"I'm Here for You": Can Social Chatbots Truly Support Their Users? A Literature Review

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Abstract. Applications of chatbots are becoming more diverse. One application that is specifically interesting is social chatbots, as they are designed to provide its users with social support and improve wellbeing and mental health outcomes. It is questionable to what extent social chatbots are successful support providers, as there are several differences between chatbots and humans. Given the diverse subconcepts of social support, this paper aims to evaluate to what extent relevant subconcepts (structural support, perceived support, received support, and support adequacy) are captivated in extant research on social chatbots, in order to draw conclusions about its potential. Support adequacy turned out to be most under scrutiny in extant research, while measures of structural support and received support received less attention. Surprisingly, directionality of support was another important subconcept of social support in social chatbot literature. Theoretical and practical implications as well as suggestions for future research are discussed.

Keywords: social chatbots, social support, wellbeing.

1 Introduction

The number of chatbots is increasing exponentially, and their applications are becoming more diverse. A chatbot is a dialogue-based technology designed to execute simple conversations through text or voice [1]. In extend of functional, rule-based chatbots, there are now also social chatbots aiming to establish an emotional bond with its users and provide companionship and support [2]. Social chatbots are not developed to solve specific problems in predefined situations, but rather to converse freely and socially with their users, about any topic [2]. Applications of this chatbot type can in turn be found in mental health contexts [e.g., 3-4], physical health contexts [e.g., 5-7], and as social companions [e.g., 8-10].

An important aim that social chatbots share, is providing its users with social support [2]. It is debatable to what extent social chatbots are truly able to support their users due to several differences between chatbots and humans. Given the diversity and richness of social support as a construct, it is necessary to evaluate to what extent important subconcepts are captivated in extant research on social chatbots, in order to

draw conclusions about its potential in comparison to human support providers. Hence, the research questions that are central to this paper are:

RQ1: Which subconcepts of social support are investigated in social chatbot research?

RQ2: Which subconcepts remain unexplored and deserve more attention in future research?

1.1 Background

Social support has been given many definitions, but in a broad sense indicates any process in social interactions that might positively affect wellbeing [11]. In social support research, the concept is often broken down into several subconcepts, each illuminating a different aspect of social support. Relevant subconcepts for social chatbot research are provided in Table 1 [12].

Table 1. Different concepts of social support and proposed operationalizations in social chatbot research

Social support concept	Definition	Operationalizations in social chatbot research
Structural support	The number and pattern of (in)direct social ties around an individual	User behavior Frequency of support seeking
Perceived support	Beliefs about the availability of support	Perceived availability of social chatbot
Received support	Reports about received support types	Self-reports about received support types
Support adequacy	Evaluations of quantity/quality of received support	Perceived (mis)understanding Measures of feeling supported Willingness to self-disclose Wellbeing outcomes Improved mental health outcomes

A first subconcept that is important to consider when mapping supportive abilities of social chatbots, is the way in which users address these technologies to seek support (i.e., structural support). After all, what use is a supportive chatbot if users are not seeking support from it? To investigate to what extent social chatbots can support their users, it is therefore crucial to evaluate how users interact with them. Hence, quantitative variables such as usage time, usage frequency, usage period, and number of words are relevant.

Second, an important subconcept of social support is its perceived availability (i.e., perceived support). People are better able to reappraise stressful situations when they experience available social support [13]. Sometimes the lack of 24/7 availability of human-human support can be problematic. To illustrate, in mental health counselling online extensions of offline therapy still lead to limited session times and long virtual queues, increasing depressive symptoms of the help-seekers [14]. Social chatbots could potentially fill this gap, as they are available to its user from any place at any time [15].

A third subconcept is the scope of support types that can be provided by social chatbots. Generally social support is subdivided into instrumental support (i.e., tangible support), informational support, and emotional support [16]. While instrumental support cannot be offered in an online setting, the latter two are easily communicated through text messages, and should in turn be present in social chatbot conversations.

