

Social Chatbot Research: A Narrative Review

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ABSTRACT

Social chatbots are increasingly prevalent. They have positive effects including a reduction in loneliness, anxiety and depression and an increase in self-efficacy and openness. Their negative effects include dependence, isolation, depression, the loss of chatbots, and the inability of chatbots to negotiate or sacrifice. Therapeutic applications have included several different forms of psychotherapy with as many as 30% of the forms being cognitive behavior therapy. For qualities of chatbot therapy, engagement style is considered important, as well as the creation of a bond, and an increase in counseling satisfaction that comes from being engaged with a chatbot. Dangers have also been noted for the use of social chatbots for serious psychological problems.

Social chatbots, as AI-powered software programs, have been designed to engage in conversation and interact with users in a human-like manner, typically appearing on social media platforms or as standalone companion apps. They are focused on building relationships, providing social support and mimicking human dialogue. This review summarizes some of the current research on social chatbots. Research was found on PubMed and PsycINFO by entering the terms social chatbots and AI chatbots. Exclusion criteria were pilot studies, case studies and non-English papers. Twenty papers are reviewed here that could be categorized as prevalence of social chatbots (1 paper), positive effects of social robots (6 papers), negative effects (8 papers) and therapeutic applications (5 papers). These sections are followed by a discussion of methodological limitations of this recent literature.

General Characteristics and Prevalence

In a review of research on general characteristics and the design of social chatbots, most of the studies are from Asia and Europe [1]. According to these authors, most social chatbots are said to be **able to remember, half of them are artificially intelligent but more than half do not portray any social-emotional behavior. In addition, most social robots do not have visual or avatar representation.** These may be underestimates of social chatbots today given the recent technological advances by AI.

In a paper entitled "Exploring artificial intelligence (AI) chatbot usage behaviors and their association with mental health

outcomes in Chinese university students" (N=1004), 46% said they **used social chatbots** in the last month [2]. Most students (79%) reported using social chatbots three days per week. Prevalence data from university students in China may not generalize to other age groups and other countries even though most of the studies have come from Asia and Europe.

Positive Effects of Social Chatbots

Several positive effects have been noted for experiences with social chatbots. They include decreased loneliness, as well as decreased anxiety and depression and increased self-efficacy and openness.

In another study on social chatbots with university students from China, the students interacted with social chatbots for four weeks (N= 176) [3]. The social chatbots were said to provide social support as well as **decrease loneliness** by week two **and social anxiety** by week four. The social chatbots were noted to have empathy but they were also said to have inconsistent responses and excessive enthusiasm. The credibility of these data is enhanced by the study being longitudinal rather than the more frequent cross-sectional studies that cannot determine directionality of effects.

Loneliness has also been decreased in research on university students (N= 120) who were exposed to a social chatbot named Replica for one month [4]. The participants had severe loneliness at baseline but their scores on the Emotional Social Loneliness

Scale were decreased after one, three and five months of intervention. They also had a **decrease in social anxiety** and an **increase in self-efficacy and resilience**. These responses may be social desirability/faking good responses related to the participants knowing they were receiving an intervention that would help them be at least less socially anxious online.

Social anxiety has decreased online following social robot exposure but not offline which is not surprising since the exposure was online. For example, in a study entitled "Longitudinal examination of the relationship between virtual companionship and social anxiety: emotional expression as a mediator and mindfulness as a moderator", the results are in the title [5]. In this sample (N= 618 undergraduate students in China), **social anxiety was decreased online, but not offline**. That would appear to be the important finding rather than knowing that emotional expression was a mediator and mindfulness a moderator. Mediators and moderators are typically arbitrarily selected based on researchers' "pet variables or theories".

In a scoping review of 10 studies on artificial intelligence (AI) chatbots, **anxiety decreased along with stress and depression**. [6]. However, most of the studies were rudimentary versions of AI chatbots. They also lacked "guardrails" and they had privacy issues.

In a systematic review and meta-analysis on 14 studies (N=1974 participants), moderate to large effects were noted for the **reduction of depression symptoms** [7]. Moderate to large effects were also noted for decreased stress and negative affect as well as increased positive affect. This group of findings is not surprising given that stress, negative affect and depression are often comorbid.

Greater openness regarding vulnerability has also been noted for exposure to social chatbots versus social media (50% versus 8%) [8]. These data were based on conversation utterances containing depression and sadness (152,783 utterances) from three western countries (Canada, UK and US) and five eastern countries (Indonesia, India, Malaysia, Philippines and Thailand). The eastern countries were noted to have stronger words and more words associated with sadness. The western countries reportedly had more swear words and talk about death. Although the authors of this study considered "greater openness regarding vulnerability" a positive effect of exposure to social chatbots, it could also be a negative effect in that conversations about sadness and death are often associated with suicidal ideation.

Suicidal ideation was not measured in any of the studies on negative effects of social chatbots. That was surprising given that suicidal ideation has often appeared in studies reporting thoughts about sadness, depression and death.

Negative Effects of Social Chatbots

Several negative effects have been noted for AI social chatbots. They include dependence, isolation, depression, loss of the chatbot and inability of the chatbot to negotiate or sacrifice.

Several researchers have noted people's **dependence on social chatbots**. An AI Chatbot Dependence Scale has been developed and validated for that reason [9]. Eight of the 17 items on this

scale explained as much as 58% of the variance in dependence. In a study already summarized, **38% showed light AI chatbot dependence and another 38% showed moderate dependence** [2]. A greater percentage scoring in the moderate to the high range on AI chatbot dependence experienced depression. Depression was associated with more AI chatbot use. Interestingly, depression has been both increased and decreased in social chatbot users.

