Text Messaging as an Adjunct to CBT in Low-Income Populations: A Usability and Feasibility Pilot Study

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This article outlines the development and usability–feasibility testing of an automated text-messaging adjunct to cognitive–behavioral therapy (CBT) for depression in a public sector clinic serving low-income patients. The text-messaging adjunct is aimed at increasing homework adherence, improving self-awareness, and helping track patient progress. Daily text messages were sent to patients, inquiring about their mood. Additional daily messages corresponded to themes of a manualized group CBT intervention. These included (1) thought tracking (both positive and negative), (2) tracking of pleasant activities, (3) tracking of positive and negative contacts, and (4) tracking of physical well-being. We tested the adjunct in 2 CBT groups (1 English & 1 Spanish) consisting of 12 patients total during and after treatment. Participants responded at a rate of 65% to text messages, and they reported overall positive experiences. We propose that text messaging has the potential to improve mental health care broadly, and among low-income populations specifically, with cost-effective means.

Keywords: depression, CBT, text messaging, mobile phones, adherence

Depression is a leading cause of disability and is associated with a variety of other chronic health problems (Anderson, Freedland, Clouse, & Lustman, 2001; Arnow et al., 2006; Van der Kooy et al., 2007). Efficacious treatments include psychotherapy, such as cognitive–behavioral therapy (CBT), which, to be effective, requires attendance to psychotherapy sessions and completion of between-session assignments. Poor adherence to the elements of depression treatment presents a major barrier to effectiveness in real-world settings (Melfi et al., 1998). Mobile phone-based text messaging (short messaging service; SMS) is a widely available and cost-effective tool, used by people of all socioeconomic backgrounds (Lenhart, 2010), that holds promise in improving adherence to mental health treatments.

Between-session therapy assignments (i.e., homework) are a key component of many current depression treatments and involve practicing skills (such as mood and activity monitoring) discussed in psychotherapy sessions. Homework helps increase the dosage of treatment by extending it beyond the once weekly psychotherapy session. In a national survey, Kazantzis, Lampropoulos, and Deane (2005) found that 68% of therapists "often" or always use homework assignments. In a meta-analysis of 27 studies, a weighted mean effect size of $r = .36$ was found for homework adherence leading to improved treatment outcomes (Kazantzis, Deane, & Ronan, 2000). However, patients are often inconsistent in their completion of these homework exercises. Studies of psychotherapy efficacy do not always report homework adherence rates, but when reported, they vary from study to study with usual rates being less than 50%. On the low end Carroll et al., (2005) found a 24% homework completion rate in CBT for cocaine dependence. On the higher end, Bryant, Simons, and Thase (1999) found 52% of patients completed homework for cognitive therapy for depression. Not properly adhering to the homework portion of therapy compromises the efficacy of treatment, as it is a critical aspect of therapies such as CBT. Affect regulation and cognitive strategies are learned best when they are practiced, and the effects of treatment rely on the daily application of these new skills. The reliance on paper-and-pencil exercises requires constant self-initiated monitoring, concentration and self-awareness, which may be difficult for patients. New strategies that provide simple cues and easy ways to respond in the patient's everyday environment are needed to improve adherence, treatment fidelity, and outcomes.

Early termination and sporadic attendance are other barriers to optimum benefit of therapy in community settings. Community studies have reported that 22% (Simon & Ludman, 2010) to 34% (Miranda et al., 2003) of people referred do not attend an initial or

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intake session. Across multiple settings, the modal number of sessions attended by patients is one (Phillips, 1985), with 21%–49% of individuals not attending therapy after their initial intake (Garfield, 1994; Simon & Ludman, 2010). Potential reasons for not returning include feeling better, being dissatisfied with treatment, and wanting to solve problems independently. People from low-income backgrounds are more likely to report that they think that therapy is not working (Westmacott & Hunsley, 2010). Low socioeconomic status and ethnic minority status are associated with higher rates of attrition (Organista, Muñoz, & González, 1994; Westmacott & Hunsley, 2010). For example, Miranda et al. (2003) found that only 36% of low-income women attended more than 6 (of 8) psychotherapy sessions, despite concerted efforts at retention. Sporadic attendance also results in the disrupting the continuity of care, which is important in the development of skills to combat symptoms of depression. Thus, we need to develop practical ways of making empirically supported psychotherapy more accessible in a community context.

