

The Treatment Effectiveness of Asynchronous Text Therapy for Depression and Anxiety: A Longitudinal Cohort Study

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Abstract

Background: Barriers to therapy such as the cost, wait times, and geographic distance mean that access to mental health care is extremely limited. As a result, the majority of adults suffering with depression or anxiety do not receive non-pharmacological treatment. Therapy delivered via technology have been developed to improve accessibility, however, there is limited research regarding text-based therapy, the medium with the greatest reach. The aim of this study was to investigate the effectiveness of an innovative text-based therapy and to evaluate a dosage effect of this type of treatment.

Method: In this prospective longitudinal study, a sample with moderate to severe depression (PHQ8 >9; $n=2757$), and a sample with moderate to severe anxiety (GAD-7 >9; $n=2869$) completed measures pre and post text-based therapy treatment. Each sample was further categorized into a “short treatment” group (Depressed sample, $n=788$; Anxious sample, $n=798$) if they received treatment for between 6-9 weeks, and a “long treatment” group (Depressed sample, $n=134$; Anxious sample, $n=130$) if they received treatment for between 13-16 weeks. Primary outcome measures were the PHQ-8 for the depressed sample, and the GAD-7 for the anxious sample.

Results: Text therapy was effective in reducing symptoms of depression and anxiety regardless of length of treatment. When duration of treatment was taken into account the long treatment resulted in more symptom reduction than that of the short treatment. Results from all analyses indicate that changes were not only statistically significant but also clinically significant. Large proportions of participants, ranging from 44-59%, saw such significant gains that they dropped below the moderate to severe diagnostic category into the none, minimal or mild categories of depression and anxiety.

Conclusion: Text-therapy treatment may be effective in the reduction of anxiety and depression symptoms to the extent of diagnostic change, in both short and long treatments. The longer the treatment the higher the proportion of clinically significant change.

Anxiety and depression related disorders are the leading cause of disability worldwide and account for a combined 55% of the burden of disease in the western world (Whiteford et al., 2013). Non-pharmacological treatment for these disorders often include a variety of traditional face-to-face psychotherapies that have consistently been found to be effective in reducing associated symptoms (APA, 2000; Young, Klapp, Sherbourne, & Wells, 2001; Elkin et al., 1989). Despite the large volume of research supporting the effectiveness of such face-to-face treatments, the majority of adults experiencing anxiety and depression do not obtain psychotherapy treatment due to barriers in accessing care (Young, Klapp, Sherbourne & Wells, 2001; Brody, Khaliq & Thompson, 1991).

Significant barriers to mental health care can occur at several levels: the patient level, the provider level and the broader systemic level (Scheppers, Dongen, Dekker, Geertzen & Dekker, 2006), and include issues such as geographic location, shortage of practitioners, economic constraints, insurance, stigmatization, and physical impairment (Alleman, 2002; Hollon et al., 2002; Nutting et al., 2002; Young, 2005). Barriers often lead to insufficient treatment access, particularly in underserved populations, and highlight the need for innovative psychotherapy delivery mechanisms to enhance access to treatment (Mohr et al., 2006).

Technology-based delivery of psychotherapeutic interventions has become increasingly popular in recent years and may be uniquely placed to potentially mitigate inequalities of access to care by reducing the cost of treatment and wait times, and removing geographical location as a barrier. A number of researchers have begun to identify contexts (e.g., rural, forensic, inner city settings) in which therapy delivered via technology platforms can be effective in symptom

reduction across a range of psychiatric diagnoses (Kessler, et al., 2009; Nelson, Barnard, & Cain, 2003; Reynolds, Stiles & Grohl, 2006; Bee et al., 2008). For example, a meta-analytic review of thirteen studies examining the effectiveness of psychotherapeutic interventions delivered by telephone, internet and videoconference, identified a medium pooled effect size of .44 for those with depression, and a large pooled effect size of 1.15 for those with anxiety disorders indicating impressive gains (Bee et al., 2008). Indeed, some data suggest that these types of treatments may be even more effective than traditional face-to-face therapy (Nelson, et al., 2003), though answers about for whom, when, and why this is so remain unclear. Wagner, Horn, and Maercker (2014) conducted an RCT investigating depression outcomes of email-based therapy in comparison to face-to-face therapy. The authors identified improvement in both groups directly following treatment, but symptom reduction was only maintained at 3-months post-treatment in the group that received email therapy. Similarly, a study comparing an online CBT treatment offered in real time to a face-to-face CBT treatment found a greater proportion of clinically significant change in the online treatment versus the traditional CBT treatment (Kessler et al., 2009).

