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Original Investigation

The Put It Out Project (POP) Facebook Intervention for Young Sexual and Gender Minority Smokers: Outcomes of a Pilot, Randomized, Controlled Trial

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Abstract

Introduction: This trial investigated whether a Facebook smoking cessation intervention culturally tailored to young sexual and gender minority (SGM) smokers (versus non-tailored) would increase smoking abstinence.

Methods: Participants were 165 SGM young adult US smokers (age 18–25) recruited from Facebook in April 2018 and randomized to an SGM-tailored (POP; $N = 84$) or non-tailored (TSP-SGM; $N = 81$) intervention. Interventions delivered weekly live counseling sessions and 90 daily Facebook posts to participants in Facebook groups. Primary analyses compared POP and TSP-SGM on biochemically verified smoking abstinence (yes/no; primary outcome), self-reported 7-day point prevalence abstinence (yes/no), reduction in cigarettes per week by 50+% from baseline (yes/no), making a quit attempt during treatment (yes/no), and stage of change (precontemplation/contemplation vs. preparation/action). Supplemental analyses compared POP to two historical control groups.

Results: POP participants were more likely than TSP-SGM participants to report smoking abstinence at 3 (23.8% vs. 12.3%; OR = 2.50; $p = .03$) and 6 months (34.5% vs. 12.3%; OR = 4.06; $p < .001$) and reduction in smoking at 3 months (52.4% vs. 39.5%; OR = 2.11; $p = .03$). Biochemically verified smoking abstinence did not significantly differ between POP and TSP-SGM at 3 (OR = 2.00; $p = .33$) or 6 months (OR = 3.12; $p = .08$), potentially due to challenges with remote biochemical verification. In supplemental analyses, POP participants were more likely to report abstinence at 3 (OR = 6.82, $p = .01$) and 6 (OR = 2.75, $p = .03$) months and reduced smoking at 3 months (OR = 2.72, $p = .01$) than participants who received a referral to Smokefree.gov.

Conclusions: This pilot study provides preliminary support for the effectiveness of a Facebook smoking cessation intervention tailored to SGM young adults.

Implications: SGM individuals have disproportionately high smoking prevalence. It is unclear whether smoking cessation interventions culturally tailored to the SGM community are more effective than non-tailored interventions. This pilot trial found preliminary evidence that an SGM-tailored Facebook smoking cessation intervention increased reported abstinence from smoking, compared to a non-tailored intervention.

Trial Registration: NCT03259360.

Introduction

While progress in prevention and cessation treatment has been made, tobacco smoking remains the leading cause of preventable death in the United States.[1] Smoking prevalence is especially high among sexual and gender minority (SGM) individuals (i.e., those who are not heterosexual and/or do not identify with their sex assigned at birth). Past-month smoking prevalence among homosexual and bisexual young adults ranges from 27.5% to 34.8%, compared with 18.5% for heterosexual young adults.[2] Although SGM individuals are, on average, significantly more willing than their non-SGM peers to access substance use treatment,[3] they face significant barriers to treatment participation (e.g., dissatisfaction with available healthcare, lack of affordable care).[4–6] Effective smoking cessation interventions are especially needed for SGM young adults, as young adults are less likely than older adults to engage in smoking cessation treatment.[7]

SGM smokers report preference for smoking cessation interventions culturally tailored to the SGM community.[8,9] However, evidence for the superiority of SGM-tailored interventions over non-tailored interventions is inconsistent.[10] In trials of smoking cessation programs tailored to gay men[11,12] and to the broader SGM community,[13–15] abstinence rates were comparable to those of non-SGM tailored smoking cessation treatments in the United States[16] and the United Kingdom.[17] These earlier evaluations were of programs that involved face-to-face sessions, which young adult smokers rarely utilize.[18] In contrast, social media offers a novel way to reach young SGM smokers by creating a safe space to share experiences with similar individuals, regardless of their geographic location.[19,20] The earlier studies also targeted SGM smokers who were ready to quit, whereas interventions targeting motivation among those not ready to quit may engage a broader group.[21] Importantly, most previous studies did not include a comparison group. Only one study[15] compared tailored and non-tailored interventions. Significant differences were not found; however, the tailored intervention was perceived more positively. Additional comparative tobacco treatment research trials focused on SGM smokers are needed.

