Original Investigation

Evaluating the Effects of a Brief Tobacco Intervention in the US Air Force

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Abstract

Introduction: Military personnel have among the highest rates of tobacco use in the United States. Unfortunately, there are few interventions aimed at reducing tobacco use among this vulnerable population. The current study addresses this need by evaluating the short-term effectiveness of a Brief Tobacco Intervention (BTI), a 40-min group-based intervention designed to reduce contemporary patterns of tobacco use among a sample of US military enlistees during an 11-week period of involuntary tobacco abstinence.

Aims and Methods: Participants were 2999 US Air Force Technical Trainees at Joint Base San Antonio-Lackland Air Force Base in San Antonio, Texas from April 2017 through January 2018. Participants were cluster randomized to three conditions: (1) BTI + *Airman's Guide to Remaining Tobacco Free* (AG), (2) AG intervention, or (3) standard smoking cessation intervention. The primary analysis was a comparison of the interventions' efficacies in preventing tobacco use during Technical Training, conducted using a generalized estimating equations logistic regression model controlling for covariates. Multiple imputation was used to account for loss to follow-up.

Results: There was not a significant difference by condition in the use of tobacco products at follow-up ($p = .454$). The BTI + AG condition did produce short-term changes in perceived harm, intentions to use tobacco, knowledge about tobacco products, and normative beliefs.

Conclusions: These findings suggest that while the intervention was effective in the short term, it was not potent enough over a 12-week period to prevent Airmen from initiating tobacco use. Future studies should examine whether adding a booster session or media campaign enhances the effectiveness of the intervention.

Implications: Despite the fact that most Airmen believe they will remain tobacco free following the ban in Technical Training, a large percentage of these Airmen resume and initiate tobacco use during this high-risk period. As a result, there is a need for interventions targeting the range of tobacco available to military trainees during a teachable moment when they report intentions to remain tobacco free. The current study shows that a BTI has promise in reducing long-term tobacco use, when coupled with additional interventions, such as a booster session or a media campaign.

Introduction

Military personnel have among the highest rates of tobacco use in the United States. In recent studies with Air Force Technical Trainees assessing tobacco use prior to enlistment, the prevalence of tobacco was on average twice that of the general population.¹⁻³ The most common products used were cigarettes (11.2%), followed by hookah (10.5%), cigarillos (8.7%), and smokeless tobacco (8.5%).² E-cigarette use was rapidly increasing, from 3% to 10.5% across cohorts entering the Air Force,² but most troubling was the association between e-cigarette use and an increased odds of using all other tobacco products, as well as dual and poly tobacco use.⁴ The prevalence of hookah was 10 times higher than the national average and 4 times higher than young adults aged 18–24, while the prevalence of e-cigarettes was 4 times higher than the national average.^{4,5}

With approximately 1.4 million active-duty personnel and 220 000 recruits entering the military annually,^{1,2} the health implications of tobacco use in the military are considerable. The Department of Defense spends on average \$1.6 billion treating tobacco-related morbidity among active-duty military personnel annually, while the Air Force loses over 893 128 work days due to tobacco use.³

Despite numerous Department of Defense tobacco control policies, cultural, physical environment, and political barriers have limited their impact.⁴⁻⁷ The US military is particularly vulnerable to tobacco use given their demographics, psychosocial risk factors,⁸ and the stress of military deployment.^{9,10} Targeted marketing by the tobacco industry also contributes to higher tobacco use rates.^{6,7} With the growing popularity of non-cigarette tobacco products among young adults, particularly those in the military,^{11,12} there is a need for effective interventions.

Brief health prevention programs may be effective for new recruits in the US military. Recruits undergo 8½–14 weeks of Basic Military Training (BMT) during which they are required to remain tobacco free and the constraints of their training make it virtually impossible to violate. In the Air Force, following BMT recruits become Airmen (they are called Airmen regardless of gender or rank) and attend Technical Training where they maintain the ban on tobacco for the first 2 weeks. During this period, 63.0% of Airmen are “completely confident” they will remain tobacco free 1 year later.¹¹ Unfortunately, 12.6% of individuals who never smoked initiated cigarette smoking and 62.6% of individuals who formerly smoked reinitiated.¹³ Interestingly, 54.2% of Airmen who reported smoking cigarettes at follow-up, reported initiating or re-initiating during Technical Training, suggesting that this is a high-risk period for which, effective brief interventions are needed.

