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Mindfulness and Mobile Health for Quitting Smoking: A Qualitative Study Among Predominantly African American Adults with Low Socioeconomic Status

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ABSTRACT
Low-income and African American adults experience severe tobacco-related health disparities. Mindfulness-based interventions show promise for promoting smoking cessation, but most mindfulness research has focused on higher income, Caucasian samples. "iQuit Mindfully" is a personalized, interactive text messaging program that teaches mindfulness for smoking cessation. This qualitative study sought feedback from predominantly low-income African American smokers, to improve the intervention for this priority population. After receiving 8 weekly group sessions of Mindfulness-Based Addiction Treatment for smoking cessation and between-session iQuit Mindfully text messages, participants (N=32) completed semi-structured interviews. Participants were adult cigarette smokers (90.6% African American, 62.6% annual income <$30,000, mean age 45.1 [±12.9]). Interviews inquired about participants' experiences with and suggestions for improving iQuit Mindfully, including message content, number, and timing. Interviews were audio-recorded, transcribed verbatim, and coded by a team of 5 coders in NVivo. The coding manual was developed based on response categories from the interview guide and themes emerging from the data. Themes were organized into a conceptual model of factors related to engagement with the mHealth program. Response categories included helpful aspects (e.g., themes of social support, mindfulness, personalization); unhelpful/disliked aspects (e.g., too many/repetitive messages); links between in-person sessions and texts; and suggestions (e.g., changes to number/timing and more personalization). Findings provide insight into participants' day-to-day experiences with iQuit Mindfully and suggest ways to improve mHealth programs among low-income and African American adults.

KEYWORDS: Smoking cessation, mobile health technology, mindfulness, qualitative research, African Americans.

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Tobacco use is the leading cause of preventable death and disease in the U.S. (USDHHS, 2014). Although most people who smoke want to quit, only 7% successfully quit each year (Babb, 2017). Moreover, tobacco-related health disparities persist, such that low-socioeconomic status (SES) adults and members of certain racial/ethnic minority groups suffer greater burden from the harms of tobacco (Babb, 2017; Creamer et al., 2019; Drope et al., 2018; U.S. National Cancer Institute, 2017). Although overall smoking prevalence has declined considerably in the general U.S. population, smoking remains disproportionately common among low-SES adults (Drope et al., 2018; U.S. National Cancer Institute, 2017). One-quarter (25.3%) of U.S. adults living in poverty smoke cigarettes, compared to 14.3% of those at or above the poverty level (Creamer et al., 2019). African Americans who smoke are more likely to indicate interest in quitting and to have attempted to quit in the past year compared to their White counterparts, but are less likely to successfully quit (Babb, 2017). To target tobacco-related health disparities, it is critical to improve upon evidence-based smoking cessation interventions for low-SES and racial/ethnic minority populations.

Literature Review

Mindfulness-based interventions show promise for promoting smoking cessation as well as recovery from early lapses to smoking (e.g., Brewer et al., 2011; Oikonomou et al., 2017; Vidrine et al., 2016; Vinci, 2020). Mindfulness has been defined as "paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally" (Kabat-Zinn, 1994, p.4). Mindfulness training encourages people to intentionally pay attention to present-moment sensations (e.g., thoughts, emotions, physical feelings) with an accepting, non-judgmental mindset (Kabat-Zinn, 1990, 1994). Mindfulness interventions for smoking cessation teach people to observe experiences of craving and uncomfortable emotions without automatically labeling them as "bad" or reacting to them by smoking (Vidrine et al., 2016). Research suggests that mindfulness weakens associations between craving and smoking, such that people can experience craving without automatically reacting by smoking (Brewer et al., 2014; Garrison et al., 2020). Moreover, mindfulness training for smoking cessation has been shown to reduce stress, anxiety, and craving (Brewer et al., 2014; Spears et al., 2017).

A meta-analysis indicated that mindfulness interventions for smoking cessation almost doubled rates of smoking abstinence for more than four months compared to usual care (Oikonomou et al., 2017). Additionally, although no differences in overall quit rates were observed, Vidrine et al. (2016) found that Mindfulness-Based Addiction Treatment (MBAT) for smoking cessation increased rates of lapse recovery compared to both cognitive behavioral treatment and usual care. This is critical because early smoking lapses are quite common (Brown et al., 2005). Learning to practice mindfulness might attenuate negative emotional responses to smoking lapses, thus increasing the likelihood that people will get back on track with their abstinence goals.

Unfortunately, most mindfulness research has focused on higher income, female, Caucasian samples. A recent review found that racial/ethnic minorities and populations with lower education were severely underrepresented in randomized controlled trials of Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-Based Cognitive Therapy (MBCT; Waldron et al., 2018). It is critical to extend mindfulness research to more diverse populations and understand if cultural adaptations are needed for particular subgroups.

Furthermore, participants in mindfulness intervention studies often do not practice mindfulness in their daily lives as much as recommended (Cavanagh et al., 2014; Lloyd et al., 2018; Vidrine et al., 2016). Mobile health technology (mHealth) could be an effective way to increase day-to-day mindfulness practice and provide additional in-the-moment support. The vast

majority of Americans (97%) own a cellphone, including 99% of Black Americans and 97% of adults with less than $30,000 annual income (Pew Research Center, 2021). Text messaging is relatively cost-effective, user-friendly, can be personalized, and can involve two-way messaging to provide support in moments of high stress or craving. Studies have demonstrated text message interventions to be effective in increasing smoking abstinence compared to usual care (Whittaker et al., 2019). Moreover, text messaging is prevalent among African Americans: on average, African Americans reported sending and receiving a mean of 70.1 text messages per day (median = 20) (Smith, 2011). Text messaging does not require internet access or a smartphone, increasing feasibility of intervention delivery among lower-SES populations.