Another important predictor to outcomes in psychotherapy across theoretical orientations is the *therapeutic alliance*, the connection that individual feels to the therapist (Horvath & Symonds, 1991), which results in patients being more willing to apply the skills they are being taught in therapy. Daily automated contact through text messaging has the potential to reinforce the therapeutic bond between sessions, with the possible outcome of increasing attendance. Increased contact through text messaging, even if automated, may act to strengthen the therapeutic alliance if patients feel that their therapist is concerned about their welfare beyond face-to-face appointments. Although messages are automated, patients may still perceive that messages are sent directly by their therapist and thus increase the connection.

Methods to improve adherence and attendance include motivational interviewing (Flynn, 2011), patient education, increased treatment accessibility, and improved patient–provider communication (Miranda et al., 2003). Collaborative care models emphasize that among several key elements of effective treatment is motivation to engage in treatment, particularly early in the depression (Unutzer et al., 2002). Constant contact with a care manager to remind patients to engage in action plans or take medication is not always feasible, nor cost efficient. Live contact with providers such as care managers is a consumable resource. The time spent with one patient can never benefit another patient. On the other hand, automated text-messaging can be used simultaneously by many patients and in conjunction with psychotherapy for motivation and reminders to increase adherence. Gains from interventions to improve adherence, such as patient education, tend to last as long as the intervention is present, with effects waning over time (Osterberg & Blaschke, 2005). The low cost and automation of an SMS adjunct to treatment provides the benefit of sustaining treatment effects through the active treatment phase and even beyond. Mobile phone-based SMS may be an important and cost-effective component in improving the implementation of efficacious treatments and diverse settings, including clinics with limited budgets, as it can act as a conduit for symptom monitoring, connection to the provider, and connection to the treatment plan (Boschen & Casey, 2008).

The challenges of adherence to CBT for depression are magnified in low-income and public sector settings. Limited resources in public sector settings often result in the limitation of psychother-

apy sessions that an individual can obtain. The time limitations combined with insufficient adherence to treatment yield reduced treatment dosage. Recent reports highlight the disparities in access to depression treatment among racial and ethnic minority populations in the United States (Alegria et al., 2008) and call for innovative, evidence-based interventions for these populations to address existing disparities (Muñoz & Mendelson, 2005). Calls for the use of adjuncts to expand the reach of health interventions to maximize public health benefit are long-standing (Christensen, Miller, & Muñoz, 1978), and current technologies are beginning to provide alternative and cost-effective means of achieving those goals (Muñoz, 2010).

Text Messaging as an Adjunct to Therapy

Mobile-phone-based SMS is a widely available and relatively inexpensive tool that can be used for health behavior change (Cole-Lewis & Kershaw, 2010). At a global level, there are now more than 5 billion mobile phones, making it possible to reach the vast majority of the roughly 6.5 billion people in the world today ("Over 5 Billion," 2010). In 2013, it is estimated that mobile phone penetration will reach 100% in the United States, meaning that there will be one phone for every individual, with that rate increasing past 100% after that (SNL Kagan, 2007). This does not mean that every person will have a phone (some people have more than one), but it highlights the penetration of the technology in our society. Of telecommunication technologies, mobile phones are one of the most wide reaching, with 87% of African Americans and Latinos and 80% of Whites in the United States owning phones as of 2010. African Americans and Latinos, who tend to be of lower SES backgrounds, also use SMS at higher rates (79% and 83%, respectively) than Whites (72%), with adoption of technology across all groups increasing over time (Lenhart, 2010).

