companion chatbots in everyday contexts: thematic analysis. *Journal of medical Internet research* 22, 3 (2020), e16235.
- 1253 [103] Peter Tracey, Mo Saraee, and Chris Hughes. 2021. Applying NLP to build a cold reading chatbot. In *2021 International Symposium on Electrical, Electronics and Information Engineering*. 77–80.
- 1254 [104] Tracy J Trothen. 2022. Replika: Spiritual Enhancement Technology? *Religions* 13, 4 (2022), 275.
- 1255 [105] Daisuke Uriu and Naohito Okude. 2010. ThanatoFenestra: photographic family altar supporting a ritual to pray for the deceased. In *Proceedings of the 8th ACM conference on designing interactive systems*. 422–425.
- 1256 [106] Aditya Nrusimha Vaidyam, Hannah Wisniewski, John David Halamka, Matcheri S Kashavan, and John Blake Torous. 2019. Chatbots and conversational agents in mental health: a review of the psychiatric landscape. *The Canadian Journal of Psychiatry* 64, 7 (2019), 456–464.
- 1257 [107] Lex van Velsen, Miriam Cabrita, Harm Op den Akker, Lena Brandl, Joana Isaac, Maria Suárez, Afonso Gouveia, Nathaniel Evans, Rute Dinis de Sousa, Ana Maria Rodrigues, et al. 2020. LEAVES (optimizing the mental health and resilience of older Adults that have lost their spouse via blended, online therapy): Proposal for an Online Service Development and Evaluation. *JMIR research protocols* 9, 9 (2020), e19344.
- 1258 [108] Craig J Vickio. 1999. Together in spirit: Keeping our relationships alive when loved ones die. *Death Studies* 23, 2 (1999), 161–175.
- 1259 [109] Tony Walter, Rachid Hourizi, Wendy Moncur, and Stacey Pitsillides. 2012. Does the internet change how we die and mourn? Overview and analysis. *Omega-journal of Death and Dying* 64, 4 (2012), 275–302.
- 1260 [110] Marloes Wezel, Emmelyn AJ Croes, Marjolijn L Antheunis, et al. 2020. "I'm Here for You": Can Social Chatbots Truly Support Their Users? A Literature Review. In *International Workshop on Chatbot Research and Design*. Springer, 96–113.
- 1261 [111] J William Worden and Howard R Winokuer. 2021. A task-based approach for counseling the bereaved. In *Grief and Bereavement in Contemporary Society*. Routledge, 57–67.
- 1262 [112] Wysa 2022. <https://www.wysa.io>.
- 1263 [113] Tianling Xie and Iryna Pentina. 2022. Attachment Theory as a Framework to Understand Relationships with Social Chatbots: A Case Study of Replika. In *Proceedings of the 55th Hawaii International Conference on System Sciences*.
- 1264 [114] Li Zhou, Jianfeng Gao, Di Li, and Heung-Yeung Shum. 2020. The design and implementation of xiaoice, an empathetic social chatbot. *Computational Linguistics* 46, 1 (2020), 53–93.
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