The final subconcept that seems relevant in social chatbot research is support adequacy. Support adequacy is an important measure to evaluate the effectiveness of social support provision, and can be operationalized in several ways. First, effective social support is proposed to make the receiver feel truly understood by the provider [17], where provided support is responsive to and understands one's needs [18]. Therefore, the expressed support should include a component that reflects true understanding, which is enabled by clear communication of the receiver's needs and the ability to understand those needs by the provider. Because of the inequality of language abilities between (social) chatbots and their users, chatbot responses are often characterized as repetitive and impersonal [19], leading to experienced miscommunication and frustration by users [20-22]. Irrelevant or inappropriate responses can be detrimental for user satisfaction and might hinder appropriate social support [23], for example because users feel neglected or misunderstood [24]. Besides these 'informational misunderstandings', there are also concerns that a social chatbot cannot show genuine empathy, as it does not have access to true feelings of emotions [25-27]. The question is whether a social chatbot's lack of emotionality hinders their abilities to accurately mimic empathetic responses. Research suggests that effective social chatbots should entail a sophisticated empathy module to convey understanding [28], without being creepy [27, 29-30]. Support adequacy of social chatbots may thus be evaluated by measures of perceived (empathetic) understanding.

A second construct that clarifies support adequacy is the level of self-disclosure. Self-disclosure refers to the verbal sharing of one's thoughts, feelings and experiences [31]. Intimate relationships often stimulate self-disclosure between individuals [e.g., 32], which in turn relates to increased social support [e.g., 33-34]. Hence, a high relational closeness is suggested to result in more empathetic understanding, and in turn in a higher quality of perceived support [35]. In contrast though, Kristiansen, Tjørnhøj-Thomsen and Krasnik [36] found that cancer patients perceived the support provided by – socially distant – health care professionals as valuable, partly because they could understand the situation without causing more distress. Thus, effective support provision might also be possible in less close relationships (e.g., with social chatbots). Indeed, several researchers in the field of online counselling suggest that an online en-

vironment – such as a social chatbot – might enhance self-disclosure and in turn adequate social support, due to its lack of physical presence [37], lack of non-verbal cues [14], and perceived anonymity [38]. This combination of characteristics, and the non-judgmental nature of a social chatbot may create a safe space to share embarrassing or sensitive topics that one would not share with another person [15, 39]. Accordingly, several studies have found that people are willing to self-disclose personal things to a (social) chatbot [e.g., 40-41]. In sum, measures of willingness to self-disclose to social chatbots can contribute to estimating their efficacy to provide support.

As a final notion, perceived social support has been related to wellbeing [e.g., 42-44] and mental health outcomes [e.g., 45-47]. If social chatbots are able to provide adequate social support, this could therefore be visible in wellbeing and mental health outcomes.

1.2   Present Study

Mapping which aspects of social support have been scrutinized and which aspects deserve more attention, will (1) clarify the extent in which social chatbots are known to be (in)supportive up until now and (2) provide directions for future research to deepen this understanding of strengths and weaknesses of social chatbots, as well as settings in which they can be applied adequately. Therefore, the aim of this review is to investigate whether the various subconcepts of social support are accounted for in social chatbot research, focusing on text-based chatbots only (no vocal or embodied conversational agents).

2   Literature Search and Procedures

A literature review was conducted to investigate the status quo of research on social chatbots as support providers. Because research on chatbots exists in several fields, each with their own terminology [48], relevant literature was found by the use of the following search term: ("social chatbot" OR "dialogue system" OR "conversational agent" OR "virtual assistant") AND ("social support" OR "user behavior" OR availability OR perceived support OR perceived understanding OR wellbeing OR therapy) -spoken -vocal -embodied, in the search engines Google Scholar (4,320 hits), ScienceDirect[1] (168 hits), SpringerLink (2,156 hits) and Wiley Online Library (80 hits). If applicable, filters to select only empirical research papers were used.

The original number of hits included many rule-based functional chatbots, hence the selection was narrowed down following this definition of a social chatbot: a dialogue-based program designed to show humanlike behavior with a personality and emotions, in social, relational or therapeutic contexts, in which the main goal is to establish an emotional connection and/or provide social support. The focus is thus mainly on *the emotional aspect of support* rather than informing or educating the user.