Over the past 20 years, researchers have utilized this period of forced abstinence to reduce rates of cigarette and smokeless tobacco use.^{8,14,15} Although these interventions were successful in helping former users stay quit,^{8,15} they were unable to impact the significant initiation that occurs following the tobacco ban. It has been estimated that nearly 15% of active-duty military initiate for the first time following enlistment.¹⁶

Not only have interventions failed to impact the increase in tobacco initiators, but there have been no efforts to address non-cigarette tobacco products. To date, no intervention has simultaneously intervened on all of the most commonly used tobacco products (eg, cigarettes, smokeless tobacco, e-cigarettes, hookah, and cigarillos) in the Air Force. To address this gap, we developed a Brief Tobacco Intervention (BTI) that addressed all five tobacco products.

In a previous investigation, we found that the BTI was efficacious in increasing perceived harm and decreasing intentions to use tobacco immediately before and after the implementation of the BTI in a sample of 1055 Air Force trainees recruited in a 6-month period.¹⁷ Although we obtained significant positive changes that are predictive of future tobacco use in self-reported intentions to use and perceived harm,¹⁸⁻²³ we did not obtain measures of tobacco resumption following the ban in training nor did we have a control group.

In the present investigation, we used the Theory of Planned Behavior (TPB) and Behavioral Economics to enhance the BTI for military trainees undergoing Technical Training in the US Air Force. Next, we conducted a clustered randomized clinical trial to examine changes in short-term tobacco use behaviors across treatment and control conditions.

Methods

Study Design

The design was a three-group clustered randomized clinical trial with the following intervention conditions: (1) BTI + *Airman's Guide to Remaining Tobacco Free* (AG), (2) AG intervention, or (3) standard smoking cessation intervention, the *National Cancer Institute's Clearing the Air (CTA) pamphlet* (Figure 1). Airmen from one squadron received all training and education by teams (groups of about 50 Airmen) throughout Technical Training. Airmen were randomized to intervention by team. The primary outcomes were tobacco use abstinence at the end of Technical Training (3 months).

Theoretical Foundation for the BTI

The BTI incorporates principles of Motivational Interviewing, the TPB, and Behavioral Economics. TPB posits that attitudes toward behavior, subjective norms, and perceived behavioral control shape an individual's intentions and behaviors.²⁴ A key implication of

Figure 1. Consort diagram. AG = Airmen's Guide to Remaining Tobacco Free; BTI + AG = Brief Tobacco Intervention plus Airmen's Guide to Remaining Tobacco Free; CTA = Clearing the Air.

TPB is that interventions need to focus on shaping one's attitudes, subjective norms, or perceptions of behavioral control in order to produce a desired behavior change.²⁴ The BTI has four intervention targets: (1) enhancing perceived behavioral control, (2) correcting subjective norms of tobacco use among Airmen; (3) fostering negative attitudes toward tobacco through peer-led discussions, and (4) increasing knowledge regarding the health consequences of tobacco use.

Brief Tobacco Intervention

The group intervention was designed to include components of effective tobacco control programs specifically tailored to the Technical Training environment.^{8,15} The intervention was approximately 40 min and delivered in a group format. The format was meant to be interactive, utilizing the Socratic teaching style and eliciting participation through the principles of motivational interviewing.²⁵ A series of open-ended questions, reflections, and decisional balance were used to increase motivation to remain tobacco free.²⁵ A description of the formative assessment process of the BTI can be found in the work of Little et al.¹⁷

To strengthen the intervention for nonusers we added several additional intervention targets. First, we enhanced discussions about the negative aspects of tobacco use and placed a greater emphasis on Airmen's control. Focusing on the benefits of being tobacco free and avoiding the costs of tobacco is in line with behavioral economic approaches.²⁶ For instance, a component was added that elicited Airmen's goals for the next 5 years across career, financial, and personal domains and asked Airmen how tobacco might be incongruent with their goals. The idea was to thwart the tendency for hyperbolic discounting by having Airmen discuss their long-term goals in the context of their current behavioral choices. We enhanced Airmen's refusal self-efficacy and brainstormed and rehearsed ways to avoid situations where there is increased pressure to smoke. We hypothesized that discussing positive social activities on base could help Airmen avoid situations where there might be pressured to use tobacco. We also expanded the BTI to include information on cigarillos/little cigars.

