ENHANCING MEMORY FOR THERAPY IN DEPRESSION

A Text Messaging Intervention

SURF Conference Panel Closing Plenary Session

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A vast body of literature suggests that memory for medical advice is alarmingly poor. In one study, Bober et al. revealed that recommendation recall for breast/ovarian cancer risk counseling hovered between 20% and 30% on average.[1] Similar results were reported by Pickney et al. as well as Leukowich and Haneline, who reported approximately 30% recall among patients with osteoporosis[2] and those with chronic back pain,[3] respectively. Studies reporting these low recall rates also suggested that poor recall is associated with decreased adherence to treatments, which can have a negative impact on treatment outcomes.[4, 5] This trend appears to hold true for the contents of therapy as well. Preliminary research in the field reveals incredibly low recall rates for therapy.[6, 7] Chambers found that insomnia patients forget at least one-third of recommendations in therapy, and it was noted that certain types of recommendations yielded even lower recall rates of approximately 13%.[8] Lee and Harvey found that patients recall 19.6% to 36.9% of therapy

1 S.L. Bober et al., "Recommendation recall and satisfaction after attending breast/ovarian cancer risk counseling." *Journal of Genetic Counseling* 16, no. 6 (2007). doi:10.1007/s10897-007-9109-0

2 C.S. Pickney and J.A. Arnason, "Correlation between patient recall of bone densitometry results and subsequent treatment adherence." *Osteoporosis International: A Journal Established as Result of Cooperation between the European Foundation for Osteoporosis and the National Osteoporosis Foundation of the USA* 16, no. 9 (2005). doi:10.1007/s00198-004-1818-8

3 G.N. Lewkovich and M.T. Haneline, "Patient recall of the mechanics of cervical spine manipulation." *Journal of Manipulative and Physiological Therapeutics* 28, no. 9 (2005). doi:10.1016/j.jmpt.2005.09.014

4 R.L. Kravitz et al., "Recall of recommendations and adherence to advice among patients with chronic medical conditions." *Archives of Internal Medicine* 153, no. 16 (1993).

5 See note 2.

6 J. Lee and A.G. Harvey (under review). "Memory for therapy in bipolar disorder."

7 M.J. Chambers, "Patient recall of recommendations in the behavioural treatment of insomnia." *Sleep Research* 20, no. 222 (1991).

8 *Ibid.*

points listed by therapists from one session to the next and noted a positive correlation between patient recall and treatment outcome.[9] Though a casual relationship has yet to be empirically established, this finding suggests that enhancing memory for the contents of therapy might play a key role in improving treatment outcomes.

One promising intervention for improving a patient's memory for treatment is cognitive support. The core principal of cognitive support is the manipulation of the external context in order to support the internal processes during the encoding and retrieval of memories.[10] A well-established literature exists demonstrating that memory impairment can be improved with the use of this technique.[11] While there are many different forms of cognitive support, the present study focuses on three in particular—repetition, application, and evaluation—as conceptualized by Harvey et al.[12] Repetition involves rote memorization to further rehearse and strengthen the memory trace.[13] Application deepens encoding by applying an abstract concept to a concrete situation.[14] Finally, evaluation involves unpacking information and looking for causal connections to deepen encoding.[15] Although much research points to such strategies as effective methods of improving learning and memory, such techniques have yet to be empirically tested in a therapeutic context.[16, 17, 18]

Another potential intervention is to incorporate text messaging as a supplement to treatment efforts, thereby reinforcing treatment information. Given the efficacy and widespread use of cell phones among teens and adults,[19] many are turning to mobile platforms, such as text messaging, to supplement healthcare interventions, increase proper self-management and adherence, educate and raise awareness, and provide preventative care. While the research in this field is still relatively new, studies so far have shown some promising results. For example, studies with diabetes management and smoking cessation have shown that the text messages do in fact increase adherence and treatment efficacy.[20, 21] Additionally, the participants in these

9 See note 6.

10 Harvey et al., "Improving Outcome of Psychosocial Treatments by Enhancing Memory and Learning." *Perspectives in Psychological Science* (forthcoming).

11 *Ibid*.

12 *Ibid*.

