

Original investigation

Efficacy of a Brief Tobacco Intervention for Tobacco and Nicotine Containing Product Use in the US Air Force

Melissa A. Little PhD, MPH¹, Gerald W. Talcott PhD¹, Zoran Bursac PhD¹,
Brittany D. Linde PhD², Louis A. Pagano Jr PhD³, Erick C. Messler PhD⁴,
Jon O. Ebbert MD⁵, Robert C. Klesges PhD¹

¹Center for Population Sciences, Department of Preventive Medicine, University of Tennessee Health Science Center, Memphis, TN; ²Department of Psychiatry, University of Texas Health Science Center at San Antonio, San Antonio, TX; ³Department of Mental Health, Wilford Hall Ambulatory Surgical Center, Joint Base San Antonio-Lackland AFB, San Antonio, TX; ⁴341 MDG, Malmstrom AFB, MT; ⁵Primary Care Internal Medicine, Mayo Clinic, Rochester, MN

Corresponding Author: Melissa Little, PhD, MPH, Center for Population Sciences, Department of Preventive Medicine, University of Tennessee Health Science Center, 66 N. Pauline, Suite 633, Memphis, TN 38105, USA. Telephone: 901-448-6878; Fax: 901-448-1849; E-mail: mlitt18@uthsc.edu

Abstract

Introduction: While effective Brief Tobacco Interventions (BTIs) are available for cigarette smoking and smokeless tobacco, given the changing prevalence of tobacco and nicotine containing products (TNCPs), there is a need for interventions targeting a broader range of TNCPs (eg, cigarettes, smokeless tobacco, electronic cigarettes, and hookah). The purpose of the current investigation was to evaluate the efficacy of a BTI, a 40-minute intervention designed to intervene on four TNCPs in a sample of US military personnel during an 11-week period of involuntary tobacco abstinence, for reducing intentions to use TNCPs and increasing perceptions of harm of TNCPs.

Methods: The BTI was administered to 1055 Airmen enrolled in Technical Training in the US Air Force. Assessments of perceived harm and intentions to use nine TNCPs (cigarettes, smokeless tobacco, snus, cigars, cigarillos, pipe, e-cigarettes, roll your own cigarettes, and hookah), were assessed at pretest and posttest (immediately following the BTI).

Results: Significant increases in perceived harm were observed across all nine TNCPs (all $P < .0001$) for both users and nonusers. Intentions to use TNCPs were significantly reduced for most products but mainly among users.

Conclusions: Results suggested that a BTI shows promise for impacting TNCP use in a military population. Further research should evaluate the behavioral outcomes (tobacco use) as a result of the intervention.

Implications: Given that there are 220 000 new trainees in the military every year, the public health implications of an effective BTI targeting the most commonly used TNCPs for military trainees is considerable.

Introduction

Tobacco is the leading cause of preventable death and disability in the United States, accounting for nearly half a million deaths annually.¹ Military personnel have among the highest rates of tobacco

and nicotine containing product (TNCP) use in the United States. According to a report published by the Department of Defense in 2013, among all military personnel, 24% reported current cigarette smoking,² compared to the national average of 18%.³ Smokeless

tobacco rates are also higher among active duty military personnel than the general population (12.8% compared to 2.6%).^{2,3} While the military has taken steps to reduce tobacco use in the armed forces, over a quarter of new military recruits report regular TNCP use prior to enlistment.⁴ This rate is higher than the national prevalence of 21.3% of US adults,³ suggesting that the military is inheriting a major public health problem.