A novel text messaging intervention for smoking cessation centered on mindfulness training ("iQuit Mindfully") was developed through an iterative process with predominantly African Americans with low income (Spears et al., 2019a, 2019b). Messages were personalized, interactive, and served as an adjunct to in-person mindfulness-based smoking cessation treatment (see "iQuit Mindfully Text Messaging Program" under Methods for more details on the intervention). A pilot clinical trial supported the feasibility and acceptability of iQuit Mindfully (Spears et al., 2019b). For example, 88% of participants said that they read all or most of the text messages, 89% texted the system interactively, and program ratings were strong. Ancillary analyses suggested that the text messaging program might be particularly beneficial for lower-income adults who smoke, who tend to have fewer day-to-day resources to help them quit smoking. To inform ongoing refinement of iQuit Mindfully, participants in the pilot clinical trial (Spears et al., 2019b) engaged in individual interviews to describe their experiences and suggestions for improvement. The current study is a qualitative analysis of these interviews, which were conducted among predominantly African American adults with low socioeconomic status.

Reflexivity Statement

The research team has reflected on how our sociodemographic backgrounds may influence our data collection and interpretation. The lead author is an African American woman who is currently a Postdoctoral Fellow and was a PhD student during the time of data collection. She aims to add to existing literature on novel smoking cessation treatment among African Americans who smoke, with the ultimate goal of reducing cancer-related disparities among this priority population.

The second author is an African American woman who was in a PhD program at the time of data collection and is now an Assistant Professor; the third author is an African American woman who was in an MPH program at the time of data collection and is now a research professional; the fourth author is an Asian American woman who was in a BS program at the time and has now attained an MPH; and the senior author is a white woman faculty member with a PhD in Clinical Psychology. Interviews were conducted by racial/ethnic minority women (i.e., African American and Asian American). Due to the difference in the positionality between the research team and the participants, our team had ongoing discussions about how our backgrounds may influence our interpretations of the data.

Methods

Participants

The study was conducted in the metropolitan Atlanta, GA area. Participants for the pilot clinical trial (parent study) were recruited through flyers (e.g., at local community health centers and near train and bus stops), Craigslist, and word of mouth. Eligibility criteria included: current

smoking (≥5 cigarettes/day for past year, verified with expired carbon monoxide [CO] ≥6ppm); intending to quit within next 30 days; ages 18-65; valid address in greater Atlanta, GA; functioning telephone number; owning a mobile phone with text messaging capability, able to read, speak, and write in English; and marginal/adequate health literacy (based on Rapid Estimate of Adult Literacy in Medicine [REALM]; (Davis et al., 1991). Participants were excluded due to contraindication for the nicotine patch; past-30-day use of recreational drugs; alcohol-related problems (Spitzer et al., 1999); current diagnosis of schizophrenia or bipolar disorder, or use of antipsychotic medications; clinically significant depressive symptoms (≥3 on Patient Health Questionnaire-2 [PHQ-2]; (Kroenke et al., 2003; Löwe et al., 2005); regular use of non-cigarette tobacco products (although individuals were not excluded for use of electronic cigarettes); current use of nicotine replacement therapy or other tobacco cessation medications; pregnancy or lactation; or another household member already in this study. This study was approved by the university's Institutional Review Board, and all participants provided written informed consent.

Study Design

The current study used a grounded theory approach to describe participants' experiences with the text messaging program and developed a conceptual model to understand participants' engagement with the program. We followed established guidelines (e.g., Creswell, 2007) for conducting grounded theory research to guide the coding process of data analysis and to inform the development of the conceptual model. The emergent themes derived from the interviews informed the factors that were included in the conceptual model.

Procedures

Pilot clinical trial participants were randomly assigned to either Mindfulness-Based Addiction Treatment (MBAT; 8 weekly group sessions of mindfulness-based smoking cessation treatment; $n = 33$) or iQuit Mindfully (MBAT with the addition of between-session text messaging; see "iQuit Mindfully Text Messaging Program" below; $n = 38$). All participants also received nicotine patch therapy and self-help materials. A qualitative approach of in-depth interviews was utilized to gain an understanding of participants' experiences with the text messaging program. Only participants in the iQuit Mindfully condition are included in the current study, which focuses on experiences with the between-session text messages. See Spears et al., 2019b for more details on the parent study.

Data collection occurred one month following the last in-person treatment session. In-depth interviews were conducted in a research office located in downtown Atlanta, GA. Interviews were semi-structured with probing questions. The interview began with a general prompt, "Tell me about your experience receiving the text messages," followed by questions about what was helpful/liked and what was unhelpful/disliked. Participants were specifically asked if anything bothered them about the text messages, including concerns about privacy, other people seeing their texts, or giving their number to the research team. They were also asked about their preferred number and timing and message content (i.e., which messages were most and least helpful, suggestions for improving message content). Participants were asked whether they used the keywords CRAVE, STRESS, or SLIP (see "iQuit Mindfully Text Messaging Program" below) and their experiences with the keywords (or why they did not use them). Finally, participants were asked their suggestions for improving the text messaging program. Interviews were audio-recorded and transcribed verbatim.

Table 1

Example Text Messages from iQuit Mindfully Smoking Cessation Program

Text Message Dimension	Example Text Message
Personalized Messages	John, Today is your quit day. You can do it! Remember, your reasons for quitting are to breathe easier, have more energy to play with your daughter, and save $2,008 per year.
Interactive Mindfulness Messages	You can practice mindfulness anytime, anywhere. Just take a minute to slow down, breathe and focus. Want to try it now? Text YES or NO *If YES:* Take a 1-minute break. Take slow, deep breaths. Focus on how it feels to breathe in and out. Let yourself be right here, right now. Then text OK *After OK:* What was that like for you? *After response:* Thanks for letting us know. Do your best to practice mindfulness throughout the day. Hope you have a great day! *If NO:* No problem. Do your best to practice mindfulness throughout the day. Hope you have a great day!
Interactive Messages about Smoking Status	John, Have you smoked today? Text YES or NO *If NO:* Congrats! You've almost made it through a whole day smoke-free, John! Make some time for sitting meditation or body scan tonight before bed. *If YES:* Forgive yourself, John. You can get back on track. Throw away those cigs and call a supportive friend or family member. Text SLIP for more support.
Momentary support through keywords (CRAVE, STRESS, SLIP)	*In response to CRAVE*: Picture your craving like an ocean wave and imagine you're surfing. Even if it gets bigger, it will eventually fizzle out. Keep surfing! *In response to STRESS*: Take a break for one minute and take some deep, mindful breaths, just focusing on being right here, right now. *In response to SLIP*: Quitting is tough & mistakes are bound to happen. The important thing is to keep going. Learn from this slip. Forgive yourself. Now move on.
Appealing Imagery	
Motivational Messages, with spiritual encouragement and quotes from famous African Americans	 Look to your spiritual beliefs for comfort and strength. You might pray or read/listen to whatever is inspirational to you. "Faith is taking the first step even when you don't see the whole staircase." – Martin Luther King Jr.
Integration with other resources (e.g., MBAT group members and Tobacco Quitline)	John, tell other people that you're quitting. Who can you call or text when you're craving? *After response:* Great. Remember, you're not doing this alone. Your group members are here to support you, and you can always call 1-800-QUIT-NOW