We previously reported the short-term efficacy of the Tobacco Status Project (TSP), a randomized controlled trial of a smoking cessation intervention delivered through Facebook to young adult smokers aged 18–25 years.[22] Compared with referral to the smoking cessation website Smokefree.gov, intervention participants were 2.5 times more likely to achieve self-reported abstinence from tobacco at the end of the 90-day intervention. This difference, however, did not persist past the end of the intervention. SGM participants in this trial did not significantly differ from non-SGM participants in self-reported abstinence,[22] although the study did not address the potential added benefits of an SGM-tailored intervention.

The present pilot study, conducted in a sample of SGM young adults, tests the primary hypothesis that participating in the Put It Out Project (POP), a Facebook smoking cessation intervention culturally tailored to SGM young adults, would result in greater likelihood of biochemically verified abstinence from smoking than participating in the non-tailored Tobacco Status Project with other SGM young adults (TSP-SGM). Secondary outcomes include self-reported abstinence, reduced smoking, readiness to quit, and making a quit attempt. SGM smokers have identified all-SGM group membership as a key benefit of an SGM smoking cessation program.[8,23] As such, we conducted supplemental analyses comparing primary and secondary outcomes between participants in the POP intervention group and participants in two historical control groups. Participants in both historical control groups were SGM young adults participating in the RCT of the original TSP intervention, which recruited a general population of young adult smokers. Thus, the groups were a mix of SGM and non-SGM young adults (TSP-Mixed) or a referral to Smokefree.gov (Referral). The TSP-SGM and TSP-Mixed interventions differed only in group membership (SGM-only versus SGM and non-SGM). The combination of primary and supplemental analyses allowed us to examine the effects of both SGM tailoring and SGM group membership.

Methods

SGM young adult smokers in the United States who varied in readiness to quit smoking were recruited online for a randomized controlled trial of a 90-day smoking cessation intervention conducted entirely on Facebook (ClinicalTrials.gov: NCT03259360). Participants were randomly assigned to the SGM-tailored intervention (experimental condition: POP) or non-tailored intervention (control condition: TSP-SGM; see Supplementary Figure S1). Survey and remote biochemical verification assessments were completed at baseline, 3 months (end of treatment), and 6 months. This study was approved by the University of California, San Francisco Institutional Review Board. Informed consent was obtained from all participants. Participants in the historical control groups were young adult smokers (both SGM and non-SGM) in the United States, recruited for a separate randomized controlled trial of a 90-day Facebook smoking cessation intervention (TSP; ClinicalTrials.gov: NCT02207036). Participants were randomized to conditions within the present trial and within the historical control group trial but were not randomized between trials. The protocol and results of the historical comparison condition trial are reported elsewhere.[24,25]

Participants and Recruitment

We recruited SGM young adult smokers in April 2018 using a targeted Facebook advertising campaign. Facebook ads were targeted toward SGM smokers using rainbow imagery and keywords such as "LGBT".[26] Clicking on an advertisement directed participants to the study description and eligibility survey. Inclusion criteria were (1) English literacy, (2) age 18–25, (3) self-identification as SGM, (4) using Facebook at least 4 days/week, and (5) smoking at least 100 cigarettes in their lives and currently smoking at least 1 cigarette per day, 4+ days per week. Electronic consent was obtained from eligible individuals using Qualtrics survey software. Three multiple-choice questions confirmed understanding of study commitments. Age eligibility was verified using participants' Facebook profiles and/or photo IDs;[24] consented and verified participants received an email link to the baseline assessment.

Following completion of the baseline survey, participants were randomized to receive the SGM-tailored (n = 84) or non-tailored (n = 81) intervention using a blocked random assignment sequence generated by the study biostatistician (KD). Randomization was stratified by daily smoking status (yes/no) and stage of change for quitting smoking (ready to quit smoking in the next 30 days or not ready). The principal investigator (DR) held the randomization

table and reported group assignment to study staff after each participant completed the baseline assessment. The sample size for this pilot trial was determined by feasibility. Participants were placed in Facebook groups based on their readiness to quit smoking, with those reporting readiness to quit in the next 30 days placed in "Getting Ready" groups and others placed in "Not Ready" groups. Participants received one $20 Amazon gift card per assessment (baseline, 3, and 6 months), a $20 bonus gift card for completing all 3 assessments, and up to $90 in gift cards for commenting on all (or nearly all) of Facebook posts each month, for a total possible incentive of $170.

