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Steps in Tailoring a Text Messaging-Based Smoking Cessation Program for Young Adults

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Steps in Tailoring a Text Messaging–Based Smoking Cessation Program for Young Adults

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Steps to develop or refine text messaging–based interventions are largely missing from the literature. Here, the authors describe steps in refining Stop My Smoking USA, a text messaging–based smoking cessation program for smokers 18–25 years old. Research activities included the following: needs assessment focus groups (n = 35); a content advisory team to affirm message acceptability (n = 10); and two beta tests to confirm technological feasibility (n = 12 and 28, respectively). Various recruitment strategies were tested to identify the optimal methods to reach young adult smokers ready to quit. Each stage of the refinement process yielded new insights, resulting in improved message content and tone, an effective recruitment strategy, and the identification and subsequent resolution of technology challenges. Findings suggest that young adults prefer messages that provide concrete behavioral strategies to overcome cravings, and which are positive in tone. Craigslist was the most efficient recruitment method and yielded a sample that was racially and economically diverse. Despite a successful beta test of initial technological feasibility, extensive problems were subsequently experienced in a beta test of the technological feasibility of the entire program. Iterative program refinement and adaptation on the basis of user input is necessary to ensure salience, while extensive field testing is required to ensure proper functioning of technology-based programs.

Public health costs related to cigarette smoking were more than $190 billion between 2000 and 2004 (Centers for Disease Control and Prevention, 2008). Affecting smoking cessation among young adults is particularly important because of immediate and long-term impacts on associated morbidity and mortality (Centers for Disease Control and Prevention, 2011; U.S. Department of Health and Human Services, 2012). Unfortunately, smoking is common in this population: between 22 and 34% of 18–24-year-old adults are current cigarette smokers (Centers for Disease Control and Prevention, 2010; Substance Abuse and Mental Health Services Administration, 2011). More than half want to quit or cut down (Lamkin, Davis, & Kamen, 1998; Reeder, Williams, McGee, & Poulton, 2001; Stone & Kristeller, 1992), yet few are successful (Centers for Disease Control and Prevention, 1993, 2002). This may in part be because evidence-based treatments are underused by young adult

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smokers (Curry, Sporer, Pugach, Campbell, & Emery, 2007; Solberg, Asche, Boyle, McCarty, & Thoele, 2007) and because intervention programs targeted and accessible to young adults are lacking (Bader, Travis, & Skinner, 2007; Lantz, 2003; Murphy-Hoefer et al., 2005).

With more than 9 in 10 U.S. young adults using text messaging (Smith, 2011), text messaging (also referred to as *mHealth*) may be an ideal delivery mode for cessation programs. Emerging evidence supports the efficacy of mHealth programs to affect smoking cessation (Free et al., 2011; Rodgers et al., 2005; Whittaker et al., 2009) as well as a variety of other health behaviors (Cole-Lewis & Kershaw, 2010; Wei, Hollin, & Kachnowski, 2011). As more and more interventionists explore the benefits of text messaging in health behavior change settings, information about how these programs are being developed is critical.

Stop My Smoking USA (SMS USA) is a mHealth smoking cessation program for young adult smokers in the United States. The content, which was crafted using cognitive behavioral theory and the smoking cessation quitline literature (Brown, 2003; Fiore et al., 2008; Holtrop, Corser, Stommel, & Holmes-Rovner, 2008; Stead, Perera, & Lancaster, 2006; Wadland, Stoffelmayr, & Ives, 2001; Zhu et al., 2002; Zhu et al., 1996), was developed originally for a smoking cessation program for adult smokers in Ankara, Turkey (Ybarra, Holtrop, Bagcı Bosi, & Emri, 2012). Messages were developed following generally known steps in health-related program development (Pancer & Westhues, 1989; Rossi, Lipsey, & Freeman, 2004; Yarbrough, Shulha, Hopson, & Caruthers, 2011), but needed to be refined to address the unique needs of young adult smokers in the United States. Because little research is available that discusses formative steps taken to create and refine salient mHealth interventions (Whittaker, Merry, Dorey, & Maddison, 2012), we describe here the steps taken to refine SMS USA. These steps can be used in refining other technology-based health behavior change programs.