13 R. Guttentag, "The mental effort requirement of cumulative rehearsal: A developmental study." *Journal of Experimental Child Psychology* 37 (1984).

14 C.E. Hemlo-Silver, "Problem-based learning: What and how do students learn?" *Education Psychology Review* 16, no. 3 (2004).

15 F.I. Craik and R.S. Lockhart, "Levels of processing: A framework for memory research." *Journal of Verbal Learning and Verbal Behavior* (1972).

16 Elgamal et al., "Successful computer-assisted cognitive remediation therapy in patients with unipolar depression: a proof of principle study." *Psychological Medicine* 37, no. 9 (2007).

17 Naismith et al., "Cognitive training in affective disorders improves memory: a preliminary study using the NEAR approach." *Journal of Affective Disorders* 121, no. 3 (2010). doi:10.1016/j.jad.2009.06.028

18 Taconnat et al., "Episodic memory and organizational strategy in free recall in unipolar depression: the role of cognitive support and executive functions." *Journal of Clinical and Experimental Neuropsychology* 32, no. 7 (2010). doi:10.1080/13803390903512645

19 H. Cole-Lewis and T. Kershaw, "Text messaging as a tool for behavior change in disease prevention and management." *Epidemiologic Reviews* 32, no. 1 (2010).

20 Franklin et al., "A randomized controlled trial of Sweet Talk, a text-messaging system to support young people with diabetes." *Diabetic Medicine: A Journal of the British Diabetic Association* 23, no. 12 (2006). doi:10.1111/j.1464-5491.2006.01989.x.

21 Rodgers et al., "Do u smoke after txt? Results of a randomised trial of smoking cessation using mobile phone text messaging." *Tobacco Control* 14, no. 4 (2005), doi: 10.1136/tc.2005.011577

studies reported that they found the text messages to be helpful and would have continued to receive them if given a choice.

While cognitive support and text messaging both have potential to improve memory and treatment outcomes, these are areas of research in need of further exploration. The present study begins to examine whether the combination of cognitive support delivered via text messages can be an effective method of improving patient memory for therapy and, consequently, improve treatment outcome in a sample of patients endorsing a range of depressive symptoms. The rationale for examining memory in the context of depression is twofold. First, major depression is a highly prevalent mental illness and is associated with profound impairment to daily functioning.[22] Second, there is much evidence revealing that cognitive impairment, including memory deficits, is associated with depression.[23, 24, 25] Given that poor memory can impact treatment outcomes (as mentioned earlier), addressing the issue of memory in depression may be of particular importance.

The aims of this study are twofold: (1) to examine if the use of cognitive support delivered via text messages improves memory for the contents of therapy and (2) to examine if cognitive support delivered via text messages is associated with improvements in treatment outcomes. For the first aim, it is hypothesized that participants who receive cognitive support via text messages will recall more therapy content than controls. For the second aim, it is hypothesized that participants receiving cognitive support via text messages will see a greater improvement in treatment outcomes. In other words, there should be a greater reduction of depressive symptoms in the experimental group compared to the control group.

I. Methods

Participants enrolled in a two-week long study and were randomly assigned to one of two conditions. The participants were all undergraduate UC Berkeley students who received class credit for their participation. By summer's end, eight individuals had completed their participation in this study.

A. Participants

The participant pool was comprised of undergraduate students at the University of California, Berkeley (target N=80). In order to participate in this study, each student must own a cell-phone and provide informed consent to receive text messages from the study. Additionally, as tasks in

22 R.C. Kessler, P. Berglund, O. Demler, et al., "The Epidemiology of Major Depressive Disorder: Results From the National Comorbidity Survey Replication (NCS-R)." *JAMA* 289, no. 23 (2003), 3095–3105. doi:10.1001/jama.289.23.3095.

23 A. Behnken, S. Schöning, J. Gerss, C. Konrad, R. de Jong-Meyer, P. Zwanzger, et al. "Persistent non-verbal memory impairment in remitted major depression—caused by encoding deficits?" *Journal of Affective Disorders* 122 (2010), 144–148.

24 S. Campbell and G. MacQueen, "The role of the hippocampus in the pathophysiology of major depression." *Journal of Psychiatry and Neuroscience* 29 (2004), 417–426.