Interventions

Both the culturally-tailored POP intervention and the TSP-SGM non-tailored intervention took place within "secret" Facebook groups (i.e., entirely private groups for which the existence is not visible to nonmembers) and the content was tailored to individual participants' readiness to quit smoking (i.e., ready to quit in the next 30 days or not ready to quit in the next 30 days). Both interventions were 90 days in duration and structurally identical (i.e., daily Facebook posts by study staff and weekly "The Doctor Is In" live group chat sessions).

Daily posts were designed using evidence-based strategies for smoking cessation from the US Clinical Practice Guidelines[16] and the Transtheoretical Model of behavior change.[27] Each post contained an image and text, including a question to prompt participant responses. Participants were encouraged to comment on each post. "The Doctor Is In" live sessions gave participants the opportunity to chat with a PhD-level smoking cessation counselor using Facebook commenting features. Each hour-long session opened with a prompt, and interested participants could respond to the prompt or ask other questions and receive information and support. Counselors were trained in motivational interviewing and smoking cessation. More details about the TSP intervention are reported elsewhere.[24]

POP was similar in structure to TSP-SGM, but culturally tailored to the SGM community. As a culturally-tailored intervention,[28] POP content reflected the characteristics of the target population (i.e., SGM young adults).[29] Surface-level tailoring[30] was accomplished using pictures of SGM individuals and couples, as well as symbols and terms that are meaningful to the SGM community (e.g., the rainbow, pride). Deep-level tailoring[30] involved discussions of SGM community issues relevant to smoking. Examples include Big Tobacco's targeted advertising, coping with prejudice and discrimination, and the prevalence of smoking in SGM social spaces like bars and nightclubs. Intervention content was developed and revised through formative work, including online focus groups[23] and usability testing.[31] Additionally, the counselor for the POP intervention live sessions introduced herself as a member of the SGM community in the first session and referred to the SGM community regularly in subsequent sessions.

Measures

Baseline Measures

Relevant baseline measures included the usual number of cigarettes per day, daily smoking (yes/no), stage of change for quitting smoking (precontemplation, contemplation, preparation), and demographic characteristics (i.e., age, sex at birth, race/ethnicity, region of the United States). In the present trial, wherein all participants were SGM, sexual identity was coded as "gay man," "lesbian woman," "bisexual and/or pansexual," and "other." Gender identity was coded as "cisgender," "transgender," or "non-binary." Measurement and coding details were reported previously.[32] In the TSP trial, from which the historical control groups were drawn, response options for sexual identity were, "straight (heterosexual)," "lesbian/gay (homosexual)," "bisexual," or "not listed (please specify)." Response options for gender identity were "male," "female," or "transgender." Participants were considered SGM if they identified as a sexual minority (lesbian/gay, bisexual, or not listed) and/or transgender.

Primary Outcome

The primary outcome was biochemically verified abstinence from smoking cigarettes. Participants who indicated that they had smoked zero cigarettes in the past 7 days were mailed a saliva cotinine test kit (a valid and reliable method of determining nicotine exposure).[33] Participants were instructed to electronically send two photos to study staff: one of them spitting into the testing tube and one showing the test kit results. Cotinine levels of less than 10 ng/mL were considered indicative of abstinence. Cotinine levels of 11–30 ng/mL were considered indicative of abstinence when the participant reported abstinence from all tobacco except use of an e-cigarette to quit smoking.

Secondary Outcomes

Secondary outcomes included: (1) self-reported 7-day abstinence (yes/no), (2) reduction in cigarettes per week by at least 50% since baseline (yes/no), (3) presence of a 24-hour quit attempt during treatment (yes/no), and (4) stage of change for quitting smoking (precontemplation, contemplation, preparation, action/maintenance).

Intervention acceptability and engagement.

Seven items assessed whether the intervention was easy to understand, gave sound advice, gave participants something to think about, and helped them to be healthier, as well as whether they used the information, thought about the information, and would recommend the intervention (1 = strongly disagree, 4 = strongly agree; dichotomized into disagreement/agreement).[34] Comment volume (i.e., total number of comments a participant posted on Facebook during the 90-day intervention) was used to measure engagement. Comment volume included comments on the study posts, live counseling sessions, and other users' posts.