The Airmen's Guide to Remaining Tobacco Free

The AG is 5 × 7 inches, 46 pages, with text and color illustration. The text covers the advantages of remaining tobacco free after BMT, and the opportunity the ban provides to begin a life without tobacco, focusing on cigarettes and smokeless tobacco. The text is supplemented by images created specifically for Airmen and designed to reinforce the messages that smoking (1) is responsible for more fatalities than combat, (2) conveys a negative image to civilians, and (3) impedes military readiness and promotion through the ranks. A description of the formative assessment process of the AG can be found in the work of Brandon et al.¹⁴

Participants

Participants were Airmen undergoing Technical Training at Joint Base San Antonio-Lackland Air Force Base in San Antonio, Texas from April 2017 through January 2018. Among the 3347 participants who we approached, 2999 consented to participate (89.6% consent rate). Eligibility criteria included being at least 18 years of age and understanding the consent process in English. Among those, 2969 were eligible to participate in the study. We completed the 3-month follow-up with 2611 Airmen (87.9% follow-up rate). The

protocol was approved by the Institutional Review Board at the 59th Medical Wing of the US Air Force.

Procedure

Airmen were convened by teams (approximately 50 Airmen per intervention). Study procedures were described and Airmen were given an opportunity to ask questions. After obtaining informed consent, consented Airmen were administered a pretest assessment. All Airmen received one of the interventions regardless of consent status since these interventions were considered part of the training. Airmen assigned to receive the AG or CTA were provided with a 5-min interactive discussion of the key concepts in the booklets. Airmen who were randomized to BTI + AG then received the BTI. After delivery of the interventions, consented Airmen completed the posttest assessment. During the last week of Technical Training (3 months after receiving the intervention), consented Airmen were reconvened by team to complete the 3-month follow-up assessment.

Study Measures

At pretest we assessed (1) demographics (age, gender, marital status, education, race, ethnicity), (2) tobacco use, (3) perceived harm,¹⁷ (4) tobacco use intentions,¹⁷ (5) normative beliefs, and (6) knowledge about tobacco. The posttest assessed (1) perceived harm,¹⁷ (2) tobacco use intentions,¹⁷ (3) normative beliefs, and (4) knowledge about tobacco. Tobacco use was measured at the 3-month follow-up.

Tobacco use was assessed by asking participants how often they used the following products: cigarettes/roll your own cigarettes, smokeless tobacco/snus, cigars, cigarillos/little cigars, pipe, electronic cigarettes, and hookah. Response categories ranged from "Never," "Quit," "Less than monthly," "Monthly," "Weekly," to "Daily." Airmen were tobacco free when surveyed at the pretest and posttest assessments, therefore the questionnaires assessed tobacco use prior to BMT. For the main outcome, tobacco use was defined as any tobacco use at the 3-month follow-up. Airmen who reported using tobacco at follow-up were asked when they initiated/re-initiated tobacco during Technical Training (0 = "During Week 0 of Technical Training" to 3 = "After the first month of Technical Training").

Airmen indicated the health consequences of using tobacco in terms of perceived harm (ie, "Based on the following scale, please rate how harmful [bad for your health] you think each of these products are"; 1 = "Not harmful to your health" to 7 = "Extremely harmful to your health"). There was also a response option that allowed for a rating of "I don't know." Airmen rated their intentions to use tobacco products in the next 12 months (1 = "Not at all likely" to 7 = "Very likely"). Normative beliefs assessed what percentage of people in the Air Force used tobacco products as well as dual and poly tobacco use (1 = "None," to 5 = "Almost All [80% or more]"). Knowledge was assessed by asking Airmen four true or false items that represented cognitive misperceptions addressed in the BTI (ie, "Almost 70% of Airmen use some form of tobacco"; "Hookah does not contain tobacco"; "The only form of tobacco that causes cancer is cigarettes"; and "E-cigarettes are less harmful than cigarettes").

Statistical Analyses

Data were analyzed using R statistical package (v.3.5.3, R Foundation for Statistical Computing, Vienna, Austria). Descriptive statistics (frequency and percent) were calculated by condition and

overall. The primary analysis was a comparison of the interventions' efficacies in preventing tobacco use during Technical Training. This analysis was conducted using a generalized estimating equations (GEE) logistic regression model controlling for age, prior tobacco use, race/ethnicity, educational attainment, and military status and clustered by team. We used multiple imputation to account for loss to follow-up. This study was powered to detect a minimal effect of 7% increase in tobacco abstinence across conditions (corresponding odds ratio = 1.32).