Sequential Methods and Results

The research protocol was reviewed and approved by the Chesapeake Institutional Review Board and the Michigan State University Institutional Review Board. As specified in the human-centered design process (Maguire, 2001), which supports the purpose of creating usable systems for technological applications, we evaluated the SMS prototype through user-based assessments and usability testing. We sequentially implemented four activities: a needs assessment with young adults to better understand their smoking behavior and previous quitting experiences, and to gather acceptability assessments of proposed program components; a content advisory team to confirm acceptability of specific messages, and the tone and content of messages overall; and two beta tests of the intervention program to confirm the technological feasibility of the intervention. The development work spanned approximately 1 year. Focus groups for the needs assessment were conducted in November 2009 and analyses were conducted through January 2010. Findings were integrated into the content, and the content advisory team assessment was conducted in May 2010. The first beta test was then conducted in August 2010 and the second in December 2010.

Eligibility criteria for participants matched those in the planned pilot randomized controlled trial: smoking 24 cigarettes or more per week (at least four per day on at least 6 days per week); owning a text-capable cell phone and knowing how to text; being currently enrolled or intending to enroll in an unlimited text messaging plan; agreeing to be verified of their smoking cessation status by a significant other; being between the ages of 18–25 years; and being able to read and write in English.

Needs Assessment Focus Groups

Two focus groups were conducted to achieve the first step in the refinement process: a needs assessment. In addition to exploring participants' reasons for smoking, triggers for smoking, and awareness and interest in smoking cessation options, we also explored the acceptability of two proposed program components first used in the New Zealand intervention (Rodgers et al., 2005): text crave (immediate text response to help deal with craving in the moment) and text buddy (pairing with another smoker going through the quit process so the two may provide support for each other).

Method

Focus groups were conducted online in November 2009. Crux Research, a survey research firm experienced in conducting online focus groups, recruited and moderated the groups. The research team developed a script of questions that were used to guide the moderator's questions. Example questions included the following:

- What would you say are key reasons why you smoke?
- Describe when it's most difficult for you *not* to smoke.
- Where are you when you most want to smoke (e.g., work, school, restaurants, bars, etc.)?
- What kinds of things worry you most about your smoking?
- If you tried to quit smoking, would you use a quitting aid like the nicotine patch?
- What would keep you in a 6-month-long text buddy smoking cessation program?

Because of different smoking prevalence rates (Green et al., 2007; Johnston, O'Malley, Bachman, & Schulenberg, 2004; Solberg et al., 2007) and our hypothesis that young adults in and out of a university setting may have different smoking and quitting experiences, the groups were stratified by school status: participants who were enrolled in at least one course at the college level and those who were not (i.e., straight-to-work individuals).

Given that online focus groups do not have practical (i.e., room space) and interactional (i.e., allowing everyone time to talk) limitations that in-person focus groups do, a larger sample size can feasibly be included in each group. This efficiency means that the amount of data obtained in one online focus group can often be equivalent to that obtained in two in-person focus groups. For each group, participants visited the bulletin board 2–3 times per day and responded to the moderator's questions and the other study participants' comments. The research team could log in to read the history of a dialogue chain and send private messages to the moderator for follow-up. At no time, however, did anyone from the research team other than the moderator have contact with the participants. Participants received an incentive of US$75 for completing all 3 days of the group.

Transcripts of completed discussions from both focus groups were coded using ATLAS.ti. Two qualitative researchers each coded the transcripts in their entirety, using a priori and emergent codes. Minimal discrepancies in coding were identified, and a discussion was held to reach agreement on remaining differences. Quotations were then queried, and the two researchers discussed and agreed upon the thematic areas of smoking behavior, quitting history and strategies, and text-based program strategies. Because consistent themes emerged within and across the two groups, and because other development steps were planned, we determined that a reasonable degree of saturation was achieved; additional groups were unnecessary.