Research on technology based treatment, however, has largely been conducted with respect to its most common medium, live video. Newer forms of therapy delivery such as text messaging have so far received much less attention but are particularly promising. As a medium, short message service (SMS) text has demonstrated universal popularity (Fjeldsoe, Marshall, & Miller, 2009) and confers several advantages over other mediums. Text messaging allows the therapist and user to interact in real time, regardless of the location of either¹, and has been found to be more cost effective (Hull & Mahan, 2016). In addition, and very importantly, mobile phone

¹ Though most if not all services attempt to match clients with therapists who reside in the same state in order to respect differences in licensure regulations.

technology has wide population reach and is accessible by those who are at high-risk of encountering barriers to care such as socioeconomic disadvantaged populations and adults with less education (Fjeldsoe, Marshall, & Miller, 2009).

Text messaging interventions have often been effectively used as an adjunct to clinical care, occupying the role of a reminder system or symptom tracker focusing on promoting healthy lifestyle behavior such as medication adherence and symptom report (Fjeldsoe, Marshall, & Miller, 2009; Militello, Kelly, & Melnyk, 2012). The use of messaging for psychotherapeutic purposes is considerably less studied, but preliminary research indicates that innovative text-based therapies may be effective in reducing symptoms in place of traditional face-to-face therapies. Kessler and colleagues (2009) conducted an efficacy study using randomization to allocate 113 participants to synchronous text therapy and 97 participants to a waitlist control, and found that 38% of patients recovered from depression compared to 24% in the control group. These benefits were maintained at an 8 month follow up. Hull & Mahan (2016) investigated the effectiveness of an asynchronous text-based therapy treatment using cross-sectional data and reported statistically significant reductions on measures of life distress and identified clinically significant improvement in 46% of the sample. Additionally, the researchers identified the cost of this type of treatment to be just 41% of that of face-to-face therapies, and the wait time to treatment to be an average of 150 minutes after registering for treatment. Although these findings suggest that text-based therapy may have the potential to overcome many barriers to access while maintaining effectiveness of treatment, each study is limited in generalizability and a cross-sectional design respectively.

Disappointingly, there appears to be no prospective longitudinal outcome research investigating the effectiveness of asynchronous text-based therapies. The current study sought to

address this deficit in the literature by conducting a prospective study examining the effectiveness of an SMS text therapy treatment in reducing symptoms of anxiety and depression in participants with moderate to severe depression and anxiety, across two different lengths of treatment, short (6-9 weeks) and long (13-16 weeks). Licensed therapists delivered therapy using an asynchronous messaging therapy platform (www.talkspace.com). Talkspace offers a native mobile application for smartphones and provides a secure, password protected mode of sending and receiving messages. Symptoms of depression and anxiety were measured previous to treatment and periodically throughout the course of therapy using the PHQ-8 and the GAD-7, respectively. We predicted that an asynchronous messaging therapy would lead to a reduction in baseline symptoms, and would lead to clinically significant change.

Method

Participants and Recruitment

Over the course of 18 months, all 13,800 individuals who signed up for text therapy and were diagnosed with an anxiety- or depression-related disorder were invited to participate in taking assessments that track depression and anxiety symptoms over time. A self-selected sample of 9,650 individuals completed GAD-7 and PHQ-8 measures prior to commencing treatment. 4235 of the 9650 failed to complete measures more than once and were thus unusable for analysis. The remaining 5,415 individuals completed the measures both pre- and post-treatment, reflecting an acceptable completion rate of 57% (Baruch & Holtom, 2008). Of those 5,415, two different samples were created – 1) those who met criteria for moderate to severe depression pre-treatment as evidenced by PHQ-8 scores >9 ($n = 2,757$, 77% female, 23% male) and 2) those who met criteria for moderate to severe anxiety pre-treatment with scores >9 on the GAD-7 (n

=2,869, 77% female, 23% male). Participants who did not meet criteria for moderate to severe depression or anxiety were removed from the analysis (See figure 1 flowchart).