Although many sophisticated Internet and mobile phone-based applications are being developed at a rapid pace, many of them require Internet access and/or specialized smartphones (e.g., iPhone or Android applications), which still have limited reach in low-income and underserved populations. One such application that integrates components of CBT, self-awareness, and emotional regulation has been pilot tested, and initial data show positive results (Morris et al., 2010); however, this application only runs on specific phones. SMS has the benefit of reaching all mobile phones, regardless of model or service provider.

SMS health applications are experiencing rapid growth; however, rigorous testing has been limited and applications to mental health have not been adequately tested. SMS has been used to send appointment reminders (Leong et al., 2006), medication reminders (Miloh et al., 2009), and health information (Franklin, Waller, Pagliari, & Greene, 2006; Rodgers et al., 2005), as well as to monitor symptoms and behaviors after treatment (Bauer, Percevic, Okon, Meermann, & Kordy, 2003). A recent review found that 8 of 9 sufficiently powered randomized controlled trials found SMS to be an effective health behavior change tool. Studies have shown initial efficacy for SMS as a tool to improve weight loss, increase smoking cessation, and reduce A1c levels in patients with diabetes (as noted in Cole-Lewis & Kershaw, 2010). Given these promising findings from other health areas, application of the technology to mental health problems is warranted, given the need to improve current treatments. Although there are advances in the use of

sophisticated smartphone applications, monitoring sensors, and other technologies, SMS remains the most pervasive and inexpensive technology with the potential to improve adherence to efficacious treatments. SMS can be considered an enhancement to current care at low cost, which can be used for live communication (thus consumable and available to a limited number of patients) or in an automated format (thus available to a virtually unlimited number of patients). As the field of mobile health develops and becomes more sophisticated, it is crucial to use these tools in low-income and minority populations so that we do not further exacerbate health disparities due to lower access to appropriate interventions using advanced technologies. Historically underserved populations in the United States can also benefit from these simple but effective technologies to improve health communication.

In particular, SMS may help overcome some of the barriers to adherence to homework in CBT, increase attendance, and increase self-efficacy. It may be used to reinforce skills through regular messages between therapy sessions, potentially increasing the frequency with which new skills are applied. Randomly generated SMS messages could help promote mood state awareness, which is a crucial step in enacting change and applying skills to improve or maintain positive mood states. An important predictor to outcomes in psychotherapy across theoretical orientations is the therapeutic alliance. Increased contact through text messaging may strengthen the therapeutic alliance if patients feel that their therapist is concerned about them, even outside of face-to-face appointments.

Because using SMS in mental health settings is a new endeavor with little research, it is particularly important to conduct thorough usability and feasibility testing to determine aspects of text messaging that are appealing and aspects that are less desirable. As a first step toward a randomized controlled trial (or a controlled study) of the utility of SMS in a low-income population, we obtained systematic feedback from patients receiving mental health care. We hoped that patients would react positively to the addition of SMS to their mental health care and that they would respond at high rates to text messages inquiring about their mood, thoughts, and activities over the course of CBT treatment and beyond. This article presents our finding of our usability–feasibility pilot study.

Method

Procedure

The first step in developing an SMS intervention is to determine how one wants to use SMS as a health improvement tool. We decided to use SMS as a tool for homework completion in group CBT for depression. Instead of using paper-and-pencil forms to track mood, thoughts, and behaviors, we wanted to send text messages that would help patients to monitor those key aspects of therapy. We sent patients messages asking about their mood (on a scale ranging from 1 to 10), number of positive thoughts, and number of pleasant activities.