Results

Nineteen participants took part in the in-school focus group, and 16 participated in the straight-to-work focus groups (see Table 1 for demographic characteristics). Few

Table 1. Participant characteristics by SMS USA development activity

Demographic characteristics	Focus groups ($n = 35$)	Content advisory team ($n = 10$)	Beta test 1 ($n = 12$)	Beta test 2 ($n = 28$)
		M (*SD*)	*M* (*SD*)	*M* (*SD*)
Age (years, range = 18–25)	22.9 (2.0)	21.3 (2.5)	21.9 (1.5)	21.7 (2.3)
	% (*n*)	% (*n*)	% (*n*)	% (*n*)
Female	51.4% (18)	40.0% (4)	41.7% (5)	35.7% (10)
Race				
White or Caucasian	Unknown	80.0% (8)	75.0% (9)	64.3% (18)
Black or African American	Unknown	10.0% (1)	0.0% (0)	21.4% (6)
Mixed racial background	Unknown	10.0% (1)	25.0% (3)	14.3% (4)
Hispanic ethnicity	Unknown	10.0% (1)	8.3% (1)	3.6% (1)
Highest level of education				
Some high school	0.0% (0)	Unknown	0.0% (0)	3.6% (1)
High school or equivalent	31.4% (11)	Unknown	16.7% (2)	21.4% (6)
Some college, but no degree	37.1% (13)	Unknown	50.0% (6)	64.3% (18)
College degree (e.g., associate's, bachelor's)	31.4% (11)	Unknown	33.3% (4)	10.7% (3)
Employment status				
Full time (31 or more hours/week)	54.3% (19)	Unknown	16.7% (2)	25.0% (7)
Part time (30 or fewer hours/week)	25.7% (9)	Unknown	41.7% (5)	25.0% (7)
Not working	20.0% (7)	Unknown	41.7% (5)	50.0% (14)
Marital status				
Single	Unknown	Unknown	66.7% (8)	50.0% (14)
Married	Unknown	Unknown	0.0% (0)	10.7% (3)
Living with someone as a couple	Unknown	Unknown	25.0% (3)	35.7% (10)
Divorced	Unknown	Unknown	8.3% (1)	3.6% (1)
Household income				
Less than $15,000	Unknown	Unknown	41.7% (5)	57.1% (16)
$15,000–$34,999	Unknown	Unknown	33.3% (4)	17.9% (5)
$35,000–$74,999	Unknown	Unknown	0.0% (0)	10.7% (3)
$75,000 or more	Unknown	Unknown	0.0% (0)	7.1% (2)
I do not know	Unknown	Unknown	25.0% (3)	7.1% (2)
Smoking characteristics	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
No. of cigarettes per day	13.4 (5.8)	14.3 (5.4)	13.7 (6.3)	11.5 (8.0)

Note. SMS USA = Stop My Smoking USA; Unknown = participants were not asked this question.

differences were noted between the two groups, perhaps because of the high percentage of people working in the in-school group. Overall, responses suggested participants were highly addicted to nicotine. Many individuals were unaware of or had mixed feelings about using pharmacotherapy, and many voiced concerns about the cost and lack of clarity about the various cessation options. Reasons to quit included, in the following order: immediate and long-term health consequences, social negatives (e.g., "others think less of me because I smoke"), smell, and cost. Participants seemed to lack a clear plan to quit even though they were seriously thinking about quitting smoking in the next month; they seemed to want to "willpower" their way through the quitting process.

Participants' narratives suggested that there was a strong social component to smoking. Many had friends and relatives who smoked and associated smoking with many of their daily activities. Nonetheless, most participants were able to name someone who wanted them to quit and who would support them in doing so. Beyond these reasons to smoke, smoking cues for participants included alcohol, stress, driving, finishing a meal, needing to focus, boredom, and as a way to take a break.

Text Crave and Text Buddy program components were both received positively, although some participants raised concerns that it would be harder to stay quit if their Buddy started smoking again.

Participants were given examples of Text Crave messages (e.g., "Sit down and sit on your hands. Don't get up until you are sure you will not reach for a cigarette") and asked to craft their own messages. Many suggestions were supportive (e.g., "You can do this; don't give up") or referred to loved ones (e.g., "I love you but you smell like an ashtray, please quit smoking so I can hug you!"). Only a few suggested scare tactics (e.g., "Quit smoking or you will end up dead!").