Secondary analyses included examining changes in the perception of harm, intentions to use tobacco, normative beliefs about tobacco, and knowledge about tobacco products. To compare perceptions of harm, we assessed the change in the perceived from pretest to posttest. For each Airman, we examined the difference between pre- and postintervention perceptions of harm; these differences were then compared across intervention groups using unadjusted Kruskal–Wallis tests. We conducted the same analyses for intentions to use tobacco and normative beliefs. Clustering was accounted for by taking the difference within Airmen. To compare knowledge about tobacco use items, we used a GEE logistic regression clustered at the individual level. This GEE model was adjusted for the timepoint and randomization group and was used to account for asking each Airman these items twice.

Baseline demographics and tobacco use were compared across conditions using unadjusted Kruskal–Wallis tests. At follow-up, cessation outcomes were compared across tobacco products using

Kruskal–Wallis tests. These comparisons were adjusted to control for prior use of the product and clustering within teams. Only the comparison of pipe use was unadjusted due to infrequent users. Finally, to test the possible differential effectiveness of intervention by prior tobacco use, we used a GEE logistic regression model to test the interaction between baseline tobacco status (ie, ever use vs. never use) and treatment in relation to tobacco abstinence at follow-up.

All differences and associations were considered significant at the alpha level of .05.

Results

Participant Characteristics by Condition

Across all three conditions, there was not a significant difference by participant age, race, ethnicity, marital status, educational background, military rank, as well as prior use of cigarettes, e-cigarettes, cigars, cigarillos, pipe, hookah, and the use of any tobacco product (Table 1). However, there was a difference by sex ($p = .026$); specifically, there was a higher percentage of males (74.0%) in the CTA condition compared to the BTI + AG (69.6%) or AG condition (67.9%), as well as in the overall sample (70.2%). Furthermore, there was a higher percentage of smokeless tobacco prior use (16.6%) in the CTA condition compared to the BTI + AG (12.0%) and AG conditions (13.0%) and in the overall sample (13.4%; $p = .001$).

Table 1. Participant Characteristics at Baseline by Condition

	All (N = 2969)	BTI + AG (N = 1438)	CTA (N = 729)	AG (N = 802)	<i>p</i>
Age M (CI)	19 (18, 21)	19 (18, 21)	19 (18, 21)	19 (18, 21)	.241
Sex (male) N (%)	2075 (70.2)	999 (69.6)	535 (74.0)	541 (67.9)	.026
Race N (%)					.976
Black/African American	581 (20.0)	289 (20.5)	143 (19.9)	149 (19.2)	
White	1835 (63.2)	889 (63.1)	454 (63.3)	492 (63.2)	
Multiple	48 (6.2)	146 (10.4)	74 (10.3)	89 (11.4)	
Other	179 (6.2)	85 (6.0)	46 (6.4)	48 (6.2)	
Hispanic N (%)	630 (23.1)	314 (23.5)	154 (23.2)	162 (22.4)	.868
Married	271 (9.2)	141 (9.8)	64 (8.8)	66 (8.3)	.456
Education N (%)					.985
High school diploma/GED	1873 (63.6)	902 (63.2)	460 (63.4)	511 (64.3)	
Vocational training	43 (1.5)	22 (1.5)	9 (1.2)	12 (1.5)	
Some college/associates	863 (29.3)	423 (29.6)	211 (29.1)	229 (28.8)	
Bachelor's degree or higher	168 (5.7)	80 (5.6)	45 (6.2)	43 (5.4)	
Military rank N (%)					.545
Active duty	2577 (87.4)	1262 (88.1)	620 (85.5)	695 (87.6)	
Guard	264 (8.9)	121 (8.4)	74 (10.2)	69 (8.7)	
Reserve	109 (3.7)	49 (3.4)	31 (4.3)	29 (3.7)	
Prior tobacco use N (%)					
Any	1161 (39.4)	553 (38.8)	297 (40.9)	311 (39.2)	.621
Cigarettes	458 (15.5)	214 (14.9)	119 (16.3)	125 (15.6)	.388
E-cigarettes	715 (24.2)	348 (24.3)	179 (24.7)	188 (23.6)	.174
Smokeless tobacco	397 (13.4)	172 (12.0)	121 (16.6)	104 (13.0)	.022
Cigars	336 (11.4)	167 (11.7)	84 (11.6)	85 (10.7)	.749
Cigarillos/little cigars	515 (17.4)	242 (16.9)	129 (17.7)	144 (18.1)	.934
Pipe	55 (1.9)	32 (2.2)	9 (1.2)	14 (1.8)	.243
Hookah	270 (9.1)	135 (9.4)	67 (9.2)	68 (8.6)	.225