25 K.M. Douglas and R.J. Porter, "Longitudinal assessment of neuropsychological function in major depression." *Australian and New Zealand Journal of Psychiatry* 43, no. 12 (2009).

this study are unsupervised and administered entirely online, a prescreening is administered to assess for suicidality. Participants were provided with a link to complete the Inventory of Depressive Symptoms (IDS) online; any participants presenting with suicidal ideation or intent, by endorsing a response of two or three for Question #18 on the IDS, were excluded from the study and offered referrals to seek psychological services.

B. Procedure

Following the prescreening, eligible participants enrolled in a two-week long "text intervention," in which they are randomly assigned to one of two conditions: (1) the cognitive support text condition (CST) or (2) the placebo text condition (PT). All questionnaires and tasks in this study were administered online through Qualtrics, an online survey platform commonly used for data collection, and all text messages were sent through a secure Google Voice number. On the first day, participants in both conditions read a lesson on Harmful Thought Patterns, completed a demographic questionnaire, and filled out an inventory about their typical cell phone usage. The latter was incorporated to collect information about average cellular usage including text messaging habits and the use of other applications such as e-mail, games, and social media. The lesson on harmful thought patterns was adapted from *Feeling Good*[26] and delivered in two parts. In the first half, participants were presented with definitions for twelve harmful thought patterns. In the second half, alternative patterns of thinking for each harmful thought were presented.

The "text message intervention" began the next day (Day 2). The intervention consisted of six text messages. Participants received one text message every other day over the period of 11 days. In the CST condition, the text messages provide a variety of cognitive support for the contents of the lesson on Harmful Thoughts. As such, 36 unique text messages were designed, encompassing three variants for each of the 12 thinking traps. This way, participants received, in no particular order, two doses each of repetition, evaluation, and application for six unique thinking traps. To control for possible confounding effects of simply receiving a text message, a control group received placebo text messages designed to match the CS texts on various characteristics including structure, length, punctuation, framing, and tone. The content of these messages, however, differed—either providing the participants with other health-related facts regarding sleep, physical exercise, and nutrition, or logistical information about their participation in the study. 36 such placebo messages were crafted for this purpose. See Table 1 for examples of each type of CS message and their counterpart placebo text messages.

At the end of the two-week period, participants were once again evaluated for their depressive symptoms using the IDS and also completed both a free and cued recall task to evaluate their memory for the lesson's content. In the free recall task (Appendix A) they were given five minutes to write down everything they could remember from the lesson two weeks prior. The cued recall task was a fill-in-the-blank activity (Appendix B) in which they were provided a word bank and instructed to fill the blanks with the correct harmful thought pattern. Finally, participants completed a text message acceptability questionnaire to assess the helpfulness, likeability, and acceptability of using text messaging in therapy (for a list of these questions, refer to Appendix C).