Integration of Findings Back into the Program

Messages were added to the program content to address concerns and triggers for young adults. For example, the following message acknowledged and addressed anticipated concerns related to pharmacotherapy: "Quitting nicotine with nicotine seems strange, but it really does work to help you learn to break the habit of smoking without the initial withdrawal." Because going out to bars was a common trigger for young adults, messages were crafted to help young people think through ways to prepare for quitting within this context: "When you go out with your friends to the bar, watch the nonsmokers. What do they do? What will you do as a nonsmokers? Have a plan and you'll be successful." Efforts also were made to help young adults view quitting as something that required a plan, rather than something they simply moved through: "Think about it—most things in life require a plan of action. People who quit smoking have a plan. A key part of the plan is to set a date, stick to it, and know what you will do instead of smoking. Before you know it, you'll be out of the rough few days." (Text messages were further refined to fit into the 160-character limit following the content advisory team.)

Content Advisory Team

The second refinement step, determining program acceptability, was done with a content advisory team, which confirmed acceptability of specific program messages. We also tested the recruitment plan for the eventual randomized controlled trial.

Method

In May 2010, 20 young adults were recruited online using a social networking site (i.e., Facebook), an online advertisement website (i.e., Craigslist), and GoogleAds. Demographic characteristics are shown in Table 1.

Participants were first emailed 20% of the proposed program text messages (approximately 60 messages) and given 1 week to provide feedback. At least two participants were asked to review each program message to ensure all program content was reviewed. Each participant received messages that spanned the entire program (e.g., prequit, quit day), and also included Text Crave messages. Instead of a rating scale, participants provided qualitative explanations to their reactions to the message by answering the questions cued from the question guide and providing their rationale. Questions included the following: Do the messages energize you, turn you off? Is the message clear? What thoughts would go through your mind if a friend intercepts and reads one of the messages on your cell phone?

Next, participants were asked to take part in a 2-day online bulletin board discussion with other content advisory team members where they discussed with one another their thoughts and reactions to the messages. This process provided the opportunity for a group convergence about the salience and tone of messages when there was variability in response. Participants were asked to describe the tone of the messages, how the messages spoke to what they thought young adults quitting smoking would be going through (e.g., on quit day), and clarity of the messages. The research team moderated and monitored the bulletin board. Participants received a combined US$35 incentive for their time (US$25 for their initial feedback and US$10 for their participation in the online discussion).

A dataset was created so that participants' feedback about specific text messages was listed next to the relevant text message. Two researchers reviewed this feedback, along with the data received from the online discussion; discussed the reactions over several meetings; and created broad themes that needed to be addressed in the program content.

Results

Ten participants provided feedback. Four participants were recruited from Facebook and 3 participants from Craigslist; the remainder did not report where online they saw the recruitment advertisement. Although the response rate was only 50%, feedback was provided by at least 1 participant for each of the intervention text messages, and themes were noted across messages. As such, the team decided that the relative benefit of getting a second opinion on each message was lower than the drawback associated with going back into field (i.e., in terms of additional time taken in the timeline, recruitment expense, and expense for staff time allocated to this rather than other project activities).

Overall, participants preferred positive, encouraging messages rather than negative or shock messages. Participants did not like tone that they perceived as lecturing or condescending. They also suggested a preference for content that did not refer to smoking, and specifically, their previous smoking behavior, because they thought it would serve as a trigger. They also disliked messages that discussed the physical withdrawal of quitting. In addition, participants expressed an aversion to the word *medication* and suggested using alternative wording (e.g., aid) when pharmacotherapy was discussed.

Integration of Findings Back into the Program

In almost all of the cases, feedback about the specific text messages was similar across participants. When it conflicted, advice that was consistent with the larger themes that emerged was followed. Care was taken to balance participants' preferences with the need to ensure content was evidence-based. For example, references

to ask people to consider their previous quit attempts were reframed. Instead of saying, "Think back to your past attempts to quit," the message was changed to more generally note: "Some people may feel like a failure from unsuccessful quit attempts. Most smokers try to quit 6–7 times before they quit for good." Content that could be perceived as negative (e.g., "Smoking may seem like it was your friend in hard times, but it was an evil friend. It harmed your health, took your money, and made you smell. Some friend.") was changed to more positive messaging: "You can make it another day without smoking. You're saving money and getting healthier." Lecturing (e.g., "Don't think you can have just one cigarette. Stay smoke-free. For now, stay clear of situations where you are most likely to want a cigarette.") was reframed to be supportive and affirming: "Continue to stay clear of situations where you are most likely to want a cigarette. You've put a lot effort into preparing for and actually quitting. Look how long you've been smoke-free."