AG = Airman's Guide intervention; BTI = Brief Tobacco Intervention; CTA = National Cancer Institute's Clearing the Air intervention; GED = General Educational Development.

Results are based on adjusted Kruskal–Wallis tests.

Table 2. Primary Analysis of Tobacco Use at Follow-up by Condition

	Odds ratio (CI)	<i>p</i>
Intercept	0.47 (0.17–0.32)	.151
Treatment condition		.454
CTA	1.05 (0.78–1.40)	
AG	0.84 (0.61–1.16)	
Age	0.93 (0.88–0.98)	.005
Prior tobacco use	8.40 (6.62–19.66)	.000
Sex (female)	0.85 (0.66–1.08)	.175
Race		.000
Black/African American	0.51 (0.38–0.70)	
Other	0.75 (0.47–1.19)	
Multiple	1.10 (0.77–1.58)	
Ethnicity (Hispanic)	0.80 (0.60–1.06)	.119
Marital status (Married)	0.90 (0.62–1.31)	.588
Education		.096
Vocational	1.81 (0.86–3.80)	
Some college/associates degree	1.24 (0.96–1.60)	
Bachelor's degree and higher	1.58 (0.94–2.66)	
Military status		.222
Guard	0.73 (0.51–1.05)	
Reserve	1.04 (0.61–1.78)	

AG = Airman's Guide intervention; CI = confidence interval; CTA = National Cancer Institute's Clearing the Air intervention.

Results are based on a generalized estimating equation model adjusted for variables shown and clustering by team.

Primary Analysis

Tobacco Use by Condition

Adjusting for covariates, there was not a significant difference by condition in the use of tobacco products at follow-up ($p = .454$; see Table 2).

Tobacco Use Timing by Condition

The timing of tobacco initiation/re-initiation at follow-up differed by condition ($p = .002$); specifically, more individuals (62.6%) in the BTI + AG condition initiated/re-initiated tobacco later in training compared to those in the CTA or AG conditions (45.8% and 55.4%, respectively). Additionally, fewer individuals (25.9%) in the BTI + AG condition chose not to respond at the follow-up to this item compared to those in the CTA or AG conditions (39.6% and 37.7%, respectively).

Secondary Analyses

Harm Perceptions

Comparing pretest and posttest scores, there was a significant difference by condition in change of harm perceptions of cigarettes, smokeless tobacco, little cigars/cigarillos, e-cigarettes, and hookah ($ps < .001$; see Table 3). Specifically, those in the BTI + AG condition increased their harm rating more than those in the AG or CTA conditions with the exception of hookah in which those in the BTI + AG and CTA conditions found hookah to be less harmful compared to those in the AG condition.

Intentions to Use

Comparing pretest and posttest scores, there was a significant difference by condition in change of intention to use cigarettes, smokeless tobacco, little cigars/cigarillos, e-cigarettes, and hookah ($ps < .05$; see Table 3). Those in the BTI + AG and AG conditions decreased their intention to use all measured tobacco products

Normative Beliefs

Comparing pretest to posttest scores, there was a difference by condition in normative beliefs about cigarettes, smokeless tobacco, little cigars/cigarillos, e-cigarettes, and hookah ($ps < .001$; see Table 4). Individuals in the BTI + AG condition experienced a greater decrease in normative perceptions compared to those in the CTA and AG conditions.

Knowledge About Tobacco Use

Airmen in the BTI + AG condition reported a change in knowledge from pretest to posttest ($ps < .05$) with the exception of the belief, "The only tobacco causing cancer is cigarettes" which did not differ (see Table 4).

Comparisons Across Tobacco Products

The use of smokeless tobacco at follow-up differed by condition ($p = .005$); specifically, a smaller prevalence of individuals in the BTI + AG and AG conditions (5.9% and 6.0%, respectively) used this product compared to those in the CTA condition (10.8%). There was not a difference in the use of other tobacco products, or the use of any tobacco product, by condition.