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1   ScienceDirect only allows 8 Boolean operators so this search excluded "dialogue system" and "virtual assistant"

In order to be selected for the final review, a paper must have (1) empirically investigated the use of a social chatbot related to subconcepts of social support, following the operationalizations from Table 1 (so no reviews, meta-analyses or design studies), (2) been published in a peer-reviewed journal or conference proceeding and (3) been written in English. This selection criteria led to the selection of 14 articles that were analyzed in more depth (4 conference proceedings and 10 journal articles). An overview of these papers' main findings is given in Table 2.

3 Results

The synthesis of relevant literature revealed that two of the proposed subconcepts of social support are elaborated on in extant social chatbot research: perceived support and support adequacy. The subconcepts "received support" and "structural support" received little attention. Surprisingly, an additional subconcept, directionality, was covered in several studies.

3.1 Perceived Support

The all-time availability of social chatbots, and its impact on perceived social support and wellbeing, was investigated. The 24/7 availability of social chatbots was often recognized as beneficial [10, 49-50, 6], especially when users would have limited access to more traditional sources of support, such as their friends or close kin [49]. Additionally, breast cancer patients felt comforted by the idea that someone could answer their questions at any time, and 88% experienced the conversations with a social chatbot to be supportive [6]. Besides these practicalities, the all-time availability of a social chatbot was also valued by users as the chatbot functioned as a positive, supporting feel-good app on demand [10]. In turn, besides the possible positive effects of actual support provision, users also experienced positive feelings as a result of knowing that they carried a support provider with them at all times [50]. Even when the social chatbot was not actively supporting its user, its mere presence could suffice.

3.2 Support Adequacy

Many papers investigated to what extent social chatbot users feel (mis)understood and how this impacts the adequacy of social support and wellbeing. Miscommunication and annoyance were frequently mentioned in several qualitative analyses of social chatbot interactions [49-51, 4]. More specifically, the repetitiveness of conversations with a social chatbot were often reported as annoying. Besides, social chatbot users indicated to receive messages that made no sense [49] or that miscommunication occurred [4, 51]. Indications of miscommunication were mostly informational [49, 4]. Woebot users, for example, indicated that they confused the social chatbot when using the free-input option rather than proposed multiple-choice options [4].

Interestingly, despite miscommunications, the social chatbots in these studies were all perceived as successful support providers or they improved (mental) wellbeing. Ly

et al. [50] for example found that participants who had interacted with a companionship chatbot experienced improved wellbeing and lower perceived stress as compared to a waitlist control group. Additionally, Fitzpatrick and colleagues [4] found that the use of Woebot significantly reduced depressive symptoms, while an e-book about mental health did not.

Furthermore, special attention was devoted to social chatbots' abilities to emotionally understand their users. To illustrate, Liu and Sundar [27] developed four social chatbot types and measured perceived message supportiveness when (1) reading a hypothetical conversation and (2) when actually conversing with a social chatbot. At first sight, message supportiveness was perceived to be higher from sympathetic or affective empathetic chatbots as compared to advice-only chatbots. However, when participants interacted with a social chatbot themselves, all messages were perceived as equally supportive [27].

The willingness to self-disclose to a social chatbot and its impacts on the adequacy of social support and wellbeing were also covered. While Ly et al. [50] found that social chatbot conversations were perceived as shallow, most studies found that the non-judgmental character of the social chatbot was inviting to discuss intimate topics, such as sexuality problems or hair loss related to cancer treatments [52, 6]. For example, more than 80% of the participants indicated that sensitive questions were more easily discussed with a social chatbot than with another person [53]. Moreover, participants experienced lower thresholds to express affection or gratitude to significant others when a social chatbot functioned as a mediator [10]. Interestingly, while social chatbots lowered thresholds to self-disclose, the impact of self-disclosure as compared to self-disclosure to a human seemed to be similar [54].

3.3   Received Support

Only one of the fourteen papers that were reviewed explicitly distinguished between different types of received social support. Ta and colleagues [49] noted that user reviews of companionship chatbot Replika frequently mentioned companionship support (77.1%) and emotional support provision (44.6%). Informational support (15.6%) and appraisal support (9.3%) were also found, but these support types were clearly outnumbered. Replika users specifically sought informational support regarding mental wellbeing. Emotional support was provided along two dimensions: (1) users felt safe to discuss their true feelings with Replika, and (2) the social chatbot would regularly inquire about their wellbeing. These two dimensions made users feeling loved and being cared for, which might also explain that users reported reduced feelings of loneliness when interacting with Replika. Though this is not made explicit, Chaix et al. [6] also mentioned that users had established an emotional connection with their social chatbot, which suggests the presence of emotional support.