We needed to do this on a limited budget ($3,000). We decided between possible SMS solutions through Internet searches as well as through hearing about other projects at a mobile health conference. The options for using SMS in health interventions are large and growing. The services that we considered fell into roughly

three categories: (1) services that handle all of the sending and receiving of data for a monthly fee (one estimate was $10,000/month), (2) a low-cost solution that required software customization for automation ($40/month with manual message sending), and (3) partnering with a private company (at $0.03 per message and $100 for additional customization of existing product). The first solution was prohibitively expensive, so we began the project with the second solution, using open source software (FrontlineSMS), which sends and receives messages on a computer through a connected mobile phone. This solution is relatively inexpensive when combined with an unlimited prepaid text messaging service on a monthly basis. We had hoped to work with a software developer to help customize this software to send out messages on a scheduled basis, but that increased costs, as we would have to pay a software developer for their time. For the first 2 months of the study, messages were sent manually to the entire group by Adrian Aguilera every day until a preferable solution was identified. We identified a private company (Trackville.com) that was interested in partnering with us to send messages through their Web site in an automated manner. The public–private partnership is efficient, particularly when financial resources are low, as both parties benefit from testing. The private company receives the benefit of testing the system in a real-world setting, allowing us to implement and test a low-cost solution. The company ensures that data is stored securely and encrypted to reduce the risk of data security breach. We excluded any patient-identifying information to comply with the Health Insurance Portability and Accountability Act.

The SMS adjunct used in the usability–feasibility study involved patients receiving two to three messages daily. The following mood-monitoring message was sent once daily at random times: "What is your mood right now on a scale of 1 to 10?" At the end of the day, patients then received a second message corresponding to the module of focus for that month (e.g., "How many positive thoughts have you noticed today? "How many pleasant activities have you done today?" "How many positive social interactions have you had today?" "How many things have you done to improve your health today?"). Patients were asked to respond to the messages as soon as was convenient for them, and the data were recorded into a data set.

Participants were instructed on the proper format for replying to messages. When a number response was required, they were asked to include a number and allowed to append an optional note elaborating further. When participants sent messages that were not in the prescribed format, they received an error message displaying the proper way to respond; for example, "please reply in this format (7, I'm doing well)." Participants were told that messages were automated and were not a form of direct communication with their clinician. If they felt suicidal, standard clinical protocols applied that include contacting their clinician and emergency services. They were given the option to text the word HELP (or AYUDA, the Spanish translation), and they would receive the phone number of a suicide hotline and directions for contacting 911 and/or going to their local emergency room.

Participants

We began the usability–feasibility testing with patients enrolled in group CBT in a primary care outpatient clinic at San Francisco

General Hospital. The group therapy is based on Muñoz et al.'s (2000) CBT-based "Healthy Management of Reality" manualized group treatment, which has been tested successfully among ethnic minorities and Spanish-language speakers (Muñoz & Mendelson, 2005). Nineteen patients (7 from an English-speaking group, 12 from a Spanish-speaking group) were approached for participation in the research study that would send them two to three text messages daily. All regular patients in each group were approached for potential participation at the beginning of the study, and patients new to the group were also given the opportunity to participate. We did not recruit participants specifically for this study to ensure that our findings generalized to a usual group of public sector patients and not to a preselected set of participants with more text messaging experience. Patients were offered phones and/or SMS service during the 4-month study period. One participant was provided a phone (valued at $10) and service (~$30/month) during the study period, and another was compensated $10/month to add SMS to her current plan. Sixteen (84.2%) patients had mobile phones, and 11 patients (5 8%) actively used SMS. Five patients were willing to learn as part of the study, including one who did not have a phone. Two patients left the group early, 3 chose not to participate, and 2 stated that they were not receiving messages, leaving a total of 12 patients (5 English speakers, 7 Spanish speakers) who used the SMS adjunct. Of the 12, 4 had never used SMS before but were willing to learn. They learned the skill quickly and reported being very happy to have done so. Of those who participated, 8 were of Latino backgrounds, 3 were European Americans, and 1 was African American; 6 participants were women, and 4 were men. The average age of the participants was 52.30 (SD = 8.13; range = 37–63), and although we did not formally gather data on socioeconomic status (SES), all patients were from low-SES backgrounds as evident by their being eligible for public health services.