Statistical Analysis

POP was compared with three control conditions (TSP-SGM, TSP-Mixed, and Referral) in two sets of analyses. Primary analyses compared conditions in the present trial (POP and TSP-SGM), while supplemental analyses compared POP participants from the present trial with SGM participants in two control conditions from the TSP trial (TSP-Mixed and Referral).

Primary Analyses

Pearson's chi-square tests compared primary and secondary outcomes at both 3 months and 6 months among participants in the present trial, who were randomized to POP or TSP-SGM. The primary outcome analysis compared biochemically verified abstinence from smoking (yes/no) between POP and TSP-SGM at 3- and 6-month follow-ups. Secondary outcome analyses consisted of

Pearson's chi-square tests comparing POP and TSP-SGM groups on all secondary outcomes. Acceptability of the intervention content was compared across conditions using a Pearson's chi-square test for each acceptability item (strongly disagree to disagree/agree to strongly agree). Comment volume was compared between groups using an independent samples t-test. Because this is pilot work, we did not control for Type I error, but we distinguish between primary and secondary outcomes.

Supplemental Analyses

Because supplemental analyses compared groups across studies, participants were not fully randomized to conditions. Therefore, we tested for between-group differences in baseline smoking characteristics using one-way ANOVAs and Pearson's chi-square tests. We adjusted all subsequent analyses for cigarettes per day due to significant baseline differences. Logistic regression analyses with planned contrasts were used to analyze differences in primary, secondary, and acceptability outcomes at both 3 months and 6 months between POP intervention participants and SGM participants in two historical control groups from the TSP trial: (1) TSP-Mixed (i.e., TSP treatment Facebook groups with both SGM and non-SGM participants) and (2) Referral (i.e., referral to the NCI Smokefree.gov website). A one-way ANOVA compared comment volume between POP and TSP-Mixed. Details on the protocol[24] and main outcomes[25] for the TSP trial (TSP-Mixed and Referral conditions) are available elsewhere.

Results

Participant Characteristics

Participant characteristics are summarized for all four conditions in Supplementary Table S1. Sexual identity of participants in the present trial was 56% (n = 93) bi/pansexual, 18% (n = 29) gay, 18% (n = 30) lesbian, and 8% (n = 13) other (e.g., asexual, queer). Gender identity was 52% (n = 86) cisgender, 18% (n = 29) transgender, and 30% (n = 50) non-binary. Cross-tabulations of sexual and gender identity in the present trial were reported previously.[32] In the historical control conditions, participants were 0.7% straight (n = 1), 27.4% lesbian/gay (n = 37), 63% bisexual (n = 85), and 8.9% other sexual identity (n = 12). Gender identity of the historical control group sample was 65.9% (n = 89) female, 31.9% (n = 43) male, and 2.2% (n = 3) transgender. POP participants smoked significantly fewer cigarettes per day at baseline than TSP-Mixed (p = .004) or Referral (p = .01) participants; therefore, supplemental analyses adjusted for baseline cigarettes per day.

Primary Analyses

Descriptive and inferential statistics are presented in Table 1.

Primary Outcome

Biochemically verified abstinence from smoking did not significantly differ between POP and TSP-SGM at 3 months or 6 months.

Secondary Outcomes

At 3 months, compared with the TSP-SGM condition, participants in the POP condition were more likely to report 7-day abstinence and 50% or greater reduction in the number of cigarettes smoked per week. However, POP and TSP-SGM participants did not significantly differ at 3 months in stage of change for quitting smoking or likelihood of making a 24-hour quit attempt during treatment. At 6 months, POP participants remained more likely to report abstinence than TSP-SGM participants. Reduced smoking and stage of change did not significantly differ between the two conditions at 6 months.