To determine whether the duration of treatment (short versus long) impacts symptom reduction, two distinct groups were developed within each of the depression and anxiety samples. In keeping with the lengths of traditional psychotherapy that are commonly studied in the literature, participants who received either between 6-9 weeks of therapy or between 13-16 weeks of therapy were placed in these short- and long-term treatment groups respectively (See figure 1 flowchart).

The sample was restricted to English speakers, individuals with regular internet access, and those who had proficiency in mobile and desktop technologies due to the nature of the intervention. Participants were between the ages of 18-50+ with the majority (52%) falling between 26-35 years, and 69% of participants have obtained a Bachelors degree or higher. 89% of participants were in the US, with the largest proportions of participants in California (13%), New York (11%) and Texas (7%). Globally the countries most prominently represented after the US were Canada (3%) and Great Britain (2%). Study psychotherapists had 8.3 years of experience (SD = 4.0) and exhibited a mix of orientations with 13 (36%) primarily aligned with a cognitive- behavioral approach, 12 (33%) primarily aligned with a relational-dynamic approach, and 11 (30%) declaring an integrative or eclectic approach. Therapists are matched with participants from the same state or region in which they hold their license. All participants provided informed consent and the study was approved by the Teachers College, Columbia University IRB.

Design and Procedure

This study investigated two samples, a depression sample that contained participants with moderate to severe depression (PHQ-8 score >9), and an anxiety sample that included participants with moderate to severe anxiety (GAD-7 score >9). Distinct and identical analyses were conducted for each sample.

Samples received text-therapy and were assessed for either depression or anxiety symptoms on two occasions, pre-treatment and post-treatment. The dependent variables were depression scores on the PHQ-8, and anxiety scores on the GAD-7. Initial analyses were conducted to assess the effectiveness of text-therapy over time in our samples using paired samples t-tests. Treatment effect sizes, as well as analyses of clinically significant change are reported in accordance with Jacobson and Truax (1991).

In order to determine the impact of duration of therapy, participants from our existing samples were categorized into a “short treatment” group if their treatment lasted between 6-9 weeks, and a “long treatment” group if their treatment lasted between 13-16 weeks. To investigate this we used a 2 X 2 mixed between-within design, with factors of time (pre, post), and length of treatment (short, long). Analyses to determine clinically significant change in a short and long treatment groups were also conducted.

Measures

Patient Health Questionnaire – 8: The 8-item Patient Health Questionnaire (PHQ-8; Kroenke & Spitzer, 2002) was used to identify the presence of core depression symptoms likely to be of clinical severity (e.g., “feeling down, depressed or hopeless”). Responses on all items were given on a 4-point Likert scale (0 = *Not at all* to 3 = *Nearly every day*) with a total maximum score of

24. Individuals with scores of >9 have been empirically equated with at least moderate clinically significant depression (Kroenke, Spitzer & Williams, 2001; Kroenke et al., 2001).

General Anxiety Disorder Questionnaire-7: The endorsement of anxiety symptoms was assessed with the 7-item General Anxiety Disorder Questionnaire (GAD-7; Spitzer, Kroenke, Williams, Lowe, 2006). Responses on all items were given on a 4-point Likert scale (0 = *Not at all* to 3 = *Nearly every day*) with a total maximum score of 21. Individuals with scores of >9 have been empirically equated with at least moderate clinically significant anxiety (Kroenke, Spitzer, Williams, Monahan, Lowe, 2007).

Text-therapy Treatment: The text-therapy intervention was delivered via the Talkspace platform, a dedicated native mobile messaging application that provides a secure medium to send and receive messages. Licensed therapists are available to provide contact with clients at least once a day, five to seven days a week. Duration of therapy ranged from 2 to 274 days ($M = 57$ days, $SD = 49.91$).

Results

Effectiveness of text-therapy

Paired-samples t-tests were conducted to evaluate the impact of a text-based therapy treatment on depression symptoms (PHQ-8) from pre- to post-treatment in those who reported moderate to severe depression, and on anxiety symptoms (GAD-7) from pre- to post-treatment in those who reported moderate to severe anxiety. There was a statistically significant decrease in PHQ-8 depression scores from pre-treatment ($M = 15.16$, $SD = 3.84$) to post-treatment ($M = 10.77$,

$SD = 5.79$), $t(2756) = 40.32$, $p < .0001$. The mean decrease in PHQ-8 scores was 4.39, 95% CI [4.36, 4.77]. Analysis revealed a large effect size from pre-treatment to post-treatment for depression ($d=.89$).