Measures

The main outcome measure for the study was the response rate to messages. Additionally, at the end of 2 months of using the text-messaging adjunct, patients completed a questionnaire asking for feedback regarding the adjunct in both qualitative and forced-choice formats. Group participants also completed the Patient Health Questionnaire–9 (PHQ-9), a widely validated instrument (Kroenke, Spitzer, & Williams, 2001), to assess depression symptoms at baseline and then monthly.

Results

After using text messaging for 2 months, 10 of the 12 patients gave feedback on the use of the text-messaging adjunct. Nine of 10 patients indicated that the text messaging made them feel closer to the group and their therapists by responding that they agreed or strongly agreed with that statement, as shown in Table 1. Most patients (80%; n = 8) also agreed or strongly agreed that receiving text messages increased their attendance to sessions, with 2 patients (20%) responding "neutral" to that statement, as shown in Table 1. Regarding the amount of messages received, 40% (n = 4) of the patients reported wanting to receive more messages, 60% (n = 6) stated that they received the right amount, and no one reported that fewer messages were desired.

As part of the usability–feasibility testing, we assessed response rate as well as qualitative feedback from patients on their experiences with receiving messages as part of their mental health treatment. Over a period of 2–4 months (individuals started at different times), the response rate was 64.88% (SD = 24.85%), with a range of 27%–99%. In making suggestions for improvement, patients most often reported that receiving messages at inopportune times was the biggest downside, and 1 person requested medication reminders and more messages with specific tips.

Among all patients approached, higher age was related to lower rates of SMS use before the study ($r = -59$, $p < .01$) but was not related to eventual use of SMS as part of the study ($r = -.09$, $p = .70$) because some patients were taught to use it. Among patients who participated and completed follow-up, higher ratings of group closeness were related to ratings that SMS increased likelihood of attendance ($r = .82$, $p < .01$).

Patients were overwhelmingly positive and supported our expectations about the benefits of SMS in a psychotherapy setting, as noted in the Appendix. Patients commented that receiving text messages improved self-awareness. One patient stated that the messages "help me check in with myself," and another also stated, "It makes me check in with myself, it's the best thing I've done, besides group." We also received feedback that being prompted about mood helped make an individual aware of things that improve mood: "I noticed that when I got rung by the study that my mood was high when I was playing music or speaking with a woman I was interested in." We also received feedback suggesting that using SMS as a part of psychotherapy may help improve self-efficacy, with 1 patient remarking, "We do have control over our mood." Spanish-speaking patients often mentioned that receiving messages made them feel as if someone cared for them.

Table 1
Participant Feedback (Percentages That Endorsed Each Option)

Question	Disagree	Somewhat disagree	Neutral	Agree	Strongly agree
Did the messages make you feel closer to the group and/or your therapists?	0%	0%	10% (n = 1)	50% (n = 5)	40% (n = 4)
Did receiving messages make you more likely to attend group sessions?	0%	0%	20% (n = 2)	30% (n = 3)	50% (n = 5)

	Wanted fewer	Wanted more	Right amount
Please rate the number of messages that you received.	0%	40% (n = 4)	60% (n = 6)

Note. n = 10.

Although the focus was on usability, we did assess for depression symptoms at baseline and 1–2 months later. Using the PHQ-9, we saw average ratings go from 10.1 at baseline to 8.5 at follow-up (scores of 5 represent mild depression and scores of 10 represent moderate depression; Kroenke et al., 2001). The difference between the two ratings was not significant ($p = .15$).

Overall, patients generally liked the text messaging component of therapy and commented frequently during therapy sessions about times that they were prompted for their mood during the previous week. At one point, a message was sent giving participants the option of not receiving messages if they chose by replying with the word REMOVE. No one requested removal; instead, participants requested that they not be removed, stating, for example, "Please don't remove me." Many patients also responded to certain messages, such as reminders, with "OK" and "Thank you," even after receiving those messages repeatedly.