Beta Test 1: Confirming Initial Technological Feasibility

The final step of the refinement work was to confirm the technological feasibility of the intervention. Beta Test 1 confirmed functionality of initial program components, including the randomization process, the Text Buddy and Text Crave components, and the recruitment protocol.

Method

Twelve participants were enrolled in August 2010 using traditional (i.e., advertisements posted around community) and online (i.e., advertisements post on Craigslist) strategies. Recruitment advertisements were targeted in New Hampshire and the East Lansing area of Michigan. These areas were chosen for practicality because this is where members of the study team were located; if intensive problem solving was required during the beta test, it would be easier to achieve in person.

Participants were randomized to the intervention group or to the attention-matched control group that received messages about improving fitness and sleep patterns. Participants received the first week of their respective study arm's prequit messages. All were matched with a Text Buddy and instructed to send two text messages per day to their buddy. Participants also were instructed to use the Text Crave feature at least once during the 1-week field period. One-on-one interviews were conducted over the phone afterwards to discuss any challenges and identify areas for program improvements (e.g., "What are your thoughts on the number of messages you received per day?" "On the times of day you received the text messages?" "Is there one text message that sticks in your mind as particularly [un]helpful?"). Participants received a US$30 incentive upon completion of the beta test.

Results

The majority (75%) of the 12 participants were recruited from Craigslist. The software functioned properly: the validation code sent by the software program during the registration process to the participant's cell phone to confirm the phone's registration on the system worked well. Also, the randomization program worked to specification. Participants received their arm's respective text messages, received on-demand Text Crave messages, and communicated with their Text Buddy without incident. As with previous mHealth programs (D. Levine, personal communication, February 17, 2012), some smaller cell phone providers were incompatible with the

program software (e.g., MetroPCS, Cricket). (More recently, this issue was able to be resolved by paying an additional fee to the aggregator to include smaller carriers [D. Levine, personal communication, February 17, 2012].)

Participants regarded the Text Buddy component as helpful because "it's someone going through the same thing you are" and also liked that they received on-demand Text Crave messages. Also, participants expressed a preference for behavioral (e.g., "Distract yourself: Text someone a text with exactly 140 characters.") rather than cognitive Text Crave messages (e.g., "Focus on not allowing yourself a single puff. This is the fastest way through the cravings.") because they helped the participant to do something physically. Participants also liked Text Crave messages that were unrelated to smoking because they felt that these messages were less likely to reinforce the urge to smoke. Prequit messages encouraging participants to maintain a smoking diary to better understand their smoking habits was perceived as "too time consuming" or something that others, but not they themselves, would find helpful.

Integration of Findings Back into the Program

We added additional behavioral messages to the pool of Text Crave messages. We added a new eligibility requirement to ensure that participants' cell phone providers were compatible with the program software. References to a smoking diary were changed to refer to a *log*. We determined that an online recruitment strategy would be optimal.

Beta Test 2: Confirming Technological Feasibility of the Full Program

Beta Test 2 was unanticipated but necessary, given the technological challenges that were experienced in field. Data confirmed the technological feasibility of components that occurred later in the program. In contrast with the 1-week Beta Test 1, participants received all 6 weeks of the program text messages. Based on research that suggests quit attempters are most likely to relapse within the first 7 days of quitting (Zhu et al., 1996), intervention participants were contacted at 2 days after quit day and again at 7 days after quit day to query whether they were smoking. They were subsequently pathed to different content depending on their response (e.g., to relapse messages, in order to help them recommit to quitting if they indicated that they were still smoking). As such, a main aim of Beta Test 2 was to verify proper pathing of intervention participants.

Method

Twenty-eight participants were recruited and randomly assigned to either SMS USA or the control arm. Intervention, but not control, participants were matched to a Text Buddy and had access to Text Crave. Follow-up data were collected at 4 weeks by text messaging, at 12 weeks online and by phone, and at 1 year by text messaging. The telephone survey asked participants about their program experience (e.g., "Is there one text message that you received that was [more/least] helpful than the others" and "What are your suggestions for ways to improve the SMS USA program?").