Similarly, there was a statistically significant decrease in GAD-7 anxiety scores from pre-treatment ($M=14.47$, $SD=3.22$) to post-treatment ($M=9.88$, $SD=5.04$), $t(2756) = 48.179$, $p < .0001$. The mean decrease in GAD-7 scores was 4.57, 95% CI [4.38, 4.76]. Analysis revealed a large effect size from pre-treatment to post-treatment for anxiety ($d=1.09$).

Given the potential clinical applications of this study we were interested in whether treatment led to a change in diagnostic category. Prior to commencing treatment 100% ($n=2,757$) of our depression sample scored above the clinical cutoff for moderate to severe depression, PHQ-8 >9 . After treatment, 1,260 of 2,757 participants (45.7%) reported scores of <10 on the PHQ-8, dropping down from the moderate to severe category into the none, minimal, or mild depression categories.

Before treatment 100% ($n=2,869$) of the anxiety sample scored above the clinical threshold for moderate to severe anxiety, GAD-7 >9 . Post-treatment, 1,529 of 2,869 participants (53.3%) reported scores of <10 on the GAD-7, indicating a reduction in symptoms and a moving down from the moderate to severe category into the none or mild anxiety categories.

Effectiveness of short versus long text-therapy treatment

The results above indicate the effectiveness of a text-based therapy treatment in reducing depression and anxiety symptoms, however it does not take into account the length of the treatment and whether it impacts the reduction of symptoms. Mixed between-within subjects analyses of variance were conducted to assess the impact of two different durations of text-

therapy treatment (short 6-9 weeks and long 13-16 weeks) on participants' depression scores on the PHQ-8, and anxiety scores on the GAD-7 across two time points (pre-treatment, post-treatment). In the depression sample a significant interaction between treatment length and time was identified, $F(1, 920) = 18.97, p < .0001$, partial eta squared = .02, indicating that treatment length had a different effect on depression scores across time. To locate the source of the interaction tests of simple effects were conducted. Results indicated that there were no significant group differences before treatment $F(1, 920) = 1.97, p = .161$. While depression scores changed following treatment for both short- and long-term treatment (short, $F(1, 920) = 386.20, p < .0001$, and long, $F(1, 920) = 164.22, p < .0001$), there was a significant difference in depression scores post-treatment between the short- and long-term treatments, $F(1, 920) = 10.95, p < .001$, with greater reductions in symptoms evident in the long-term treatment group.

To investigate the impact of two different durations of text-therapy treatment on participants' anxiety symptoms (GAD-7) pre- and post-treatment, a second mixed design analysis of variance was carried out. A significant interaction between treatment length and time was identified, $F(1, 926) = 15.13, p < .0001$, partial eta squared = .016, suggesting that treatment length had a different effect on anxiety scores across time. Further tests of simple effects were carried out to identify the source of the interaction. Results revealed that there were no significant group differences before treatment $F(1, 926) = 2.96, p = .085$. Anxiety scores changed following treatment for both short and long treatments (short, $F(1, 926) = 673.40, p < .0001$, and long, $F(1, 926) = 215.17, p < .0001$), however, there was a significant difference in anxiety scores post-treatment between the short- and long-term treatment groups, $F(1, 926) = 7.57, p < .006$, with greater reductions in symptoms in the long-term treatment group.

To determine whether the short and long treatment groups differed in terms of

proportions of change in diagnostic category we analyzed for clinically significant change. In the depression sample prior to commencing treatment 100% (n=922) of both duration groups scored above the clinical cutoff for moderate to severe depression (PHQ-8 >9). After treatment, 544 (59%) participants in the long-term treatment group reported scores of <10 on the PHQ-8, in comparison to 43.8% (404) of the short-term treatment group. This indicates that while both groups experienced large proportions of participants dropping from severe to moderate depression categories, a higher proportion of participants in the longer duration group experienced clinically significant change.