Discussion

Our results indicate that a diverse group of Spanish- and English-speaking low-income psychotherapy outpatients in a public sector primary care setting are responsive to and like using SMS as part of their treatment. SMS may be particularly well suited for application as an adjunct to psychotherapy because of regular therapist contact that encourages patients to continue participating in the intervention. It may also be beneficial for sustaining therapy gains after live sessions are complete. Speaking to this point, all patients who participated in the CBT group and moved on to a less structured group requested that they continue to receive text messages even if they were not participating in the CBT treatment. SMS is a technology that may be received well by patients in diverse and public sector settings with the potential to improve outcomes at relatively low costs. We tested this intervention augmentation in a public sector, safety-net clinic with an older, low-income, Spanish- and English-speaking sample with physical and mental health issues. This type of sample is less represented in research assessing technology and health. Thus, this usability–feasibility study demonstrates that it is a worthwhile investment to test the use of this technology more rigorously as a means to improve outcomes.

Conducting this pilot study provided many lessons to remember for future work in this area. We found that many patients are willing to learn to use this technology, which is often present in their phones and included in their service plans but goes unused. Taking 10 min to teach a person how to use SMS turned out to be a mini-intervention in itself, with participants reporting excitement at learning a new technology. Some patients are also willing to use the technology but may not be able to afford a phone or plan or are not aware of low-cost plans. Low-cost phones were obtained on eBay, and low-cost prepaid phone plans with unlimited text messaging are available for ≤$40/month. Patients who did not participate tended to be older (typically in their 60s), and one common problem was the inability to see the text on the phone because of eyesight problems. This may be overcome by phones with larger displays or numbers more suitable for people with eyesight difficulties.

Future interventions will have an increased emphasis on assessing longitudinal outcomes, focusing on both symptom-based measures but also on functioning and other factors that may be of importance to patients. They should focus on utilizing the data provided by patients to reflect functioning that will help both patients and clinicians to target treatments. One way to do this is to display data (e.g., daily mood ratings, thought tracking, and pleasant activity tracking) during therapy sessions or to make it available to patients through the Web, as shown in Figure 1.
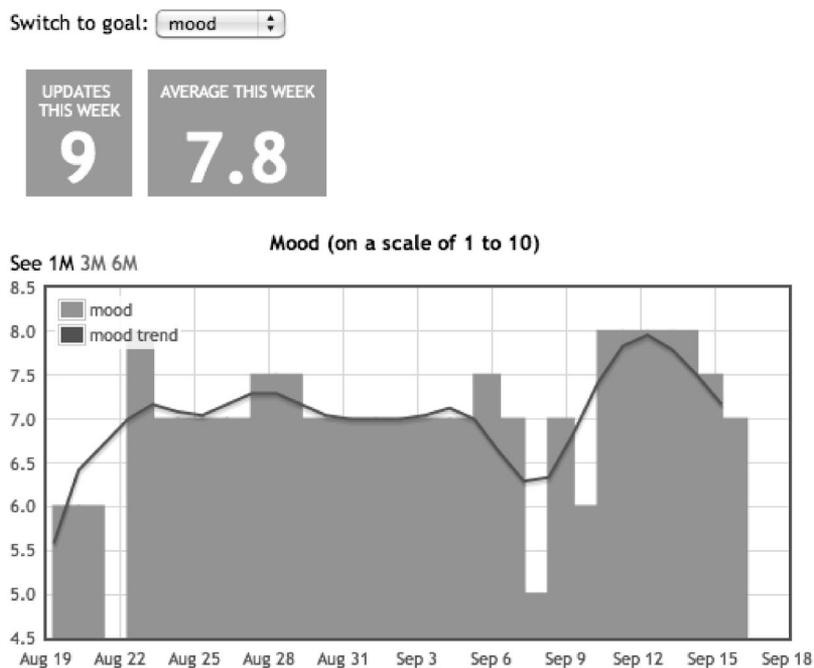

Figure 1. Data representation example.