In a recent study we conducted with US Air Force trainees regarding TNCP use prior to enlistment, we found that TNCPs were on average twice as prevalent in our sample compared to estimates from the civilian population.⁴ The most common TNCPs used by Airmen were cigarettes (11.2%), followed by hookah (10.5%), cigarillos (8.7%), and smokeless tobacco (8.5%).⁴ E-cigarette use was rapidly increasing, from 3% to 10.5% across cohorts entering the Air Force,⁴ but most troubling was the association between e-cigarette use and increased odds of use of all measured TNCPs as well as dual and poly tobacco use.⁵ Airmen who used e-cigarettes were more likely to be using another TNCP. E-cigarette use was associated with 4.5 times higher odds of dual use, and 41.2 times higher odds of poly use compared to non-e-cigarette use.⁵ Unfortunately, there are currently no tobacco interventions aimed at preventing TNCP use in the military, particularly TNCPs which are growing in popularity with young adults, such as hookah and e-cigarettes.

Brief health prevention programs may be particularly effective for new recruits in the US Air Force. All recruits undergo 8 ½ weeks of Basic Military Training (BMT) at Joint Base San Antonio-Lackland Air Force Base (AFB) in San Antonio, Texas. Throughout this training period, recruits are required to remain alcohol and TNCP-free and the constraints of their training make it virtually impossible to violate this ban. Following Air Force BMT, recruits become Airmen (called Airmen regardless of gender or rank) and go to Technical Training where they acquire the skills for their designated job in the Air Force. Airmen are assigned to squadrons and attend class, eat, and sleep in the same facilities with their other squadron members. During this early phase of Technical Training they are under a heightened level of scrutiny that is more similar to BMT than the later phases of Technical Training. During this period, nearly two-thirds (63.0%) of Airmen are “completely confident” they will remain TNCP-free 1 year later.⁴ After 2 weeks, Airmen are allowed to leave the Air Force Base for the first time. This period of independence is a time of high risk for TNCP use because of the celebratory nature of having these restrictions lifted. Unfortunately, research suggests that the majority (69.8%) of former smokers return to smoking during Technical Training.⁶ Given that all Airmen have been tobacco-free for 8 ½ weeks and that most are confident that they won’t return to TNCPs, it seems to be a time or teachable moment when a brief intervention might be effective in maintaining abstinence from TNCPs. For TNCP users, the ban represents a time to introduce skills to assist recruits in remaining TNCP-free after the bans are lifted.^{7,8} For non-TNCP users, receiving a prevention program during this protracted period may prevent many from initiating use in the military environment. It has been estimated that nearly 15% of active duty military initiate tobacco use following enlistment,⁹ suggesting that an effective tobacco prevention program for this population could have substantial effects on reducing use overall.

In two different studies, we found that a brief (1–2 hours) tobacco intervention increased long-term tobacco cessation rates.^{7,8}

In our first study, a generic antismoking tobacco program coupled with 6 weeks of forced abstinence, increased long-term abstinence in the 18% of Airmen intending to resume tobacco use.⁷ While there was no overall main effect of the intervention on quit rates, the intervention was effective for ethnic minorities, women and those intending to stay quit at baseline, with those that were intending to stay quit 1.73 times more likely to remain abstinent at 1-year follow-up.⁷ In the second study, a tailored smoking relapse prevention program was successful in significantly increasing long-term cessation in both cigarette smokers and smokeless tobacco users.⁸ The behavioral interventions, while helpful, were only successful in reducing tobacco use and only slight, although significant reductions, were observed.^{7,8} Given the changing prevalence and patterns of TNCPs, there is a need for interventions targeting the broad range of TNCPs available to military trainees.

The purpose of the current study was to develop a Brief Tobacco Intervention (BTI) aimed at reducing intentions to use TNCPs and increase perceptions of harm of TNCPs. The Theory of Planned Behavior posits that attitudes towards using tobacco, subjective norms and perceived behavioral control shape an individual’s intentions and behaviors.¹⁰ Research has found that intentions are reliable predictors of future use.¹⁰ A number of studies have found that intentions to use cigarettes predict initiation of use or escalation of use among adolescents.^{11–14} In fact, intentions have predicted use up to 3 years out, suggesting that intentions may be a robust predictor when determining future risk. Disproportionate estimates of harm regarding TNCPs have also repeatedly been found between cigarette smokers and nonsmokers. Smokers consistently underestimate the harm associated with TNCPs compared to nonsmokers,^{15,16} suggesting an established association between these cognitions and behavior. Importantly, these misperceptions have been linked with the use of new and emerging products, such as hookah and e-cigarettes, which may be contributing to escalating rates of use.^{5,16–20} Taken together, both intentions to use and perceived harm seem to be important predictors of future use. As a result, interventions might prove more effective if they target change in these factors.