Table 2. Selected papers and their main findings

Authors	Sample	Country	Method	Chatbot Type	Chatbot Input	IV/moderator/ covariates	DV	Main Findings
Narain et al. (2020)	N= 24 students and young professionals M_{age}= unknown	USA	Experiment, survey and interview	Companion	Free input	Chatbot interaction (yes vs no)	Wellbeing, Self-esteem	Qualitative outcomes: more self-reflection, increased relationship depth with friends and SD that would not occur F2F. Quantitative outcomes: increased self-esteem and wellbeing in experimental group, but not significant.
Ta et al. (2020)	Study 1: N= 1,854 reviews Study 2: N= 66 adults M_{age}= 32.64	World	Field study (thematic analysis and interview)	Companion	Free input, MC answer options	None	Perceived social support	Companionship support (77.1%) and emotional support (44.6%) most commonly referenced. Chatbot perceived as helpful support provider.
Liu & Sundar (2018)	Study 1: N= 85 adults M_{age}= 34.76 Study 2: N= 88 students and adults M_{age}= 25.75	USA	Experiment	Physical health	Free input	Chatbot type (advice-only vs sympathy vs cognitive empathy vs affective empathy)	Perceived understanding, message supportiveness, message effectiveness, perceived social support	Sympathy and affective empathy chatbots more supportive and perceived understanding than advice-only when reading hypothetical interaction (study 1) but no such effects after an actual interaction with a chatbot (study 2).
Inkster et al. (2018)	N= 129 young adults M_{age}= unknown	World	Quasi-experiment	Mental health	Free input, MC answer options	Usage intensity (high vs low)	Depressive symptoms	Both groups had improved in terms of depressive symptoms significantly, but high users significantly improved more than low users.

Note: IV = Independent Variable, DV = Dependent variable (only relevant ones included), F2F = Face to Face, MC = Multiple Choice, CG = Care Giving, CR = Care Receiving SD = Self-Disclosure MHP = Mental Health Professional

Table 2. Continued

Authors	Sample	Country	Method	Chatbot Type	Chatbot Input	IV/moderator/ covariates	DV	Main Findings
Oh, Jang, Kim, & Kim (2020)	N= 41 adults M_{age}= 40.97	South Korea	Randomized Controlled Trial and thematic analysis	Mental health	Free input, MC answer options	Condition (chatbot vs book)	Clinical outcomes such as anxiety, depression and panic disorder	Decreased panic disorder severity and social phobia, no further effects. Only 3 participants reported that received support was the best thing about the chatbot.
Ho, Hancock, & Miner (2018)	N= 98 students M_{age}= 22.00	USA	Experiment	None	Free input	Partner identity (human vs chatbot) Disclosure type (emotional vs factual)	Emotional experiences, perceived understanding, disclosure intimacy	Regardless of partner identity, participants reported improved emotional experiences and feeling better after the emotional disclosure as compared to the factual disclosure.
Greer et al. (2019)	N= 45 adults M_{age}= 25.00	USA	Randomized Controlled Trial	Physical health	Free input, MC answer options	Content access chatbot (full vs emotion ratings only)	Anxiety, depression, positive and negative emotions	Chatting sessions were seen as helpful. 4 weeks chatbot access reduced anxiety significantly compared to waitlist control.
Chaix et al. (2019)	N= 958 breast cancer patients M_{age}= 48.00	France	Prospective study and survey	Physical health	Free input, MC answer options	None	Qualitative user experiences, conversation content	No effects on depressive symptoms and emotions. 88.00% said the chatbot was supporting. Users claimed to have established an emotional connection.
De Gennaro, Krumhuber, & Lucas (2020)	N= 128 students M_{age}= 24.12	UK	Experiment	Mental health	Free input, MC answer options	Condition (empathetic chatbot vs control questionnaire)	Mood	The mood of participants that interacted with the chatbot was significantly more positive compared to the control group after being ostracised. This effect holds when controlled for the feeling of exclusion.
Lee et al. (2019)	N= 67 M_{age}= 25.10	Holland	Longitudinal experiment	Mental health	Free input, MC answer options	Condition (CG chatbot vs CR chatbot)	Self-compassion	CG chatbot did not increase self-compassion, CR chatbot did. Effects were stronger for women; they increased in self-compassion for both conditions, where CR had strongest effect.