Similarly, in the sample of moderately to severely anxious participants all 928 (100%) scored >9 on the GAD-7 indicating moderate to severe anxiety. Post-treatment, the short-term treatment group saw 54.9% (506) of participants reducing their anxiety symptoms to a none or mild anxiety category, while the longer duration group had 59.2% (546) participants achieve clinically significant change.

Discussion

Barriers to therapy such as cost, wait times, and geographic distance mean that access to mental health care can be limited, particularly for already underserved populations. As a result, many adults suffering with depression or anxiety do not receive non-pharmacological treatment. More accessible technology-based therapeutic interventions are demonstrating effectiveness in the reduction of symptoms, however there is limited research regarding text-based therapy, a medium with great reach. The aim of this study was to investigate the effectiveness of an innovative text-based therapy that may address some of these barriers to access while remaining

efficacious. This study is the first of its kind to use a prospective longitudinal outcome design and to evaluate a dosage effect of this type of treatment.

Consistent with our predictions, text therapy was effective in reducing symptoms of depression and anxiety regardless of length of treatment. When duration of treatment was taken into account the long-term treatment (13-16 weeks) resulted in more symptom reduction than that of the short-term treatment (6-9 weeks). Results from all analyses indicate that changes were not only statistically significant but also clinically significant. Large proportions of participants, ranging from 44-59%, saw such significant gains that they dropped below the moderate to severe diagnostic category into the none, minimal or mild categories. This suggests that text-therapy treatment may be useful in the reduction of symptoms to the extent of diagnostic change.

Although this study advances effectiveness research on text-based therapeutic treatment there are several limitations. The samples used in this study were self-selecting, and the duration of treatment was decided by the participant. It is important to note that the individuals who were invited to participate had registered for www.talkspace.com platform and as such could be described as active help seekers. A further issue is that 43% of invited participants only completed baseline measures. It is unclear why these individuals dropped out, or whether they continued receiving treatment but simply did not complete the study measures. Because we lack information about this missing data, and because we only had a treatment condition it limits the extent to which we can generalize the findings. Including an active control condition, or a face-to-face treatment comparison group in future research would greatly enhance the validity of the findings.

Notwithstanding these limitations, the current study offers a unique opportunity to gain an insight into the effectiveness of short and long text-therapy treatment with moderately and

severely depressed or anxious individuals. However, it is unclear exactly what mechanisms of change are at play with text-therapy. The act of writing about stressful, emotional or traumatic events has been found to lead to better psychological and physical outcomes (Smyth, 1998; Baikie & Wilhelm, 2005) and has been referred to as the emotional disclosure paradigm (Pennebaker, 1989; 1997). Based on this paradigm Kessler et al. (2009) suggests that perhaps that the act writing down ones thoughts and feelings changes the relationship with those negative expressions encouraging meta-cognitive awareness. Further investigation into these mechanisms could greatly enrich our understanding of text-therapy and identify specific effective components for further development.

This study is the first of its kind to use a prospective longitudinal outcomes design for text-based therapy, and to approach the investigation of a dosage effect. This is an important first step but there is still much to be learned about optimizing text-based therapy interventions. Consideration of the methodological and conceptual issues reviewed in this study is recommended for future studies seeking to improve the quality of research in the field, and to better understand the mechanisms of change in text-based therapy. Although further research is needed, the current findings indicate that text-based therapy has significant potential in effectively reducing symptoms of depression and anxiety and in generating diagnostic change, both in short time frames and in a more affordable manner than traditional psychotherapy.

Results of Latent Growth Mixture Modeling not yet reported in the text above indicate 5 classes of users:

- 1. Chronically High Symptoms (16.9%)**
- 2. Chronically Low-Moderate Symptoms (20.7%)**
- 3. Delayed, Large Improvement (6.4%)**
- 4. Immediate, Large Improvement (13.1%)**
- 5. Immediate Moderate Improvement (42.8%)**

Auxiliary analyses indicate that Class #2 (Low Chronic) wrote significantly less characters than the other classes. The fastest remitting class (#4) needed less characters from their therapists, when compared to the slower remission trajectory (#3).

62.3% of the sample achieved clinically significant change

Graph follows on next page (Y-axis = PHQ scores, X-axis = time, with “1.0” equal to 6 weeks)

Note that the stringent requirements of LGMM meant that some of the sample could not be included due to missing data at Time 1.0, which is why the % of clinical remission is higher here than in the simple effects models.