Mindfulness-Based Addiction Treatment

Group treatment involved eight weekly 2-hour sessions of MBAT (Wetter et al., 2009). MBAT closely follows the structure of MBCT, including teaching and discussing experiences with various mindfulness practices (Segal et al., 2002), but content specific to depression is replaced with material on nicotine dependence. MBAT aims to help participants increase awareness of present-moment sensations; develop different ways to relate to these sensations (i.e., observing them without judging them as right/wrong, good/bad); and practice more skillful responses (rather than automatic reactions) to feelings, thoughts, and situations. The first four sessions aimed to help participants prepare for a quit date on session 5, and sessions 6-8 provided further support for quitting and relapse prevention.

iQuit Mindfully Text Messaging Program

Participants in the iQuit Mindfully condition received text messages on each day between MBAT treatment sessions. Messages were automated and sent via the Mobile Commons/Upland Mobile Messaging platform. The messages were designed to reinforce information and practices learned in the in-person MBAT sessions. The messages reminded participants to practice mindfulness, including reminders for informal practice (e.g., awareness of the breath throughout the day) and reminders for formal practice (e.g., sitting meditation). Text messages were personalized to include participants' first names, reminders of their personal reasons for quitting, and how much money they would save when they quit (assessed on baseline questionnaire). The texts also provided specific cessation strategies (e.g., reminders to get rid of cues to smoke, elicit social support, and use mindfulness for coping with cravings). Many of the texts were designed to be interactive in efforts to foster a sense of social support and accountability (see Table 1 for examples). They also included appealing imagery and motivation, including inspirational quotes from famous African Americans. Messages were automated and ranged in frequency from 2-3 per day to 6-7 per day. Frequency started out lower, increased around the week 5 quit day, and then gradually declined in the final weeks. Participants could also text keywords CRAVE, STRESS, or SLIP at any time to receive text message tips for managing cravings, stress, or smoking lapses (see Table 1 for examples). During the 1-month follow-up period, participants received approximately 4 texts per week and could still text the keywords.

Data Analysis

Transcripts were managed and coded using NVivo 11 (QSR International). The coding manual was developed using both inductive and deductive approaches (Ayres et al., 2003; Ryan & Bernard, 2003). First, the first and senior authors generated response categories from the questions in the interview guide (e.g., helpful aspects of messages, unhelpful/disliked aspects, suggestions for improvement). Then, five members of the research team independently read the transcripts to create a list of themes. Themes were common concepts emerging across participant interviews, which gave a richer picture of their experiences beyond what was asked in the interview guide (e.g., perceived social support). The team then collaboratively created an initial coding scheme. Next, all five coders independently coded the same interview, and the group met to review inconsistencies and further refine the coding scheme. All coders then independently coded seven interviews, with ongoing meetings to review inconsistencies and further refine the coding scheme. Once the coding scheme was finalized, the remaining transcripts were distributed amongst the coders, with regular meetings with the lead coder (first author) to discuss questions and maintain

consistency over time. Final coding determinations were made through discussion of each of the coding discrepancies between the lead author and senior author. The senior author is a clinical psychologist with expertise in qualitative methods, mindfulness interventions, mHealth technology, and smoking cessation.

Finally, the lead author and senior author collaborated to organize the themes into a conceptual model of factors related to engagement with text messaging programs for smoking cessation (Figure 1). The model is based on qualitative themes emerging from the interviews as well as our preliminary work (Spears et al., 2019a, 2019b) and extant research (e.g., Graham et al., 2016; Hoeppner et al., 2017).

Results

Participant Characteristics

Of the 38 participants in the iQuit Mindfully condition in the pilot clinical trial, 32 completed the follow-up interview and were included in the current analysis. Of these 32 adults, the majority were African American (90.6%), and 46.9% were female. Most (62.6%) reported total annual income of $30,000 or less. Mean age was 45.1 (*SD* = 12.9). Mobile phone usage was quite high among this sample (See Table 2). Among this subsample of participants in the pilot clinical trial, 24.1% (7/29) reported abstinence from smoking for at least the past 7 days, which was biochemically confirmed (expired CO < 6ppm).

Table 2

Sociodemographic Characteristics of Participants (*N* = 32)

Characteristics	
Age, *mean* (± *SD*)	45.1 (±12.9)
	n %
Female	15 (46.9)
Race/Ethnicity	
Black/African American	29 (90.6)
White	3 (9.4)
Other	0 (0)
Hispanic/Latino	1 (3.1)
Employment	
Regular full-time work (40+ hours/week)	4 (12.5)
Regular part-time work	3 (9.4)
Temporary part-time work	1 (3.1)
Self-employed	1 (3.1)
Student	2 (6.3)
Unemployed	11 (34.4)
Retired	5 (15.6)
Unable to work or disabled	5 (15.6)
Education	
Less than High school degree	6 (18.8)
High school degree or GED	7 (21.9)
Some college/technical school	10 (31.3)
Associates degree	3 (9.4)
Bachelor Degree	4 (12.5)
Some post-bac school	2 (6.3)