Note: IV = Independent Variable, DV = Dependent variable (only relevant ones included), F2F = Face to Face, MC = Multiple Choice, CG = Care Giving, CR = Care Receiving SD = Self-Disclosure MHP = Mental Health Professional

Table 2. Continued

Authors	Sample	Country	Method	Chatbot Type	Chatbot Input	IV/moderator/ covariates	DV	Main Findings
Lee, Yamashita, & Huang (2020a)	$N = 47$ $M_{age} = 23$	USA	Longitudinal experiment	Mental health/ Companion	Free input, MC answer options	Condition (chatbot no SD vs chatbot low SD vs chatbot high SD)	SD, sharing with MHP, trust	More SD of feelings to the MHP and the chatbot after conversing with high SD chatbot > 80% of the participants found it easier to talk about sensitive questions with a chatbot vs MHP 90% shared their answers with MHP
Lee, Yamashita, Huang, & Fu (2020b)	$N = 47$ $M_{age} = 23$	USA	Longitudinal experiment	Companion	Free input, MC answer options	Condition (chatbot no SD vs chatbot low SD vs chatbot high SD)	Word count, SD depth, trust, intimacy	Conversing with high SD chatbot related to high MHP trust Answering to sensitive questions: more words and more feelings in high SD condition than in no SD or low SD. Over time increased SD and perceived intimacy in high SD condition when answering sensitive questions. SD decreased when journaling.
Ly, Ly, & Andersson (2017)	$N = 27$ adults $M_{age} = 26.2$	Sweden	Randomized Control Trial and interview	Companionship	Free input, MC answer options	Condition (chatbot vs waitlist control)	Wellbeing Perceived stress Life satisfaction App engagement	Chatbot condition showed improved wellbeing and lower perceived stress than the waitlist control group. No effect on life satisfaction.
Fitzpatrick et al. (2017)	$N = 70$ students $M_{age} = 22.20$	USA	Randomized Controlled Trial	Mental health	Free input, MC answer options	Condition (chatbot vs. self-help e-book)	(Among others) Anxiety Positive and negative affect Depressive symptoms	Woebot reduced signs of depression while the control group that was given an e-book did not show improvement. Completers showed reduced anxiety in both conditions. No effects were found on affect.

Note: IV = Independent Variable, DV = Dependent variable (only relevant ones included), F2F = Face to Face, MC = Multiple Choice, CG = Care Giving, CR = Care Receiving SD = Self-Disclosure MHP = Mental Health Professional

3.4 Structural Support

Structural support measures such as word count or interaction frequency were included in only three of the fourteen studies under review. Lee and colleagues [55] investigated the word count of disclosures towards self-disclosing social chatbots (high vs. low vs. no disclosure) and found that participants used more words to answer sensitive questions when they interacted with a high self-disclosing social chatbot. Chaix et al. [6] were the only ones to consider user behavior of a social chatbot developed to support cancer patients, in their analysis of usage data from one year. Specifically, they investigated usage time, interest in several themes, and level of interactivity. This analysis for example showed that participants were more eager to answer multiple-choice questions rather than open questions asked by the social chatbot. They also found that 31% of the participants still interacted with the social chatbot after 8 months. Finally, Fitzpatrick et al. [4] included a measure of usage frequency and found that participants checked in with their social chatbot 12.14 times in 2 weeks on average.

3.5 Directionality

Unexpectedly, directionality of social support was covered in several studies, even though social chatbots are not capable of feeling distress and hence do not need to be supported. In these studies, the focus was mainly on reciprocal self-disclosure [53, 55-56]. Conversing with a social chatbot that shared many self-disclosures resulted in more trust in the social chatbot and the mental health professional it later referred to, as compared to a social chatbot that shared no or little information about himself [53]. Also, more feelings were shared with a self-disclosing social chatbot [55].