Comparisons by Baseline Tobacco Status

Adjusting for covariates, no differences were found by baseline tobacco status (ever use vs. never use) and treatment effectiveness ($p = .512$).

Discussion

The results of the current investigation suggest that the BTI + AG intervention was efficacious in producing short-term changes in theorized predictors of behavior including perceived harm, intentions to use tobacco, knowledge about tobacco products, and normative beliefs. Although the BTI was ineffective in reducing tobacco use behavior over a 3-month period compared to control conditions, it was effective in delaying the timing of tobacco use at follow-up. These results are in line with our previous investigation which found that the BTI was able to significantly reduce intentions to use tobacco and increase perceptions of harm across a variety of tobacco products, however that study did not measure changes in tobacco use behavior.¹⁷ These findings suggest that while the intervention was effective in the short term, it was not potent enough to prevent Airmen from initiating tobacco use over the 13 weeks of training. Although not statistically significant, the AG condition had a larger impact on tobacco cessation compared to the CTA condition. This finding is less surprising given that the AG condition was tailored to include information specifically relevant to the US military and thus was likely more impactful compared to the information in the CTA condition.

Overall, the BTI + AG condition outperformed both the AG and CTA conditions in terms of increasing perceptions of harm and decreasing intentions to use tobacco. Additionally, Airmen assigned to the BTI + AG condition had greater decreases in normative beliefs about the prevalence of tobacco use in the US Air Force. This is an important finding because previous studies have found that Airmen were more likely to initiate tobacco if they perceived smoking to be normative among their peers,²⁷ their roommate smoked,²⁷ or their BMT instructors, Military Training Leaders, or Technical Training Instructors used tobacco.^{27–29}

Table 3. Pretest and Posttest Comparisons of Perceptions of Harm and Intentions to Use by Condition

	BTI + AG	CTA	AG	
	Mean (SD)			<i>p</i>
Perceptions of harm				
Cigarettes				<.001
Pretest	6.47 (0.90)	6.44 (1.02)	6.40 (1.03)	
Posttest	6.66 (0.73)	6.52 (0.84)	6.54 (0.85)	
Smokeless tobacco				<.001
Pretest	6.12 (1.14)	6.04 (1.28)	6.05 (1.30)	
Posttest	6.53 (0.87)	6.13 (1.16)	6.17 (1.19)	
Cigars/Cigarillos				<.001
Pretest	5.98 (1.27)	5.97 (1.32)	5.95 (1.33)	
Posttest	6.50 (0.90)	6.06 (1.18)	6.11 (1.18)	
E-cigarettes				<.001
Pretest	4.46 (1.92)	4.43 (1.92)	4.52 (1.95)	
Posttest	5.43 (1.69)	4.80 (1.89)	4.90 (1.88)	
Hookah				<.001
Pretest	1.38 (1.09)	1.41 (1.15)	1.39 (1.18)	
Posttest	1.26 (0.93)	1.39 (1.17)	1.36 (1.08)	
Intentions to use				
Cigarettes				<.001
Pretest	1.39 (1.18)	1.46 (1.32)	1.46 (1.25)	
Posttest	1.33 (1.08)	1.53 (1.43)	1.39 (1.13)	
Smokeless tobacco				.003
Pretest	1.47 (1.38)	1.65 (1.60)	1.54 (1.50)	
Posttest	1.37 (1.17)	1.68 (1.65)	1.48 (1.38)	
Cigars/Cigarillos				<.001
Pretest	1.65 (1.51)	1.69 (1.51)	1.65 (1.51)	
Posttest	1.45 (1.26)	1.71 (1.54)	1.53 (1.37)	
E-cigarettes				<.001
Pretest	1.77 (1.63)	1.83 (1.66)	1.91 (1.78)	
Posttest	1.62 (1.47)	1.85 (1.69)	1.83 (1.68)	
Hookah				<.001
Pretest	1.38 (1.09)	1.41 (1.15)	1.39 (1.18)	
Posttest	1.26 (0.93)	1.39 (1.17)	1.36 (1.08)	

AG = Airman's Guide intervention; BTI = Brief Tobacco Intervention; CTA = National Cancer Institute's Clearing the Air intervention; SD = standard deviation. Comparisons made by unadjusted Kruksal-Wallis tests. For perceptions of harm, values based on seven-point Likert scale (ie, 1 = *Not harmful to your health* to 7 = *Extremely harmful to your health*). For intentions to use, values based on seven-point Likert scale (eg, 1 = *Not at all likely* to 7 = *Very likely*).