Interventions can also move to better include family members and caregivers when appropriate by providing psychoeducational messages or reminders that can benefit patients with depression or other mental disorders that require monitoring over time. Family members could also be involved in assessing their perceptions of patients' daily mood levels.

SMS may help increase adherence to homework assigned as part of the CBT treatment, which may lead to more robust positive outcomes for patients because of their increased involvement in therapy. SMS shows some promise for increasing patient attendance to therapy sessions as well. The patient population at San Francisco General Hospital, similar to other public service settings, has a high no-show and drop-out rate. The SMS adjunct may help provide continuity of care for those who miss sessions, may encourage consistent attendance through reminders, and can extend the intervention well after the group sessions have ended to prevent relapse and recurrence. SMS approaches may also increase self-efficacy over one's mood. Although there are still limitations in terms of the number of people who have mobile phones and use SMS, we have demonstrated that low-income patients receiving routine CBT for depression at an inner-city safety-net clinic are willing to learn to use and apply this technology, which is often already present in their existing mobile phones.

Limitations

An obvious limitation of this pilot study is the small sample size. This was a usability–feasibility study, not an outcome study. Therefore, we cannot make broad conclusions based on the feedback of this small group to diverse settings, particularly with regard to changes in symptoms. Additionally, we did not have a control group comparison, which limits our ability to attribute positive effects on symptom levels to the text messaging adjunct. Another limitation was the older and narrow age range in this sample. It is problematic in that our results may not generalize directly to younger samples, but it is also encouraging that an older population less familiar with SMS can still be engaged and benefit from this tool. However, given the largely positive feedback, this feasibility study provides encouragement for expanding and testing SMS as an enhancement to standard depression treatment.

Conclusion

The use of text messaging as part of mental health care may help maximize the resources needed to provide services in a cost-effective manner. If more patients complete treatment, show improved outcomes, and have lower relapse rates, they reduce their need for chronic treatment of depression and other comorbid disorders. Text messaging interventions may have a role in psychotherapy because of the pervasiveness of the technology across SES. Given the accessibility of mobile phones and the relatively low costs of this form of intervention, more people can benefit from health interventions that encourage positive behavior change compared with other technological innovations such as smartphone applications. We have determined that an SMS adjunct to CBT is both feasible and acceptable to patients. It is important to test whether using SMS technology in depression treatment can improve outcomes in the larger population, including people with low incomes, ethnic minorities, and non-English speakers.

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Appendix

Participant Qualitative Feedback

English Group

"They forced me to 'check' in with myself."

"They are quick to respond to."

"Messages trigger self-examination."

"They made me stop and think for a moment about how I was feeling and why I was having those feelings."

"I like the ability to actually look in the proverbial mirror."

"Please continue sending me messages even without compensation. Checking in with myself is its own reward."

"Sometimes I am so busy I hardly stop and think about how I feel. Now that I get texts, I stop and think every day. When it stopped, I missed it. My life is so crazy I need a reminder to think about how I feel."

"We do have control over our mood!"

Spanish Group (With Translations)

"Los mensajes me motivan para seguir luchando para sentirme mejor." (The messages helped motivate me to continue working on myself)

"Cuando estuve en situaciones difíciles y me llego un mensaje, me sentí mucho mejor. Me sent apoyada y que alguien se preocupa por mi. Hasta me siento mejor."(When I was in difficult situations and I received a message, I felt much better. I felt cared for and supported. My mood even improved.)

"Lo mejor de los menajes es cuando uno esta en un momento difícil y llega un mensaje, se que alguien se preocupa por me y no me siento tan sola." (The most positive thing about receiving text messages is when one is in a difficult moment and a message arrives, I realize that someone cares for me and I don't feel alone.)

"Los mensajes son refrescantes y ayudan mucho. Me hacen sentir que hay personas que se preocupan por mi salud."(The messages are refreshing and are very helpful. They make me feel that there are people that care about my health.)