Acceptability and Engagement

Agreement with most acceptability items did not differ across conditions (easy to understand, gave sound advice, helped me be healthier, used information, would recommend intervention, I thought about what I read). However, POP participants were somewhat more likely to agree that the posts gave them something new to think about

Table 1. Primary analyses comparing outcomes between POP (N = 84) and TSP-SGM (N = 81) participants

	3 mo				6 mo			
	POP (n/%)	TSP-SGM (n/%)	OR (95% CI) / Cohen's d	p	POP (n/%)	TSP-SGM	OR (95% CI) / Cohen's d	p
Smoking outcomes								
Verified abstinence	6 (7.1%)	3 (3.7%)	2.00 (.48, 8.28)	.33	9 (10.7%)	3 (3.7%)	3.12 (.81, 11.97)	.08
Self-reported abstinence	20 (23.8%)	10 (12.3%)	2.50 (1.08, 5.80)	**.03**	29 (34.5%)	10 (12.3%)	4.06 (1.80, 9.17)	**<.001**
Reduction by 50%+	44 (52.4%)	32 (39.5%)	2.11 (1.09, 4.08)	**.03**	47 (56.0%)	40 (49.4%)	1.44 (.74, 2.78)	.28
Preparation or action stage	37 (44.0%)	27 (33.3%)	1.84 (.95, 3.57)	.07	40 (47.6%)	30 (37.0%)	1.69 (.88, 3.24)	.12
Quit attempt during treatment	59 (70.2%)	51 (63.0%)	2.14 (.99, 4.62)	.05	—	—	—	—
Acceptability and engagement								
Easy to understand	71 (84.5%)	72 (88.9%)	1.97 (.17, 22.24)	.58	—	—	—	—
Gave sound advice	66 (78.6%)	65 (80.2%)	1.52 (.51, 4.52)	.45	—	—	—	—
Helped me be healthier	48 (57.1%)	42 (51.9%)	1.52 (.78, 2.98)	.22	—	—	—	—
Something new to think about	65 (77.4%)	58 (71.6%)	2.56 (.98, 6.66)	**.048**	—	—	—	—
I used the information	55 (65.5%)	55 (67.9%)	1.12 (.53, 2.37)	.77	—	—	—	—
Recommend the program to others	62 (73.8%)	61 (75.3%)	1.32 (.54, 3.24)	.54	—	—	—	—
I thought about what I read	66 (78.6%)	62 (76.5%)	2.13 (.75, 6.02)	.15	—	—	—	—
Comment volume: M (SD)	60.2 (41.0)	78.4 (35.1)	d = .48	**.003**	—	—	—	—

Note: Percentages reflect all participants per original randomization, not complete cases. Analyses were conducted on complete cases, with the exception of biochemically verified abstinence (assumes missing = smoking). Boldface indicates statistical significance (p < .05).

than TSP-SGM participants. On average, TSP-SGM participants responded to posts with significantly more comments throughout the intervention than did POP participants.

Supplemental Analyses: Comparison of POP with Historical Control Groups

Descriptive and inferential statistics are presented in Tables 2 and 3, respectively.

Primary Outcome

Biochemically verified abstinence did not differ between POP and TSP-Mixed or POP and Referral at 3 months or 6 months.

Secondary Outcomes

At 3 months, POP participants were significantly more likely than Referral participants, but not TSP-Mixed participants, to report 7-day abstinence and reduced smoking. POP did not differ from TSP-Mixed or Referral in the stage of change for quitting smoking or likelihood of making a quit attempt during treatment at 3 months.

At 6 months, POP participants were significantly more likely to self-report 7-day point prevalence abstinence than Referral participants, but not TSP-Mixed participants. POP participants did not significantly differ from TSP-Mixed or Referral participants in likelihood of reduced smoking or in the stage of change for quitting smoking at 6 months.

Acceptability and Engagement

POP participants were more likely than Referral participants to agree that the intervention content was easy to understand, gave sound advice, helped them to be healthier, and gave them something new to think about, and that they used the information, would recommend the program to others, and thought about what they read. POP and TSP-Mixed participants did not significantly differ in their perceptions of the intervention or comment volume.