4 Discussion

The aims of this paper were twofold: (1) to concisely summarize empirical research on social chatbots' social support abilities, and (2) to explore which subconcepts of social support are still missing from this body of literature.

Several researchers question the capability of social chatbots to act as support providers because they are unable to deeply understand their interlocutors [e.g., 20-21], specifically on an emotional level [25-27]. The present synthesis found that support adequacy received most attention: even though social chatbot users experienced miscommunications, they still gained benefits from the interaction in terms of experienced social support and improved wellbeing. Even when people valued an emotional component when reading human-chatbot interactions, this was not confirmed in actual human-chatbot interactions [27]. It is therefore questionable how important this proposed communication problem really is. Experiences of miscommunication were mainly of informational nature (responses that were off-topic or repetitive) and did not seem to impact the adequacy of social support or users' wellbeing. The reviewed studies also revealed that – mainly due to its non-judgmental character – people were willing to

self-disclose about intimate, personal topics to a social chatbot. Mostly in relation to support adequacy, numerous papers considered the subconcept of perceived support when they determined how the all-time availability of social chatbots was perceived by and impacted their users. Measures of structural support and received support were only discussed to a limited extent.

Interestingly, in contrast with our initial expectations, the subconcept of "directionality" [12] was also covered: a few studies suggested that in order to maximize the benefits of a human-chatbot interaction, the social chatbot should self-disclose too. This relates to the norm of reciprocity in natural communication, where people expect that both interaction partners provide input to the conversations [57]. Reciprocal self-disclosure may facilitate the development of a profound relationship, which some participants indicated to desire before they fully self-disclose [e.g., 55].

4.1   Theoretical and Practical Implications

To feel truly understood on a deep and emotional level is often seen as a prerequisite to improve wellbeing through supportive acts [17, see also 26-27]. However, present findings do not fully corroborate this notion. This questions to what extent profound emotional understanding is necessary to provide adequate support. In turn, developing social chatbots that can mimic empathy perfectly may not only be unnecessary, it may even backfire [29-30].

Rather, social chatbot developers may benefit from investing in a self-disclosure module, to exploit the benefits of chatbot technologies in sensitive, personal domains such as mental and physical health. The reviewed studies suggest that high self-disclosing social chatbots can provoke more detailed self-disclosure and more trust in both the social chatbot as in possible external sources the technology refers to (such as a mental health professional). These are important practical implications to consider, for example when a client is reluctant to open up to his/her therapist, when a patient does not fully self-disclose to his/her doctor, or when a victim is reluctant to talk to the authorities. To illustrate the latter, Park and Lee [58] discuss the potential of chatbot technologies to lower the burden of sexual assault victims when filing a report. The use of social chatbots may thus be particularly fruitful in delicate circumstances.

4.2   Future Directions for Social Chatbot Research

This overview poses several directions for future research. First of all, more attention should be devoted to structural support (i.e., the number and types of social ties around an individual). While most reviewed studies already applied a repeated-measures design with several weeks of intervention [e.g., 51, 3, 4], little attention was devoted to user behavior. Usage time and frequency are important factors to consider for future research, as these may influence outcomes [see 51] and are important operationalizations of structural support. To illustrate its importance, it is imaginable that annoyance about the repetitiveness of the chatbot's replies increases as users have had more interactions. Future research should therefore consider user behavior rather than the time-frame of the study as relevant quantitative variable.

Secondly, little attention was devoted to explicit measures of the types of social support that are (adequately) provided by social chatbots (i.e., received support). Users' support demands may depend on the context [27, 52] or individual differences [49, 56, 53]. Greer et al. [52] for example propose that different cancer types and stages of illness may require different types of support provision from a social chatbot. More focus is therefore needed on such individual differences related to the subtypes of social support to further explore the boundaries within which social chatbots can be helpful in general, and to what extent personalization is necessary.

5   Conclusion

Despite experienced misunderstandings, social chatbots showed potential in the studies that were reviewed, and particularly their non-judgmental character and availability were valued. Social chatbots showed promising results as they provided companionship support, mental health support, physical health support or acted as a facilitator of real-life companionship. Moreover, social chatbots seemed to be capable of improving its user's wellbeing. Though, follow-up research is needed to include received support types and structural support as informants of social chatbots' abilities to provide adequate social support to their users.

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