Graduate Degree	0 (0)
Annual Household Income	
Less than $12,000	10 (31.3)
$12,001 - $18,000	6 (18.8)
$18,001 - $30,000	4 (12.5)
$30,001 - $42,000	2 (6.2)
$42,001 - $54,000	0 (0)
$60,001 - $84,000	0 (0)
More than $84,000	5 (15.6)
Missing	5 (15.6)
Below poverty threshold	13 (40.6)

Mobile Phone Usage	*n* (%)
How often do you have your cell phone with you?	
All of the Time	29 (90.6)
Most of the Time	3 (9.4)
Some of the Time	0 (0)
Occasionally	0 (0)
Almost Never or Never	0 (0)
How often do you check your text messages?	
Immediately as the come in (or as soon as possible)	31 (96.9)
About every hour during the day	1 (3.1)
At least 4 times a day but not every hour	0 (0)
2-3 times a day	0 (0)
Once a day	0 (0)
Once every couple of days	0 (0)
Once a week or less	0 (0)
Can your cell phone access the internet?	
Yes	30 (93.8)
No	2 (6.3)
Can your phone send and receive picture text messages?	
Yes	29 (90.6)
No	3 (9.4)

Note. For all variables except age, N (%) is shown.

Qualitative Results

Overall, participants indicated the text messages were helpful in their efforts to quit smoking. One participant noted,

> *I put down the cigarettes and picked up the texts. I started reading all of them, and before I knew it, I was looking forward to them because it was a constant reminder that I was doing something right and doing something good for me, for my health* (ID 173, African American female, age 26).

Response categories (described along with themes in Table 3) were: helpful aspects of text messages (*n*=32); unhelpful/disliked aspects of text messages (*n*=20); experiences with (*n*=24) and suggestions (*n*=31) regarding keywords; links between in-person sessions and text messages (*n*=10); and suggestions for improving the text messages (*n*=24). Below we describe specific themes that emerged as participants discussed how the text messaging program affected their

experience quitting smoking as well as their daily lives more broadly. As shown in Table 3, each of these themes links to the broader conceptual model (Figure 1) which is further elaborated in the Discussion section. Aspects of iQuit Mindfully that emerged as highly related to engagement with the text messaging program in this sample included: social support, message intensity, strategies for coping with stress and craving (including mindfulness), momentary support, appealing imagery, integration with MBAT, motivational messages (including education about health effects of smoking/quitting and positive, inspirational tone), and personalization.

Figure 1

Conceptual Model of factors related to engagement with text messaging program for smoking cessation