Discussion

This pilot study compared smoking outcomes between SGM young adult smokers who participated in an SGM-tailored smoking cessation intervention on Facebook (POP) and three non-tailored interventions across two clinical trials. Receiving the SGM-tailored intervention resulted in greater likelihood of (1) self-reported abstinence at both 3 months and 6 months, and (2) reduction in number of cigarettes smoked per week of 50% or greater at 3 months, compared with receiving the non-tailored intervention delivered in groups with other SGM young adults (TSP-SGM) or a referral to Smokefree.gov (Referral). Participants did not differ across conditions in biochemically verified abstinence, smoking reduction at 6 months, readiness to quit smoking (i.e., stage of change), or likelihood of making a quit attempt during treatment. Moreover, outcomes did not differ between the SGM-tailored intervention and the non-tailored, mixed-identity intervention (i.e., both SGM and non-SGM group members; TSP-Mixed) at 3 months or 6 months. Despite the relatively small sample size in this pilot trial, the SGM-tailored intervention increased SGM young adult smokers' likelihood of reporting quitting or reducing smoking.

Point prevalence estimates of biochemically verified abstinence were low (1.7%–10.7%) across all conditions, likely due to testing kit errors and the growing popularity of e-cigarettes. In the SGM-tailored intervention, 5 of the 30 participants who reported abstinence at 3 months were inadvertently not sent a salivary cotinine test kit, which may have lowered the rate of biochemical verification. Other difficulties encountered with the saliva test kits included test kit malfunctions and lack of a mailing address for receiving kits. Moreover, cotinine testing did not allow us to differentiate smoking from other sources of nicotine exposure, such as the use of high-nicotine e-cigarettes. Of the 9 participants in the present trial whose saliva test kits showed cotinine exposure greater than 30 ng/ml during the follow-up period, all but one (88.9%) reported e-cigarette use. The use of combustion-specific biomarkers (e.g., NNAL, carbon monoxide) would likely have resulted in higher rates of biochemically verified abstinence. Our experience supports the need for more

Table 2. Descriptive statistics for supplemental analyses comparing outcomes between POP ($N = 84$) and two historical comparison conditions (TSP-Mixed, Referral).

	POP (Ref.; $N = 84$)		TSP-Mixed ($N = 75$)		Referral ($N = 60$)	
	3 mo	6 mo	3 mo	6 mo	3 mo	6 mo
Smoking outcomes						
Verified abstinence: *n* (%)	6 (7.1%)	9 (10.7%)	4 (5.3%)	5 (6.7%)	1 (1.7%)	5 (8.3%)
Self-reported abstinence: *n* (%)	20 (23.8%)	29 (34.5%)	7 (9.3%)	11 (14.7%)	**2 (3.3%)***	**8 (13.3%)***
Reduction by 50%+: *n* (%)	44 (52.4%)	47 (56.0%)	30 (40.0%)	33 (44.0%)	**16 (26.7%)***	25 (41.7%)
Preparation or action stage: *n* (%)	37 (44.0%)	40 (47.6%)	25 (33.3%)	19 (25.3%)	20 (33.3%)	23 (38.3%)
Quit attempt during treatment: *n* (%)	59 (70.2%)	—	41 (54.7%)	—	32 (53.3%)	—
Acceptability and engagement						
Easy to understand: *n* (%)	71 (84.5%)	—	55 (73.3%)	—	**35 (58.3%)****	—
Gave sound advice: *n* (%)	66 (78.6%)	—	53 (70.7%)	—	**33 (55.0%)****	—
Helped me be healthier: *n* (%)	48 (57.1%)	—	36 (48.0%)	—	**20 (33.3%)***	—
Something new to think about: *n* (%)	65 (77.4%)	—	50 (66.7%)	—	**26 (43.3%)*****	—
I used the information: *n* (%)	55 (65.5%)	—	45 (60.0%)	—	**20 (33.3%)****	—
Recommend the program to others: *n* (%)	62 (73.8%)	—	50 (66.7%)	—	**30 (50.0%)****	—
I thought about what I read: *n* (%)	66 (78.6%)	—	53 (70.7%)	—	**29 (48.3%)*****	—
Comment volume: M (SD)	60.2 (41.0)	—	43.4 (45.3)	—	—	—

Note: Percentages reflect all participants' original randomization, not complete cases. Analyses were conducted on complete cases, with the exception of biochemically verified abstinence (assumes missing = smoking). Boldface indicates statistical significance of the pairwise comparison with the POP group (*$p < .05$, **$p < .01$, ***$p < .001$).

Table 3. Inferential statistics for supplemental analyses comparing outcomes between POP ($N = 84$) and two historical comparison conditions (TSP-Mixed, $N = 75$; Referral, $N = 60$).