Recruitment began in December 2010. Five advertisements per day were posted on Craigslist for five days a week for two weeks. Facebook advertisements ran for 16 days at a daily budget of US$25 per day; advertisements were targeted to U.S. users between 18 and 25 years old. Keywords were identified using Facebook's keyword tool, which resulted in a mix of common (e.g., *quit smoking today, cigarettes*) and

uncommon (*going out with mates, beer pong*) phrases. Google AdWords were targeted based on smoking-related keywords (e.g., *how do I stop smoking, stop smoking guide*). One advertisement per day was posted on each of the other classified sites (e.g., Recycler, eBay Classified, and PennySaverUSA) for a one week period.

Craigslist was posited to be the preferred online recruitment site based upon experiences in the content advisory team and Beta Test 1. As such, a comprehensive plan was developed to strategically advertise in a variety of communities. A list of Craigslist communities by state, along with their demographic characteristics as reported by the U.S. Census Bureau (2010), was compiled. Community-level census data was aggregated across targeted Craigslist communities for an overall total, and then compared to countrywide demographic characteristics to ensure a diversity of young people was being targeted. Then, communities were purposefully selected to target a range of community types, and placed on a recruitment calendar that articulated which would be targeted during the field period. More than 60 communities were identified; Table 2 provides an abbreviated example of the recruitment plan. Recruitment advertisements were posted under the *Jobs* category, and then the *General Labor* or *et cetera* subcategories. An example post is shown in Figure 1.

A website link was included in online enrollment efforts that directed interested parties to a project website where an eligibility screener could be found. Study staff received e-mail notification when screeners were completed. Eligible candidates were followed up with using preferred contact method (e.g., phone, e-mail); ineligible candidates were e-mailed additional resources to help them in their quitting process (e.g., http://smokefree.gov).

Graduated incentives were provided to promote retention after completion of each follow up activity: US$10 after completing the 4-week follow up; US$20 after completing the 3-month follow up with an additional incentive of US$10 sent to those who completed the 3-month follow-up within 48 hours of receiving the reminder text message; US$35 after completing the 1-year follow-up.

Results

As shown in Table 1, the sample was racially and economically diverse, and majority male. Almost all (93%) were recruited from Craigslist, with the remaining participants identified from Facebook advertisements. No participants were successfully recruited through Google AdWords or the other classified sites. Some Craigslist advertisements were flagged for removal and pulled down because they were considered spam.

The registration and baseline survey, which research staff conducted over the phone, took between 45 minutes to1 hour to complete; because participants thought the process was too time-consuming, enrollment was impeded. Most candidates preferred contact by text message, rather than by e-mail or phone.

Unlike Beta Test 1, major problems occurred with the technology, including cell phone access (e.g., participants had an eligible cell phone provider (e.g., T-Mobile, Sprint) but were unable to receive program messages), and programming issues (e.g., participants in the intervention group were pathed incorrectly following the 2-day or 7-day post-quit contact). Problems occurred in sections of the program that had not been tested in Beta Test 1.

Follow-up response rates were high: 71% of participants ($n = 20$) completed the text messaging–based 4-week follow-up survey. Of the eight nonresponders, four had nonworking numbers. Three months after quitting smoking, 64% ($n = 18$) completed the online survey. At 1-year follow up, 68% ($n = 19$) completed the text messaging–based survey. Of the nine nonresponders, seven had nonworking phone numbers. One additional voicemail was not set up, so although the number was still working, it was not possible to verify it was still the participant.

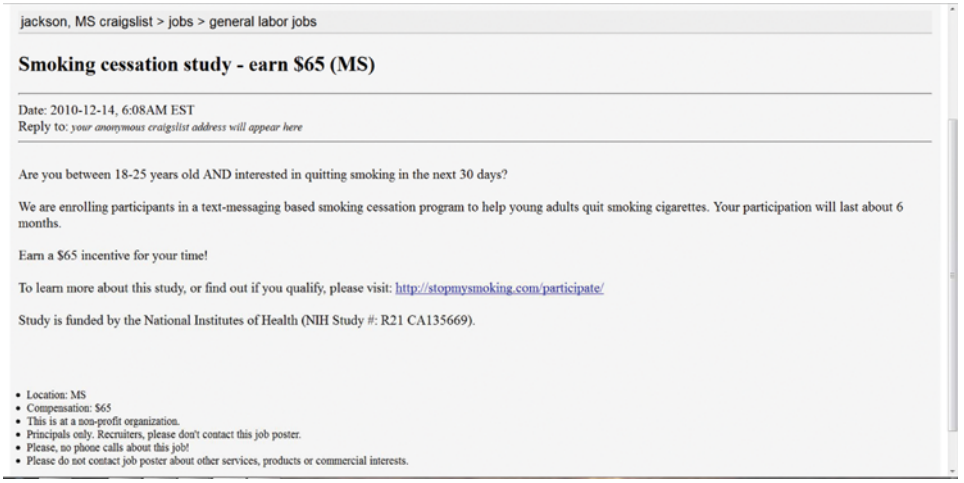
Table 2. Excerpt of the SMS USA Beta Test 2 Craigslist recruitment plan designed to target a diverse population based on U.S. Census data