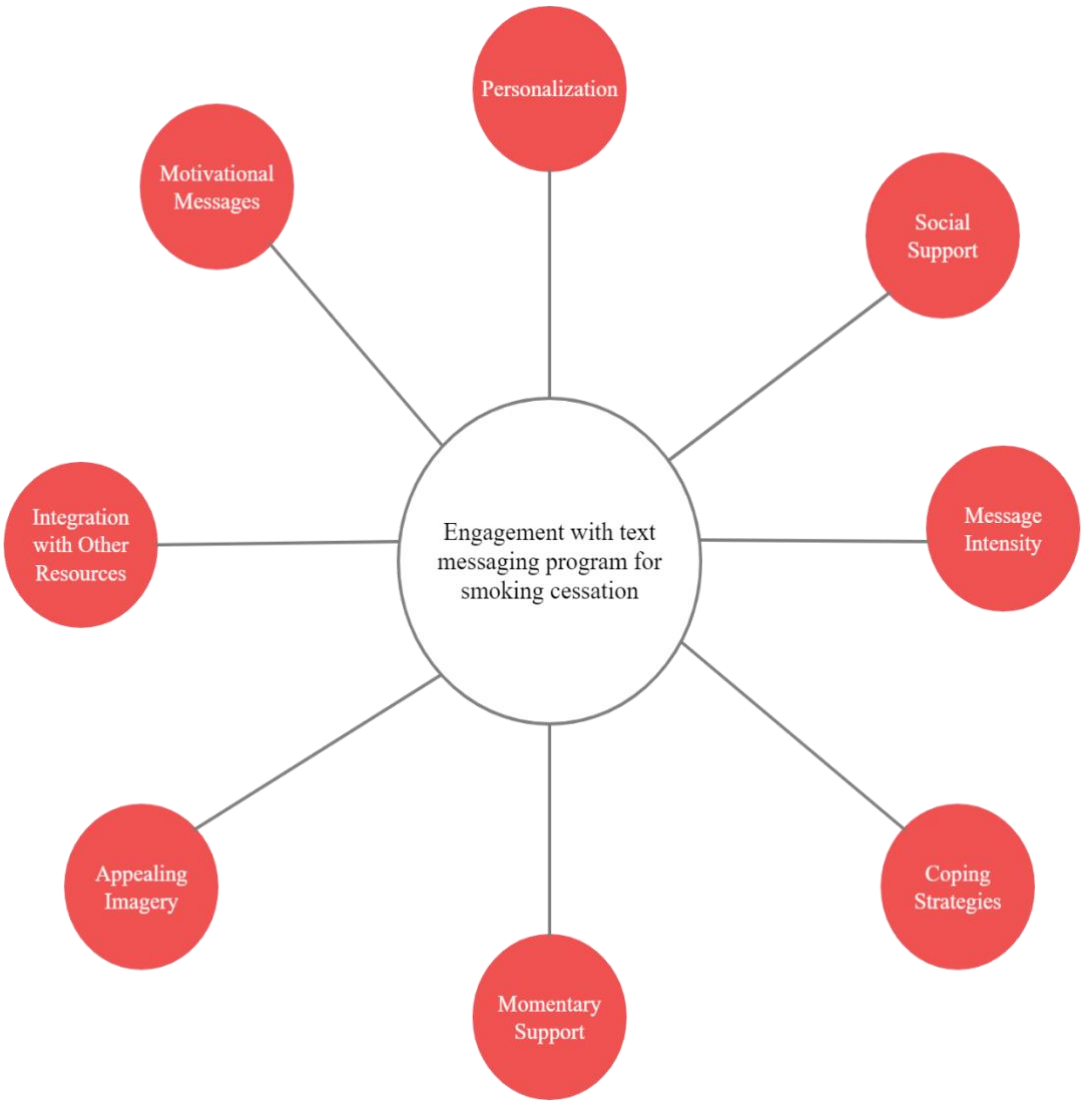

Table 3
Response Categories, Themes, and Linkage to Conceptual Model

Response Categories	Themes	Factor of the Conceptual Model
Helpful Aspects of Text Messages	• Timing of messages • Positive, uplifting tone • Perceived social support • Strategies to manage stress and cravings • Mindfulness • Personalized messages • Pictures	• Momentary support • Motivational messages • Social support • Coping strategies • Coping strategies • Personalization • Appealing imagery
Unhelpful/Disliked Aspects of Text Messages	• Too many text messages/repetitive • Not enough text messages • Not sufficiently personalized	• Message intensity • Personalization
Experiences with and Suggestions regarding Keywords	• STRESS • CRAVE • SLIP	• Coping strategies • Momentary support
Links between In-person Sessions and Text Messages	• Connections between text messages and in-person MBAT sessions	• Integration with other resources
Suggestions for Improving Text Messages	• Changes to number and timing • More personalization • More information about health effects of smoking, including fear appeals (e.g., graphic images)	• Message intensity • Personalization • Motivational messages

Helpful Aspects of Text Messages

Participants mentioned appreciating the timing of the messages; positive, encouraging tone; social support; picture messages; personalization; mindfulness; and using text messages as strategies to manage stress and cravings. Participants denied any concerns about privacy (e.g., other people seeing their texts or providing their phone number to the research team).

Timing. Participants often noted that the text messages came "right on time." For example: "Sometimes they'll catch you while you're trying to light a cigarette, and the text would show up. Then you got to put it out or don't light it." Another participant stated,

> *It seemed like the texts came right when I need it. It was right when I would feel like I might slip, or crave, I would get a text message, and it would make me think about what I was about to do.* (ID 101, African American female, age 32)

Another described how well-timed messages improved their mood: "Some days I be feelin' down and all of a sudden… there'd be a text message. It'd cheer me right on up. I looked forward to [the text messages]" (ID 130, African American male, age 59). Overall, the texts seemed to provide motivation, encouragement, and coping strategies in difficult moments when people needed support.

Positive, uplifting tone. Participants often noted the "positive," "encouraging," or "inspiring" tone of the messages. One participant said, "They inspired me. I would read them over and over during the day" (ID 137, African American female, age 59). Others mentioned that the encouraging tone helped them to avoid giving up on their goal of quitting even when they had continued to smoke:

> *What helped me even though you're still smoking, which I was… it was telling me still don't give up, still give yourself positive affirmation. Those were good affirmations even though I knew I [messed] up, they were still saying keep goin'.* (ID 107, African American female, age 36)

Perceived social support. Participants reported a sense of social support from the texts: "The fact that somebody out there seemed to care about what I was doing …. Just the support system" (ID 123, African American female, age 55). When asked what they liked about receiving the text messages, one participant responded, "They were like my friend" (ID 107, African American female, age 36**).** Another described the texts as "almost like a digital coach" (ID 170, African American male, age 52). Participants noted that the texts provided "accountability." Some described how the texts also encouraged them to seek out more social support in their daily lives:

> *Actually, it just made me wanna talk to one of my family members, and get close with them, and let them know that I'm trying to quit smoking, and maybe they can support me. That worked out fine. I started going to church then with my family.* (114, African American, male, 36)

Strategies to manage stress and cravings. One participant described:

> *I'll be feelin' myself slip up, get stressed out, and I'll be like, 'These text messages are so helpful,' cause I could be stressed out and I'll be wanting to smoke a cigarette, but I always get that encouragement, and it makes me feel a lot better, like I can go throughout my day.* (ID 140, African American female, age 24)

Participants also indicated using the strategies to manage craving:

> *I remember one particular time I was getting ready to light a cigarette and a text message came up about mindful thinking, and I just put the cigarette down and just did it, and the craving went away.* (ID 155, African American female, age 59)

Mindfulness. Participants indicated that text messages encouraging mindfulness practice were helpful. For example, a participant stated:

> *The ones that said 'STOP' (i.e., "Stop, Take a Breath, Observe, Proceed" mindfulness practice that was taught in group), and the ones that encourage you to take a moment to do some mindful breathing. Those were the best ones for me."* (ID 152, African American female, age 64)

Another indicated that the messages encouraging mindfulness practice, with the request to reply to the text after doing so, were helpful: "Do a mindful meditation for three minutes and text back once you do it. Those were good 'cause it made you feel accountable" (ID 152, African American female, age 64). Participants noted the benefits of mindfulness for managing cravings: "During the day as I get cravings or urges and I'd think about smoking, I would practice the body scan. For the most part, those craving and urges would go away when I'd do the body scan." (ID 126, African American male, age 51). Furthermore, participants described the benefits of mindfulness in their overall lives: "I was just maybe more aware—the mindfulness made me more aware of actions, and things I do" (ID 123, African American female, age 55). One participant reported:

> *I think that mindfulness helps in all areas of life, no matter what our struggles are, no matter where we are. It helps with regulating emotions. It helps with responsiveness to situations and so that you're more appropriate. I think it helps to be really in the moment with things. Most people live in the past or the future, and we really only have present.* (ID 117, white female, age 54)

Overall, participants seemed to appreciate short, accessible mindfulness practices that could be incorporated into daily life (e.g., the STOP exercise, 1- to 3-minute meditations, awareness of breathing in the midst of routine activities).

Personalized Messages. Participants appreciated the personalized aspects of the text messages: "They were really helpful… because you personalize them. You made the person feel like you were talking to them directly" (ID 146, African American male, age 48). Participants indicated that the personalized reminders of reasons for quitting and amount of money to be saved were especially helpful (e.g., "I received the text messages that estimated the amount of money that I would save in a year. I looked at that text message, and it really inspired me not to smoke because I was like, Wow," (ID 114, African American male, age 36). When asked which messages were most helpful, one participant answered:

> *[John], remember your reasons for quitting, your time, your money, and your health. I memorized that, 'cause that's the one I would say to myself all the time. It kind of made me strong, so I'm like, 'I'm in this, and I'm gonna win it.'* (ID 119, African American female, age 43)

Participants noted that in the midst of daily life, it was motivating to be reminded of exactly how much money they would save by quitting.