Interestingly, perceptions of harm increased across all tobacco products among Airmen assigned to the BTI + AG condition, with the exception of hookah. Although these findings are consistent with previous research that has found that young adults underestimate the harms associated with using hookah,³⁰⁻³² they also highlight the fact that the BTI was not effective enough to change perceptions. Although the BTI + AG condition did decrease intentions to use hookah, these findings suggest that one modification to the BTI should include strengthening the content regarding the potential harm from hookah use.

The TPB posits that intentions and beliefs represent an individual's actual control over their tobacco use²⁴; thus changing these constructs should lead to a change in behavior. While there is research to support this idea,^{33,34} contrary evidence also exists suggesting that good intentions are insufficient.^{33,35} To address this limitation, researchers have proposed implementation intentions, an additional act of willing that adds an if-then plan to the goal intention specifying when, where, and how the individual will implement responses that enhance goal realization.³⁶ A meta-analysis of 94 studies demonstrated that implementation intentions substantially increased the likelihood of goal achievement. Adding an implementation intentions component to the intervention where individuals clearly specify how they will achieve their goals and under what situations (eg, *where* and *how*) could

increase the effectiveness of the BTI. Future studies should explore adding this component to the intervention.

Additionally, the fact that Airmen who received the BTI were more likely to want to stay tobacco free suggests that there are other environmental and social factors that also influence their choice to use tobacco. Unfortunately, the TPB does not consider environmental and social influences.

The culture of tobacco use is unusually strong in the military. In a recent survey of active-duty personnel, 73.1% reported that some or more of their friends used cigarettes and 61.2% reported that at least some of their friends used smokeless tobacco.³⁷ Furthermore, only 50% felt that the leadership at their installation discouraged smoking.³⁷ Smoke breaks are commonly used to break up the duty day,^{38,39} and tobacco products are seen as a way to bond with peers and supervisors.³⁹ Tobacco products are legal products, conveniently available in installation exchanges (ie, retail stores) and commissaries (ie, grocery stores) at historically reduced prices.^{40,41} Finally, military personnel are heavily targeted by tobacco companies which could influence their higher tobacco use rates compared to the general population.⁴² Therefore, in order to strengthen the effects of the BTI beyond changing intentions to use tobacco and perceptions of harm, a social-environmental approach may be needed.

Table 4. Pretest to Posttest Comparisons of Normative Beliefs and Knowledge About Tobacco Use by Condition

		BTI + AG	CTA	AG	
		Mean (SD)			<i>p</i>
Normative beliefs					
Cigarettes					<.001
Pretest		3.31 (0.77)	3.29 (0.79)	3.35 (0.76)	
Posttest		2.66 (0.86)	3.40 (0.83)	3.47 (0.74)	
Smokeless tobacco					<.001
Pretest		3.17 (0.79)	3.16 (0.80)	3.16 (0.78)	
Posttest		2.56 (0.77)	3.15 (0.80)	3.18 (0.75)	
Cigars/Cigarillos					<.001
Pretest		2.90 (0.82)	2.82 (0.80)	2.87 (0.83)	
Posttest		2.47 (0.75)	2.80 (0.79)	2.90 (0.79)	
E-cigarettes					<.001
Pretest		3.35 (0.94)	3.29 (0.93)	3.40 (0.92)	
Posttest		2.65 (0.84)	3.20 (0.94)	3.27 (0.92)	
Hookah					<.001
Pretest		2.70 (0.95)	2.64 (0.96)	2.72 (0.95)	
Posttest		2.45 (0.77)	2.63 (0.94)	2.69 (0.90)	
	All	BTI + AG	CTA	AG	
	N (%)	N (%)	N (%)	N (%)	
	False	False	False	False	<i>p</i>
Knowledge about tobacco use					
70% of Airmen use tobacco					<.001
Pretest	1191 (40.5)	573 (40.2)	292 (40.5)	326 (41.0)	
Posttest	1765 (60.5)	1173 (83.1)	287 (40.2)	305 (38.6)	
Hookah does not contain tobacco					.020
Pretest	2172 (92.3)	1314 (92.1)	659 (91.5)	739 (93.2)	
Posttest	2794 (95.9)	1379 (97.7)	671 (94.1)	744 (94.3)	
The only tobacco causing cancer is cigarettes					.432
Pretest	2879 (98.0)	1394 (98.0)	707 (98.1)	778 (97.9)	
Posttest	2863 (98.2)	1393 (98.7)	698 (97.8)	772 (97.8)	
E-cigarettes are less harmful than cigarettes					.003
Pretest	1375 (47.0)	675 (47.5)	338 (45.7)	362 (45.7)	
Posttest	1349 (46.4)	706 (50.2)	314 (44.0)	329 (41.8)	