State	City	White	Black	American Indian	Asian	Native Hawaiian	Other	2 + races	Hispanic
Florida	Tallahassee	57.9	35.3	0.3	3.0	0.1	1.6	1.9	20.1
Florida	Fort Myers	53.9	34.4	0.4	1.2	0.0	8.5	1.6	2.2
Georgia	Valdosta	44.8	49.8	0.3	1.6	0.0	1.2	2.2	8.6
Hawaii[a]		26.9	2.4	0.3	38.5	8.8	1.3	21.7	10.2
Iowa	Des Moines	79.3	9.2	0.3	3.8	0.0	5	2.4	13.7
Iowa	Sioux City	84.3	2.8	1.6	2.8	0.4	6	2.1	10.5
Idaho	Twin Falls	93.0	0.2	0.5	0.8	0.5	3.2	1.8	27.4
Illinois	Chicago[b]	41.9	34.1	0.2	4.9	0.0	17.1	1.6	2.7
Indiana	Bloomington	85	4.5	0.4	7.1	0.1	0.9	2.1	8.9
Kansas	Topeka	78.5	11.7	1.3	1.1	0.0	4.1	3.3	9.6
Kansas	Wichita	75.2	11.4	1.2	4.0	0.1	5.1	3.1	5.5
City/ state average across all identified communities		67.57	18.72	1.57	3.37	0.25	5.77	2.72	14.26
U.S. national average		74.5	12.4	0.8	4.4	0.1	5.6	2.2	15.1

Note. This is a selection of the recruitment plan created which targeted more than 60 communities on Craigslist. The city and state are provided for each community selected to have a recruitment advertisement posted. Race and ethnicity data were obtained from the U.S. Census Bureau American Fact Finder website in 2010. A state/city average for targeted communities was then tabulated and compared with the U.S. national average. SMS USA = Stop My Smoking USA.

[a]For states where advertisements could only be posted by state rather than specific communities, total state population demographics are reported.

[b]Communities where paid advertisements were posted.


jackson, MS craigslist > jobs > general labor jobs

Smoking cessation study - earn $65 (MS)

Date: 2010-12-14, 6:08AM EST
Reply to: *your anonymous craigslist address will appear here*

Are you between 18-25 years old AND interested in quitting smoking in the next 30 days?

We are enrolling participants in a text-messaging based smoking cessation program to help young adults quit smoking cigarettes. Your participation will last about 6 months.

Earn a $65 incentive for your time!

To learn more about this study, or find out if you qualify, please visit: http://stopmysmoking.com/participate/

Study is funded by the National Institutes of Health (NIH Study #: R21 CA135669).

- Location: MS
- Compensation: $65
- This is at a non-profit organization.
- Principals only. Recruiters, please don't contact this job poster.
- Please, no phone calls about this job!
- Please do not contact job poster about other services, products or commercial interests.

Figure 1. Example of recruitment advertisement placed on Craigslist. (Color figure available online.)

Integration of Findings Back into the Program

The recruitment strategy was modified to limit the number of Craigslist advertisements posted at any one time (three advertisements per day, 2 days per week). After trying various posting schedules, we found this number sufficient to result in a steady number of completed eligibility screeners without the advertisements being removed by Craigslist. The enrollment process was altered so that registration was completed over the phone (e.g., verifying eligibility, obtaining verbal consent) and then the participant was e-mailed a survey link to complete the baseline survey online. Technology problems were so significant that fielding of the later pilot randomized controlled trial was delayed so that solutions could be tested thoroughly by the team beforehand. Once technology problems were addressed, a final internal team test from quit date through the final pathing stage (i.e., 7 days after quit day) was conducted to ensure issues were resolved.