Pictures. Participants particularly enjoyed the messages containing pictures. When asked which text messages were most helpful, one participant stated, "The little pictures that they send … telling you about the air and how fresh, and it's like a mind-opener. I liked that. It helped to begin your day off a good start. I love those" (ID 110, African American female, age 56). Another described, "When I received a couple of [text messages] to practice my mindfulness, then I received pictures of the sky with the mountains. I love those pictures…. It was so calming" (ID 160, African American female, age 56). Appealing images may be particularly memorable for participants, and some noted that they appreciated scrolling through the past pictures that had been sent.

Unhelpful/Disliked Aspects of Text Messages

Most participants indicated that there was not anything unhelpful or disliked about the text messaging program: "[The text messages] were perfect to me. Don't change nothing. They were right to the specific point about craving, about stress, about everything that an individual goes through on a daily basis. They were right on point" (ID 129, African American male, age 48). Of those who did report things they disliked, the most common responses were receiving too many and/or repetitive messages or not receiving enough messages. Nine participants stated the amount of the text messages were "too much," six participants stated that they received "too few," and 17 participants felt that the amount of text messages were "just right."

Another common theme was that the texts were not sufficiently personalized.

Too many messages/repetitive. Some mentioned that there were too many text messages or that they became repetitive or bothersome (e.g., "They just came in a little too much. I might be busy or somethin'… I felt myself sometimes being annoyed by 'em," ID 101, African American female, age 32). Others noted that the texts came at inconvenient times (e.g., while they were at work or in the middle of a meal).

Not enough text messages. Conversely, some participants indicated that they did not receive enough text messages, especially on and around the quit date (e.g., "It wasn't enough. I wish I could've gotten more," ID 130, African American male, age 59). Several mentioned that they did not like that the number of texts declined during the one-month follow-up period. For example:

> *When the texts decreased, I've found myself wishing I had the abundance that they were before and then every now and then will get a text, and I'm like, 'Yeah, I forgot about this.' Then I'll say, 'I wish I got them more.'* (ID 173, African American female, age 26)

Another participant indicated, "After the study was over, I was like, 'Where's my text messages?' I got a few, but it really decreased…. I had gotten used to 'em" (ID 123, African American female, age 55). Although it may be difficult to make the number and timing of messages personalized to individual preferences and schedules in an automated program, we have attempted to improve this aspect in later iterations (see Discussion).

Not sufficiently personalized. Although many participants appreciated that the program was somewhat individualized, several reported that the texts felt automated. One participant said, "It doesn't feel personalized like a human touch" (ID 170, African American male, age 52). Another indicated, "It was obvious I was talkin' to a robot, and I don't like talkin' to robots or a computer" (ID 153, African American male, age 26).

Experiences with and Suggestions regarding Keywords

Overall, participants reported positive experiences with the CRAVE, STRESS, and SLIP keywords. When asked what was helpful about them, one participant stated, "Just to know that I could [*text a keyword*] and get a message instantly and get some support instantly. I think that was a big thing for me, that instant support" (ID 119, African American female, age 43). A common suggestion was to provide more frequent reminders of what the keywords were (this could be done during the in-person treatment groups and/or through text messages), as several participants forgot the specific keywords.

CRAVE. An example quote about the CRAVE keyword was: "When I was craving, I received a text message back instantly telling me to just take a deep breath and do this or do that to get my mind off of that craving for that slight moment, so it was good" (ID 111, African American female, age 23).

STRESS. Participants noted that the STRESS keyword was helpful; for example:

"I did text STRESS, and I received the most comforting text back. It told me to take a minute to myself, even if it's nothing but three to five minutes, to focus on what's goin' around, what I'm doin', and to practice the breathing" (ID 110, African American female, age 56).

SLIP. An example quote about the SLIP keyword was:

"They let me know I'm not by myself. Don't give up. Don't quit. It gives me confidence. I'm not there by myself out there. That's the main one I used to love, the SLIP, 'cause they always let you know an alternative. Don't quit. Keep going" (ID 135, African American male, age 57). Another said, "I texted SLIP, and the message just made me feel better. I felt kind of bad about myself, but after the message, I was like, 'Okay. I can start over. I can do this" (ID 119, African American female, age 43).

Links between Text Messages and In-Person Sessions

Although participants were not explicitly asked about connections between the text messages and their in-person MBAT sessions, several commented on this. Participants noted that the texts reminded them of information from MBAT groups (e.g., "Yeah, [t*he text messaging program*] was supportive. The fact that it just reminded me of everything that I have back here in the program," ID 163, African American male, age 22). Some stated that the texts helped them to bring what they had learned in group to the outside world: "I really liked [*the texts*]. Because as you leave here from group, it's not that good, comfortable place that you was—once you hit the streets, it's chaos. Your mind just wanders" (ID 110, African American female, age 56). Participants said the text messages helped them to feel greater connection to the group instructor and fellow group members (e.g., "Reiterating the support of my other group members. It felt good to know that you're not in it alone," (ID 170, African American male, age 52); "It reminded me that I am in this group and that people wanna stop smoking cigarettes with me." (ID 163, African American male, age 22).

Suggestions for Improving Text Messages

As briefly described above, the most common suggestions were to change the number and/or timing and incorporate more personalization. However, participants also suggested providing more information about dangers of smoking and offered detailed suggestions regarding text number, timing, and personalization.

Changing number and timing of text messages. Participants' suggestions for number and timing varied drastically. Some suggested 2-3 messages per day, while others suggested 10-15 or more each day. Participants also offered suggestions regarding time of day, with some preferring more texts in the mornings vs. evenings and others preferring specific times of day (e.g., upon wakening, after meals, based on work schedules). Overall, the primary suggestion was to individualize the number and timing (e.g., "Customize it to that person's day. 'Cause I know that there are times I'm most vulnerable, or most busy where I can't look at [the texts]," (ID 117, white female, age 54).