Excessive use has been correlated with dependence in an analysis of 3 million conversations and a survey of 4000 users [10]. In a study entitled "Too human and not human enough", mental health-relevant posts on Replica Reddit (N= 582) were explored for emotional dependence [11].

Emotional dependence was unlike other forms of technical dependence. The social chatbot users felt that Replica had its own needs and emotions to which the user must attend, highlighting the reciprocal nature of chatbot companionships.

In a paper entitled "Chatbot Companionship", the results of a survey (N= 404) suggested that seven distinct user profiles either enhanced **social confidence or isolation** [12]. Fifty percent of the variance in loneliness in this sample was explained by neuroticism, social network size and problematic chatbot use.

In a study entitled "Deletion, departure, death experiences of AI companion loss", some participants experienced the **loss of chatbots** that were terminated by their developer [13]. AI companion users who lost their "soulmate" (N=58) experienced a **metaphorical death** [13]. Most adults coped by re-creating their AI personas on other platforms, highlighting their dependence on their chatbot companions.

In a commentary on whether AI chatbots could emulate human connection, the authors concluded that they can regarding conversations, but they can't because they don't **negotiate and sacrifice** for a partner. [14]. They also noted that **AI chatbots may reinforce undesirable behaviors**.

Table 1. Positive effects of social chatbots (and first authors).

Positive Effects	First Authors
Decreased loneliness	Kim, Lu
Decreased social anxiety	Kim, Lu Xie, Gallegos
Decreased depression	Feng
Increased openness regarding vulnerability	Chin

Social Chatbots for Psychotherapy

Social chatbots have also been considered therapeutic and in some cases have been used for therapy. In a systematic review on social chatbots, 53% of 293 apps mentioned evidence – based therapies [15]. Of these, **30% were focused on cognitive behavioral therapy**, 16% on mindfulness, 9% on positive psychology, 3% on dialectical behavior therapy and 2% on acceptance and commitment therapy. However, only 6% of the publications were evidence – based.

In a systematic review entitled "Evaluation of digital mental health techniques in the US", 26 studies were focused on the

perspectives of patients, caregivers and healthcare providers [16]. Of these studies, 88% focused on **engagement styles of the digital mental health providers**. The users valued cost, accessibility and technical considerations.

Table 2: Negative effects of social chatbots (and first authors)

Negative Effects	First Authors
Dependence	Zhang, Phang, Laestadius
Isolation	Liu
Loss of companion	Banks
Lack of negotiation	Smith

In a study that focused on adults (N=26) who interacted with two mental health chatbots (WOEBOT and WYSA), diaries, conversation screenshots, surveys and semi-structured. Interviews were conducted weekly for four weeks [17]. Eighteen of the 26 adults formed a **bond with the chatbots** irrespective of their well-being. They valued the **private nonjudgmental conversations** they experienced with their social chatbots.

In a paper entitled "Do anthropomorphic chatbots increase counseling satisfaction and reuse intention? The moderated mediation of social rapport and social anxiety", the results are given in the title [18]. In this sample (N= 374 US adults) chatbots with a high anthropomorphic design (human face) or low design (robot face) were compared. As might be expected, the **human face chatbot was more effective for increasing counseling satisfaction**.

Concerns have been raised that AI chatbots will dominate the field of psychotherapy. For example, in a recent commentary, the authors expressed the concern that while chatbots might be good for milder mental disorders, they **might be dangerous for those with more serious problems** (e.g. psychosis, bipolar disorder and eating disorders) [19]. They also expressed the concern that **chatbots make mistakes** (hallucinations) and sometimes go rogue (acting outside the parameters set by human programmers). The authors also expressed concern that the psychotherapy practitioners are complacent about therapies being delivered by AI chatbots.

Table 3: Social chatbots for psychotherapy (and first authors)

Chatbots for therapy	First authors
Evidence-based therapies	Marshall
Engagement style	Catania
Bond formation	Xu
Increased counselling satisfaction	Park
Dangerous for serious problems	Frances

Methodological Limitations of this Literature

Several methodological limitations can be noted for this literature on social chatbots. These include sampling problems, variability of the social chatbots and the degree of their use, and variability of the data collection methods.

The samples for these studies are almost exclusively university students. This might be expected given that they are the most frequent users and they are convenience samples. In addition,

most of the studies have been conducted in Asia and Europe. The cross-cultural variability can be seen in the conversation screenshots with the eastern countries tending to express more sad words and the western countries more swear words.

The chatbots clearly vary across studies given their different names (Replica, Woebot and WYSA). They differ on their anthropomorphic features including some having a human face, some having a robotic face and some having no face. Half are said to be artificially intelligent, but half are said to have no social-emotional behavior, and all chatbots make mistakes.

The data are typically cross-sectional and only occasionally longitudinal, making it impossible to determine directionality or causality. The researchers have used various data collection methods including conversation screenshots, surveys, and interviews, making cross-study comparisons impossible.

The therapeutic chatbot studies have varied on the types of therapy delivered, including CBT at 30% and DBT at only 2%. The duration of therapy has also varied across studies.

Despite these methodological limitations, the current literature on social chatbots has been informative. Future research is needed on the engaging qualities of social chatbots that are likely to increase with further AI technology, on the development of relationships between humans and social chatbots and on ways to prevent the negative effects of social chatbots as they will likely continue to be companions of humans.

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