	3 mo				6 mo			
	POP vs. TSP-Mixed		POP vs. Referral		POP vs. TSP-Mixed		POP vs. Referral	
	AOR (95% CI) / Cohen's d	*p*	AOR (95% CI)	*p*	AOR (95% CI)	*p*	AOR (95% CI)	*p*
Smoking outcomes								
Verified abstinence	.90 (.23, 3.49)	.88	3.02 (.34, 26.68)	.32	1.38 (.43, 4.41)	.59	1.07 (.33, 3.47)	.91
Self-reported abstinence	2.22 (.84, 5.86)	.11	6.82 (1.47, 31.63)	**.01**	2.26 (.99, 5.15)	.05	2.75 (1.11, 6.84)	**.03**
Reduction by 50%+	1.23 (.59, 2.56)	.58	2.72 (1.23, 6.00)	**.01**	1.06 (.51, 2.21)	.88	1.53 (.72, 3.24)	.27
Preparation or action stage	1.14 (.55, 2.36)	.72	1.22 (.57, 2.65)	.61	1.53 (.71, 3.27)	.28	.95 (.44, 2.06)	.90
Quit attempt during treatment	1.24 (.51, 3.03)	.63	1.60 (.66, 3.92)	.30	—	—	—	—
Acceptability and engagement								
Easy to understand	3.04 (.26, 35.07)	.37	32.85 (3.92, 275.55)	**.001**	—	—	—	—
Gave sound advice	.84 (.22, 3.25)	.80	5.08 (1.71, 15.08)	**.003**	—	—	—	—
Helped me be healthier	1.00 (.47, 2.14)	.998	2.40 (1.10, 5.25)	**.03**	—	—	—	—
Something new to think about	1.27 (.41, 3.99)	.68	7.68 (2.81, 20.98)	**<.001**	—	—	—	—
I used the information	.66 (.27, 1.62)	.36	3.62 (1.59, 8.22)	**.002**	—	—	—	—
Recommend the program to others	.82 (.28, 2.41)	.72	3.52 (1.39, 8.92)	**.008**	—	—	—	—
I thought about what I read	.86 (.22, 3.30)	.83	7.50 (2.57, 21.85)	**<.001**	—	—	—	—
Comment volume: M (SD)	$d = .39$	.06	—	—	—	—	—	—

Note: Analyses were conducted on complete cases, with the exception of biochemically verified abstinence (assumes missing = smoking). Boldface indicates the statistical significance of the pairwise comparison with the POP group ($p < .05$).

feasible and effective biochemical verification procedures in digital health studies. Although biochemical verification rates were low and not significantly different between groups, participants in the SGM-tailored intervention group were twice as likely as the non-tailored, SGM-only group to be abstinent at 3 months and three times more likely at 6 months. Effect sizes for biochemically verified abstinence were comparable to those for reported abstinence.

Reported abstinence was significantly higher in the group that received the SGM-tailored intervention than in the groups that received the non-tailored, SGM-only intervention or received a referral to Smokefree.gov. This finding suggests that having SGM-tailored intervention content is an important component of the SGM-tailored intervention's effectiveness. Cultural tailoring of health promotion and disease prevention interventions improves outcomes by increasing both the acceptability and personal relevance of messages to participants.[30] Importantly, smoking outcomes did not significantly differ between the SGM-tailored intervention group and the non-tailored, mixed-identity intervention group. Participants in the SGM-tailored and non-tailored, SGM-only groups were recruited for a clinical trial targeted toward SGM young adult smokers, while SGM participants in the non-tailored, mixed-identity group were not expecting an SGM-tailored intervention. Given SGM smokers' general preference for tailored interventions,[8,9] expectations of engaging, personalized content may have been higher in the non-tailored, all-SGM group than the non-tailored, mixed-identity group. The non-tailored intervention may have been less effective in the all-SGM group if those higher expectations were not met. Importantly, results compared across studies should be interpreted with caution. However, the pattern of results across primary and supplemental analyses suggests that simply branding an intervention as SGM-tailored may be influential.