More personalization. Participants emphasized that message content should be more personalized: "I think that they should say something that you can't find on the Internet, something

creative, something that makes it feel personalized" (ID 173, African American female, age 26). Specific suggestions included tailoring to particular triggers: "If you're goin' out to an event, and you know that you're gonna be around people who are smoking or something that triggers it, you should get texts geared towards that, if you're at a party or something" (ID 162, African American male, age 32). Participants also suggested sending text message reminders of personal reasons for quitting every day rather than more sporadically.

More information about health effects of smoking. Participants made suggestions like, "More messages about what smoking does to the body…If I was constantly seeing what my behavior was doing, it would make me think more about what I was doing" (ID 117, white female, age 54). They suggested including pictures (e.g., "…if you get pictures of people that have quit and saw how they were before they quit, sickly or something. And then you see them improve in their health. Pictures like that could probably be more encouraging too. Before and after," (ID 126, African American male, age 51). Participants commonly suggested incorporating fear appeals (e.g., "Some very educational and some scary," (ID 111, African American female, age 23), including graphic images (e.g., "Like the commercials on TV… talk about cancer, and show 'em that they got holes in throat, and teeth fell out of their mouth," (ID 110, African American female, age 56).

Discussion

This study examined experiences with iQuit Mindfully, a mindfulness-based text messaging program for smoking cessation, among predominantly African American adults with low socioeconomic status. Goals were to identify the most helpful aspects of the program and suggestions for improvement. Specific helpful aspects included the timing (e.g., right when they were craving or about to smoke), positive tone, social support, personalization, and mindfulness. Suggestions were to add more personalization and more information about health effects of smoking. These suggestions are now being incorporated into the next version of iQuit Mindfully, and the results could also inform other mindfulness and text messaging-based cessation interventions for disadvantaged populations.

Drawing from our qualitative findings, conceptual model (Figure 1), and extant research we will elaborate on several factors related to engagement with the text messaging program among low income and African American adults. First, s*ocial support* has been a common theme in qualitative studies of text messaging programs for smoking cessation (e.g., Davis et al., 2014; Douglas & Free, 2013; Grau et al., 2017; Granado-Font et al., 2018; Spears et al., 2019a, 2019b). On one hand, it is surprising that participants feel such social support from an automated technology program without a "real person" on the other side. However, text messaging seems to be a natural platform to instill a sense of social support and accountability, since participants are used to texting with friends and loved ones in their daily lives. Although social support for quitting smoking is important across various populations, low-SES individuals tend to experience higher levels of stress, more pro-smoking social context (Cambron et al., 2020), have lower interpersonal resources (Matthews & Gallo, 2011; Matthews et al., 2010), and report lower support for quitting smoking (Businelle et al., 2010). Text messaging may be one promising way to provide support to individuals with lower socioeconomic resources who engage in smoking.

Message intensity was critically important to participants in the current study. Although most participants were satisfied with the number of messages, some wanted more and some wanted less. It may be difficult to strike a balance between providing a sufficient "dose" of the intervention without irritating some who are bothered by frequent messages, or even stimulating urges to smoke (Douglas & Free, 2013; Grau et al., 2017). Based on this, we recently revised iQuit Mindfully to allow participants to choose from several message frequencies and to change the frequency as

needed throughout the course of the program.

Encouraging *strategies for coping with stress and craving* is a key goal of most text messaging programs for smoking cessation, and this may be particularly important given higher levels of stress among low-SES and racial/ethnic minority populations. Notably, the current sample of predominantly African American adults with low socioeconomic status found practicing mindfulness to be beneficial for quitting smoking as well as managing stress in other areas of their lives. This is consistent with previous studies indicating that mindfulness practice is perceived as beneficial to mental and physical health among people with low income and African American adults (Spears et al., 2017; Woods-Giscombé & Gaylord, 2014). Research suggests that mindfulness intervention can serve as a buffer against the health effects of stress (Creswell & Lindsay, 2014). Mindfulness practice can be done anytime, anywhere (e.g., simply paying attention to one's breath throughout the day), which may be feasible for people with low resources and high-stress situations (Spears, 2019). Future research might examine mindfulness and/or mHealth strategies for coping with specific stressors known to impede smoking cessation in African American populations, such as racial discrimination (e.g., Webb Hooper et al., 2020).

Text messaging interventions may be a powerful tool for providing *momentary support* (i.e., just-in-time support in the context of high-risk situations in daily life). iQuit Mindfully participants appreciated that they could text CRAVE, STRESS, or SLIP any time of day to receive an immediate message. This is an important resource that people can use in the middle of the night, or even in the midst of a high-risk situation (e.g., a party or being around others smoking) where they might not be able to call for support.

iQuit Mindfully includes picture messages (*appealing imagery*) because this was a specific suggestion of participants with low income and African American participants in our early formative work (Spears et al., 2019a). Extant research suggests that pictures may increase message receptivity (Manno et al., 2018; Noar et al., 2018). Appealing images may promote engagement with text messaging programs, and visuals might be especially useful for participants with lower literacy levels. More research is needed to examine which types of images are most motivating and impactful for promoting smoking cessation among people with low income and African American adults.

In terms of *integration with other resources*, iQuit Mindfully was initially implemented as an adjunct to in-person treatment. The between-session text messages reminded participants of the mindfulness techniques learned during in-person MBAT sessions. Participants indicated that the texts helped them to practice these strategies in their daily lives and feel a greater connection with their group instructor and fellow group members. Although the use of text messaging to enhance in-person mindfulness treatment for smoking cessation is novel, at least one study has examined text messaging as an adjunct to in-person smoking cessation treatment. Yingst et al. (2018) study included three brief sessions in a family practice setting and pharmacological treatment with varenicline. No difference was observed in abstinence rates between participants who received text messages and the control group, but those who received text messages were more likely to recommend the program to others and engage in positive smoking cessation activities than controls. Taken together, our findings and those of Yingst et al. (2018) support the promise of implementing text messaging programs in combination with in-person cessation treatment. Research also supports the use of text messaging for improving engagement with depression treatment (Aguilera et al., 2017) and obesity treatment (Woolford et al., 2010; Li et al., 2020). Text messaging might be a promising and relatively low-cost method for enhancing other types of in-person interventions. Text messaging could also be a useful modality to increase engagement with other resources like web-based smoking cessation interventions (Graham et al., 2020).

iQuit Mindfully involved *motivational messages* in the form of education about health risks of smoking and benefits of quitting, inspirational quotes (with emphasis on quotes from inspiring African Americans), and generally setting a supportive, non-judgmental tone. Given the high rates of lapse and relapse in the context of smoking cessation, particularly for low income and African American populations (Babb, 2017), providing encouragement to forgive oneself and get back on track after a lapse is critical. Based on participants' requests for more information about the health effects of smoking, we have recently added a "FACT" keyword to iQuit Mindfully.