Discussion

Refinement of SMS USA to ensure its saliency for young adults was iterative and revealed important insights about testing a new intervention. Five steps to developing or refining an mHealth program emerged:

1. Conduct needs assessment focus groups with your target audience to better understand their decision making around the risk behavior and trying to affect behavior change, and to confirm acceptability of program components.
2. Write draft program content, integrating findings from the focus groups.
3. Test the acceptability of drafted content, preferably with a two-stage focus group that allows for direct feedback on each specific text message, as well as global feedback on the content as a whole.
4. Integrate findings into the final content pool.
5. Confirm the technological feasibility of the entire intervention before fielding the planned trial.

Concrete examples of how to integrate user feedback into the content (see Results above) demonstrate how participatory research designs can ensure that the target population has a voice in the intervention content while ensuring its adherence with behavior change theory. As echoed by recent observations reported by other mHealth researchers (Whittaker et al., 2012), this step-by-step process is time intensive and can be costly, but it also increases the likelihood that the final product will be understood and used by the target audience.

Important lessons learned for refining SMS for a young adult smoking population include a preference for content that has a positive tone, provides actionable behavioral strategies, and does not reference smoking—especially past smoking experiences. Given the high rates of addiction and low endorsement of pharmacotherapy, these cessation aids clearly need to be promoted in the intervention content. The Text Buddy social support component is well received and has the potential to addresses the social contact young adults stand to lose by quitting smoking.

Our experience amplifies the importance of Step 5: We tested the technological feasibility of the first week of the intervention in Beta Test 1 and thought that this brief test would be sufficient to identify any and all problems. Extensive problems were experienced when the full program was rolled out, however, thus necessitating a second beta test. Technology-based programs are complex; it is impossible to anticipate every challenge without testing the entire experience in a real-world setting. Even if time consuming, researchers are encouraged to test the entire program internally before fielding externally (e.g., in an randomized controlled trial).

This multistep program refinement process allowed us to simultaneously refine our recruitment strategy. Several options were tested in the content advisory team and beta tests, including Facebook ads, Google AdWords, postings on Craigslist, and postings on other classifieds websites. Because of the overwhelming adoption of Facebook among young adults (Lenhart, Purcell, Smith, & Zickuhr, 2010), and the ubiquitous use of Google as a search engine (comScore, 2011) we expected these to be the most effective strategies. However, contrary to our expectations, though consistent with findings from other researchers employing an online recruitment strategy to recruit this population (Ramo, Hall, & Prochaska, 2010), Craigslist was the most efficient and cost-effective source of participants. As such, we built our recruitment plans for Beta Test 2 around Craigslist. By tying Craigslist communities to U.S. Census data, we had an additional advantage of efficiently targeting a diversity of cities with various racial and economic compositions across regions.

Participants were required to have their own cell phone and be enrolled in an unlimited text messaging plan. Despite these restrictions, the samples recruited for both beta tests were racially and economically diverse. Moreover, nonworking phones were not a threat to internal validity: 86% of participants had working numbers at 4- and 12- week follow-up, as did 75% at 1 year. One could perhaps reduce this further by adding an eligibility criterion that participants intend to have the same cell phone number for the next year. Together, these data suggest that mHealth programs can be targeted to frequent users of text messaging without necessarily resulting in overly privileged samples or high dropout rates.

Findings should be interpreted within the limitations of the research. Specific program recommendations that emerged from this work with young adult smokers may not generalize to other populations. Furthermore, young adults responding to online recruitment approaches are unlikely to be representative of the larger young adult population. In the real world, however, smoking cessation programs are accessed through self-selection: People enroll on their own. The aim when testing mHealth interventions should not necessarily be to understand how the program works in the general population, but rather in the population most likely to use it: frequent texters. In this case, the question is how young adults recruited from sites

such as Craigslist compare with young adults who would self-select into a mHealth smoking cessation program that they would enroll themselves in online, or would access through their health plan or university. The answer to this question is unknown.

Iterative intervention refinement work is time consuming and costly, but greatly increases the likelihood that the content is salient to and used by the target population while retaining its adherence to theory. Steps that emerged as a useful refinement recipe can be applied to other text messaging–based health behavior change programs.

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