AG = Airman's Guide intervention; BTI = Brief Tobacco Intervention; CTA = National Cancer Institute's Clearing the Air intervention; SD = standard deviation. Comparisons of normative beliefs were made by unadjusted Kruskal–Wallis tests. Comparisons of knowledge items were based on a general estimating equation model adjusted for timepoint and randomization group and clustered at an individual level. Comparisons made by Kruskal–Wallis tests. Analyses are unadjusted. For normative beliefs, values based on five-point Likert scale (ie, 1 = *None* to 5 = *Almost All [80% or more]*).

Antitobacco media campaigns are an effective environmental tobacco control approach.⁴³ Popova et al.⁴² evaluated the effects of existing antismoking advertisements on intentions and perceived harm to use tobacco among 782 Air Force Technical Trainees. Using a pretest–posttest experiment, they found that existing antitobacco advertisements produced significant increases in perceived harm and decreases in intentions. Advertisements featuring the negative effects of tobacco on sexual performance and health combined with anti-industry sentiments were especially effective across most tobacco products. These findings suggest that pairing the BTI with existing antismoking campaigns for military enlistees may be an effective approach to tobacco control among trainees. Additionally, tobacco policies, such as Tobacco 21 laws, could help boost the effects of individual interventions. Tobacco 21 laws, which raise the tobacco age to 21, mostly exempt military personnel.⁴⁴ Consequently, the tobacco use disparity might further increase between military personnel and their civilian peers. Implementing policies to remove this exemption could decrease the growing prevalence of new and emerging products among younger personnel.⁴

The current results should be interpreted in light of several limitations. Airmen randomized to CTA condition had significantly higher rates of smokeless tobacco use at baseline compared to BTI + AG or AG conditions. Airmen were randomized to conditions by teams. The higher rates of smokeless tobacco observed in the CTA condition may be due to the fact that smokeless tobacco is more prevalent in males and there was also a higher prevalence of males in the CTA condition. The higher rates of smokeless tobacco use at baseline among the CTA condition could explain why a smaller prevalence of individuals in the BTI and AG conditions reported using smokeless tobacco at follow-up compared to Airmen in the CTA condition. However, our primary analyses controlled for both tobacco use and gender, minimizing the impact of this difference.

The BTI was delivered during a period of complete tobacco abstinence; previous research has documented that the ban produces 15%–20% long-term cessation among users.^{8,15} Although it is unclear how this period of forced abstinence influences tobacco use, this is a uniquely military phenomenon. As a result, the BTI may not generalize to civilian populations. However, since all military

branches have similar tobacco bans, our results should generalize to all military branches. Another limitation is the fact that Airmen were sampled about their baseline tobacco use during this protracted tobacco ban, thereby introducing potential recall bias. Although it is possible that some error is introduced after 8 weeks of BMT, the likelihood that this leads to large errors is negligible. Additionally, capitalizing on this teachable moment when Airmen have been tobacco free for a long period of time outweighs any potential recall bias. Finally, we relied on self-reports of tobacco use status. While evidence suggests that self-reported retrospective assessments of substance use data are reliable for up to 5 years,⁴⁵ biochemical verification of tobacco use status at follow-up would increase reliability.

Most Airmen believe they will remain tobacco free following the ban in Technical Training. Unfortunately, a large percentage of these Airmen resume/initiate tobacco. Given the changing prevalence of tobacco,¹¹ there is a need for interventions targeting the range of tobacco available to military trainees during a teachable moment when they report intentions to remain tobacco free. The current study shows that a BTI has promise in reducing long-term tobacco use, when coupled with additional interventions, such as a booster session or a media campaign.

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Declaration of Interests

None declared.

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