26 David D. Burns, *Feeling Good: The New Mood Therapy*. New York: HarperCollins Publishers Inc., 2012.

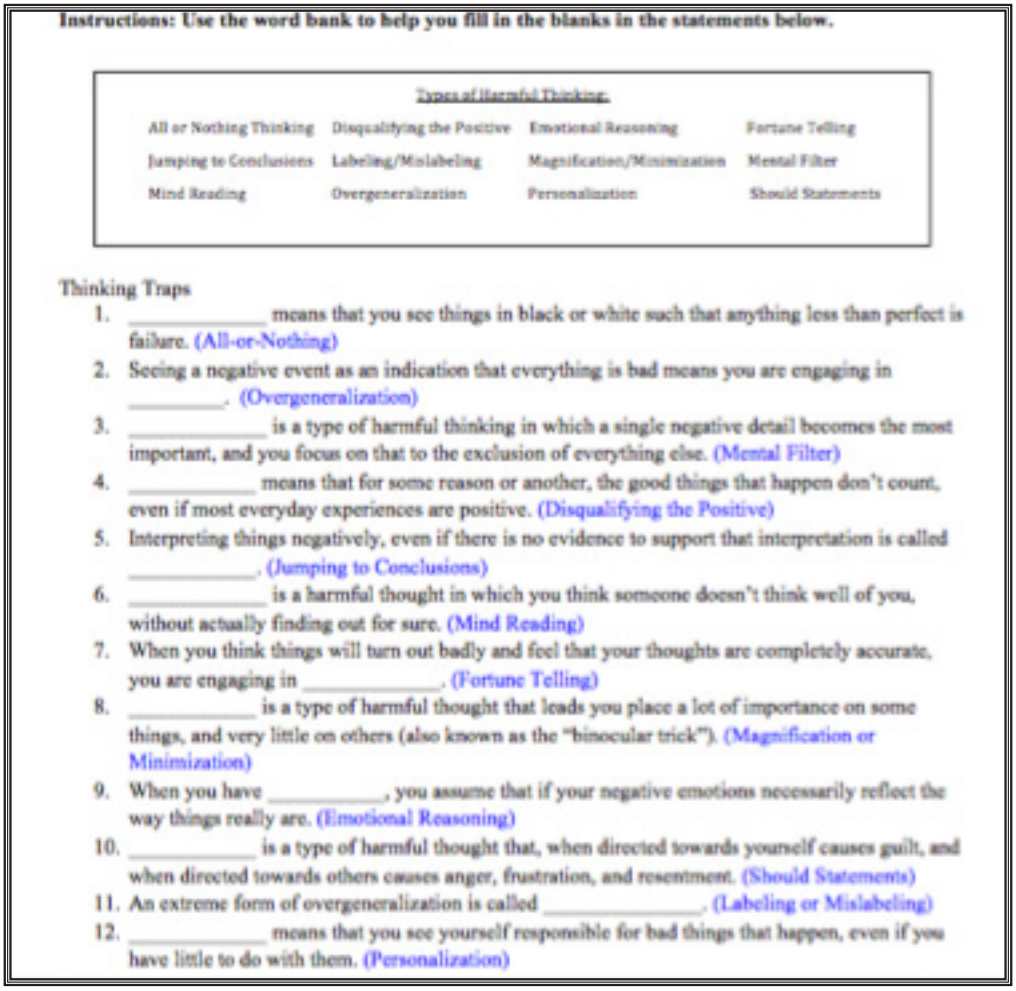
Text Number	CS Texts	Inert Texts
1	Thinking Trap #1: All or Nothing Thinking. Hi <participant's name> - All-or-Nothing Thinking is seeing things in black and white, such that anything that is less than perfect is total failure.	Hi <participant's name> - Don't forget to complete the exit survey at the end of the study. You will receive the rest of your credit when you do.
21	Thinking Trap #1: All-or-Nothing Thinking. <Participant's name>, you are a straight-A student, but one day, you get a B and think, "Now I am a complete failure." What is an alternative thought you could have had?	Hi <participant's name> - Don't forget to complete the exit survey at the end of the study. You will receive the rest of your credit when you do. If you have any questions, you can email the experimenter.
41	Thinking Trap #1: All-or-Nothing Thinking. <Participant's name>, you are a straight-A student, but one day, you get a B and think, "Now, I am a complete failure." What are some disadvantages of having such thoughts?	Hi <participant's name> - Don't forget to complete the exit survey at the end of the study. You will receive the rest of your credit when you do. Can you think of some pros and cons of participating in RPP?

Table 1. Side-by-side comparison of the CS and placebo texts (left top: CS Repetition, left middle: CS Application, left bottom: CS Evaluation)

Appendix A: Free Recall Task Instructions

Think back to the lesson you learned about Harmful Thinking two weeks back. In the space provided on the next page, write down what you remember as being the most imporant take-home message of that lesson. You have 5 minutes for this task. Please take the entire 5 minutes so that you record every point you remember.

Appendix B: Fill-in-the-Blank Cued Recall Task



Instructions: Use the word bank to help you fill in the blanks in the statements below.