Participants in the current study commonly discussed the importance of *personalization* – both in terms of what they appreciated about iQuit Mindfully (e.g., reminders of personalized reasons for quitting and money to be saved) and in their suggestions for improvement. Personalized technological interventions have been found to be more effective than generic interventions when implemented across a range of health behaviors (Cugelman et al., 2011; Head et al., 2013; McCoy et al., 2017; Sahin et al., 2019). iQuit Mindfully participants emphasized the importance of individualizing the number and timing of text messages. Allowing participants to choose and change their message schedule as needed might also be a way to support participants' autonomy and provide them with the right intensity throughout their process of quitting smoking.

Although not uncommon for qualitative research, the current study is limited by a relatively small sample size. Moreover, results may not generalize to populations excluded based on our eligibility criteria (e.g., people who have mental health comorbidities or use multiple types of combustible tobacco products) or populations that differ from our sample in terms of socioeconomic status, race/ethnicity or other factors. Additionally, social desirability may have influenced participants' responses, even though the interviewers emphasized wanting to hear both positive and negative opinions. This study only examined participants' subjective perceptions about the effectiveness of the text messages. Experimental studies to systematically investigate the effects of specific factors (e.g., the extent to which text messages are individually tailored; focus on mindfulness versus other strategies) on smoking cessation would be useful. Future studies could examine the efficacy of iQuit Mindfully for smoking cessation, both as an adjunct and standalone treatment, as well as individual differences (e.g., text messaging habits, level of nicotine dependence) that might moderate the efficacy of text messaging programs for smoking cessation. Despite limitations, this study is strengthened by in-depth qualitative examination of experiences with a novel text messaging program among the priority population of African Americans with low income who engage in smoking.

Overall, these qualitative findings, in combination with quantitative data from the parent trial (Spears et al., 2019b), suggest that text messaging is acceptable and feasible for enhancing mindfulness-based smoking cessation treatment among predominantly African American adults with low socioeconomic status. Participants indicated positive experiences with the text messages and reported that the encouragement, social support, and specific strategies offered were useful in their attempts to quit smoking. Participants' suggestions are being incorporated into the next version of iQuit Mindfully (e.g., Mhende et al., 2021). The COVID-19 pandemic has further heightened awareness of the need for mHealth interventions when in-person treatment is not feasible. Many health promotion programs have pivoted to virtual delivery during this time, and it is likely that this trend will continue beyond the pandemic. Text messaging could be a cost-effective method for virtually delivering mindfulness-based or other health promotion interventions for populations with limited resources.

Implications

- A text messaging-enhanced mindfulness program was acceptable and feasible among predominantly African American adults with low socioeconomic status.
- Health promotion efforts might utilize text messaging as a cost-effective method of delivering mindfulness-based treatment among underserved populations.
- Based on participant responses, factors such as momentary support and personalization may help to make a text messaging program engaging for smoking cessation.

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Conflict of Interest

The authors declare that they have no conflicts of interest.

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Notes on Contributors

Dr. Cherell Cottrell-Daniels has seven years of experience in public health in the areas of health disparities, program development, program implementation, and program management. In her current position as a Postdoctoral Research Fellow at Moffit Cancer Center, her research focuses on tobacco cessation among minority and special populations. Dr. Cottrell-Daniels is particularly interested in utilizing mixed methods to understand stressors and protective factors as they relate to marijuana and tobacco co-use among these priority populations. Her work aims to promote tobacco cessation; eliminate tobacco-related cancer health disparities among underserved populations; and to develop culturally relevant interventions.

Dr. Dina M. Jones is an Assistant Professor in the Department of Health Behavior and Health Education in the Fay W. Boozman College of Public Health at the University of Arkansas for Medical Sciences. Dr. Jones' primary research interests include investigating the role of tobacco product characteristics and social-environmental and psychosocial factors as contributors to tobacco use and tobacco-related health disparities among socially disadvantaged groups. Dr. Jones aims to use her research to inform regulations and technology-supported observational studies and interventions to increase successful smoking cessation and reduce tobacco-related disparities among populations disproportionately burdened by tobacco use.

Ms. Sharrill A. Bell earned her MPH with a concentration in Health Promotion and Behavior at Georgia State University School of Public Health in May 2018. She has spent the last five years working in clinical research coordinating studies with a focus on participant retention and program implementation. She is passionate about minority health and working to eliminate health disparities and reducing barriers to care.

Ms. Maitreyi Bandlamudi started her public health training at Georgia State University where she received her Bachelor of Science. While at GSU, she assisted with mindfulness-based smoking cessation research. She then went on to complete her MPH in 2019 at Boston University focusing on Health Policy and Law with a sub concentration in Human Rights and Social Justice. She now works in the Healthcare Industry in the New England area.

Dr. Claire A. Spears is an associate professor in Health Policy & Behavioral Sciences in the School of Public Health at Georgia State University. Dr. Spears' research focuses on interventions to reduce health risk behaviors and enhance quality of life in underserved populations. She is particularly interested in mindfulness-based approaches and understanding the mechanisms through which these practices promote healthier behaviors—for example, smoking cessation, lower alcohol use, and healthier diet. Her work aims to promote health equity for underserved communities; expand the study of mindfulness to more diverse populations; and leverage mobile health technology (mHealth) for scalable, just-in-time interventions.

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