Although the SGM-tailored and non-tailored interventions (both SGM-only and mixed-identity) were generally perceived positively, participants in the SGM-tailored group posted fewer comments in the Facebook groups on average than participants in the non-tailored, SGM-only group. This finding was unexpected, as our formative work found no significant differences in engagement with intervention content by SGM tailoring or content category.[31] Despite lower engagement (as measured by comment volume), the SGM-tailored intervention resulted in greater reported abstinence and reduced smoking. Prior research has shown mixed associations between measures of engagement in digital smoking cessation interventions and smoking cessation outcomes.[35–37] These studies underscore the need for *effective* engagement (i.e., engagement that improves an outcome of interest) in digital behavior change interventions, not just increased engagement.[38] The SGM-tailored intervention may have promoted more effective engagement that was not captured by the number of comments posted on the Facebook groups. Findings suggest that a lower dose of the SGM-tailored intervention may be more effective than a higher dose of the non-tailored, SGM-only intervention. Increased engagement in the SGM-tailored intervention may have resulted in even higher reported abstinence.

Tailored content may have increased the salience of being part of a marginalized community and ignited a desire to quit smoking to contribute to the community's health. Indeed, research in the SGM community has found high receptiveness to anti-tobacco messages communicating the impact of tobacco on the community's health.[39] Given that family-focused intervention content is frequently effective in culturally tailored smoking cessation interventions[40] and SGM individuals often highly value their "chosen families,"[41] POP intervention content highlighting the positive effects of individuals' smoking cessation on the community's health may have encouraged participants to use the community's support to quit smoking. Importantly, stage of change for quitting smoking at the end of treatment and likelihood of making a quit attempt during treatment did not differ across conditions. Results suggest that participants who received the tailored and non-tailored interventions were equally motivated to quit smoking and equally likely to try; however, those who received the SGM-tailored intervention were more likely to be successful.

Reported abstinence rates for this SGM-tailored digital smoking cessation intervention were comparable to those of SGM-tailored smoking cessation interventions that included face-to-face contact and only enrolled smokers who were ready to quit.[13,15] Consistent with our previous research,[31,34] results of this study suggest that Facebook remains an effective platform for delivering a smoking cessation intervention to SGM young adults throughout the United States. The sample was diverse in both sexual identity and gender identity, suggesting a broad appeal of the intervention and supporting our previous finding that SGM young adults desired diverse groups in an SGM-tailored Facebook smoking cessation intervention.[23] Given the dearth of culturally-appropriate smoking cessation resources for SGM individuals in many rural areas, scaled up and continually adapted tailored interventions delivered entirely on Facebook are promising.

Limitations and Future Directions

There were several notable limitations to this study. First, abstinence from smoking could not be biochemically verified in a large portion of the participants reporting abstinence, largely due to the use of high-nicotine e-cigarettes. Using biomarkers specific to combustion (e.g., carbon monoxide, NNAL) in future research would likely yield more accurate rates of abstinence.[42] Second, although the sample was geographically diverse within the United States, the majority of participants were non-Hispanic White. Future research could aim to increase diversity by reaching out to SGM organizations in communities of color. Third, supplemental analyses compared results across two studies; therefore, participants in supplemental analyses were not fully randomized to conditions. Despite similar recruitment methods and adjustment for significant baseline differences, results compared across studies should be interpreted with caution. Finally, this pilot study may not have had significant power to detect clinically meaningful differences in smoking-related outcomes between the SGM-tailored and the non-tailored, SGM-only interventions. Promising results suggest that a fully-powered clinical trial is a logical next step. Modifications to promote engagement in the group, such as gamification,[43] may yield stronger results.

Conclusions

This pilot study provides preliminary support for the effectiveness of a Facebook smoking cessation intervention tailored to SGM young adults. Culturally tailored intervention content appeared to boost reported abstinence above that of comparable non-tailored interventions. A smoking cessation intervention delivered entirely on Facebook may be highly beneficial for SGM young adults who lack access to culturally-appropriate smoking cessation resources.

Supplementary Material

Supplementary data are available at *Nicotine and Tobacco Research* online.

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Declaration of Interests

Danielle Ramo has consulted for Carrot, Inc., which makes a tobacco cessation device. Judith Prochaska has provided consultation to pharmaceutical and technology companies that make medications and other treatments for quitting smoking and has served as an expert witness in lawsuits against the tobacco companies. Erin Vogel, Meredith Meacham, Kevin Delucchi, and Gary Humfleet have no financial interests to declare.

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