Types of Harmful Thinking:

All or Nothing Thinking	Disqualifying the Positive	Emotional Reasoning	Fortune Telling
Jumping to Conclusions	Labeling/Mislabeling	Magnification/Minimization	Mental Filter
Mind Reading	Overgeneralization	Personalization	Should Statements

Thinking Traps

1. _____ means that you see things in black or white such that anything less than perfect is failure. (All-or-Nothing)
2. Seeing a negative event as an indication that everything is bad means you are engaging in _____. (Overgeneralization)
3. _____ is a type of harmful thinking in which a single negative detail becomes the most important, and you focus on that to the exclusion of everything else. (Mental Filter)
4. _____ means that for some reason or another, the good things that happen don't count, even if most everyday experiences are positive. (Disqualifying the Positive)
5. Interpreting things negatively, even if there is no evidence to support that interpretation is called _____. (Jumping to Conclusions)
6. _____ is a harmful thought in which you think someone doesn't think well of you, without actually finding out for sure. (Mind Reading)
7. When you think things will turn out badly and feel that your thoughts are completely accurate, you are engaging in _____. (Fortune Telling)
8. _____ is a type of harmful thought that leads you place a lot of importance on some things, and very little on others (also known as the "binocular trick"). (Magnification or Minimization)
9. When you have _____, you assume that if your negative emotions necessarily reflect the way things really are. (Emotional Reasoning)
10. _____ is a type of harmful thought that, when directed towards yourself causes guilt, and when directed towards others causes anger, frustration, and resentment. (Should Statements)
11. An extreme form of overgeneralization is called _____. (Labeling or Mislabeling)
12. _____ means that you see yourself responsible for bad things that happen, even if you have little to do with them. (Personalization)

Appendix C: Acceptability Questionnaire

1. Please indicate to what extent you read the text messages you received.
2. Please indicate how helpful it was to receive the text messages asking you to recall the content of the CBT lesson (e.g., asking you for advantages or disadvantages, or presenting a real-world situation).
3. Please indicate how helpful it was to receive the text messages that reminded you of a specific point from the CBT lessons (e.g., giving you the definition of a specific automatic thought).
4. How useful do you think these text messages were in helping reduce your depression symptoms?
5. To what extent did you like receiving these text messages?
6. To what extent did you find the content of these text messages to be interesting?
7. To what extent do you think it would it be acceptable to you if a therapist gave you these kinds of text messages after each session?
8. Please indicate how many text messages reminding you about the content of CBT lessons you would prefer to receive per week.
9. Overall, to what extent would you recommend that we pursue text messaging as a way to remind people receiving CBT about what they learned?

II. Results

A. Participant Characteristics

At the end of the summer, eight participants had completed the study, four in the cognitive support text condition and four in the placebo text condition. Participant characteristics did not differ significantly between conditions.

B. Means of Recall Rates and Changes in Depressive Symptoms

T-tests were performed to look for differences between the two conditions. For our first aim, independent sample t-tests were used to look for any significant differences between the cognitive support and control groups in their recall of therapy contents. For our second aim, independent sample t-tests were again used to look for any significant differences between the two groups regarding changes in depressive symptoms. Preliminary analyses, as summarized in Table 2, showed no significant results or trends.

	CS (n = 4)	Control (n=4)	*t*	*df*	*P*
Recall Outcomes					
Free Recall	1.31 (1.60)	1.63 (0.60)	-0.37	6	0.73
Cued Recall	10.75 (7.14)	11.25 (4.50)	-0.12	6	0.91
Outcome Measures (Pre-Post)					
IDS Deviation Score	4.00 (5.89)	10.25(3.30)	-1.85	6	.114

Table 2. Preliminary Results: recall and depressive symptoms

III. Discussion

A. Conclusions

No conclusions about trends or significant results can be made based on the preliminary data given the small sample size at the time. When data collection is complete, we would hope to see improvements in depressive symptoms and higher rates of recall among the cognitive support group, as postulated earlier.

B. Limitations and Future Directions

The present study is limited by a few different factors. First, all the participants were selected amongst a pool of undergraduate students, which may impact the generalizability of our results. Second, while participants' depressive symptoms were assessed at the beginning and the end of the experiment, the participant pool was not limited to a clinically depressed population or to any specific range of depression scores. As such, it is possible that the effectiveness of the text message intervention was either diminished or enhanced depending on the participant's ability to relate to the information in the lesson. Prospective studies would need to be conducted to assess the effectiveness of such an intervention with a more representative sample, perhaps within a clinical setting. Additionally, research targeting the mechanisms behind poor memory for professional medical and psychological advice is needed, so we might improve upon our current techniques and more optimally incorporate technology and any other resources in delivering therapy in the future.

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