In the present investigation, we used the Theory of Planned Behavior to inform the development of a BTI for military trainees currently undergoing Technical Training in the US Air Force. We designed an intervention that we hoped would influence intentions to use and perceived harm of TNCPs during the later phases of Technical Training. Additionally, we examined how our intervention effected these factors for each TNCP and the impact on prior users versus nonusers.

Method

Subjects

Participants were 1055 US Air Force Airmen undergoing Technical Training at Joint Base San Antonio-Lackland Air Force Base (AFB) in San Antonio, Texas from October 2014 and March 2015. Anonymity was maintained to help ensure candid assessments of future tobacco product use. The protocol was approved by the Institutional Review Board at Wilford Hall Ambulatory Surgical Center.

Enrollment and Pretest Assessment

At the time of data collection, the BTI was being implemented to all Airmen as part of Technical Training. Airmen were convened

by squadrons and in groups of approximately 50 Airmen per intervention. Upon arrival, the study and procedures were described and Airmen were given an opportunity to ask questions. After given the opportunity to decline participation in the assessments, consenting Airmen were administered a pretest questionnaire immediately prior to the BTI and a posttest questionnaire immediately after receiving the BTI. Both assessments were anonymous and no personal identifying information was collected. Overall, the participation rate in this study was 99%. Due to the fact that Airmen were alcohol and TNCP-free when surveyed, the pretest questionnaire assessed TNCP use prior to BMT. The pretest questionnaire evaluated four domains: (1) demographics (ie, age, gender, education, race, ethnicity and marital status), (2) use of TNCPs, (3) perceptions of harm of TNCPs, and (4) intention to use TNCPs. The posttest questionnaire evaluated two domains: (1) perceptions of harm of TNCPs and (2) intention to use TNCPs.

Prevalence of TNCPs

The prevalence of TNCPs was assessed by asking participants how often they used the following products prior to enlistment: cigarettes, smokeless tobacco (chewing tobacco), snus, cigars, cigarillos (little cigars, eg, Black & Mild, Swisher Sweet, White Owl), pipe, electronic cigarettes, hookah (waterpipe, shisha, narghile, kальяn, and hubble-bubble), and roll your own cigarettes. Response categories ranged from “Never,” “Quit prior to BMT,” “Less than monthly,” “Monthly,” “Weekly,” to “Daily.” Regular use of a TNCP was defined as at least monthly use of the product, as this is a common definition of regular TNCP use in young adults.^{21,22} Participants who reported never using any of the nine TNCPs, using TNCPs less than monthly and had quit prior to BMT were considered nonusers.

Perceptions of Harm of TNCPs

Airmen were asked to indicate the health consequences of using these nine TNCPs 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”). Airmen rated each TNCP on a 7-point Likert scale (with anchors of 1 = “Not harmful to your health”, 4 = “Moderately 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”.

Intention to Use TNCPs

Airmen rated their intentions to use the nine TNCPs during the later phases of Technical Training (when it is allowed; approximately 2 weeks following pretest data collection) and anytime in the next 12 months. Airmen rated each TNCP on a 7-point Likert scale (with anchors of 1 = “Not at all likely”, 4 = “Hard to say”, to 7 = “Very likely”). There was also a response option that allowed for a rating of “I don’t know”.

Brief Tobacco Intervention

The BTI was developed in collaboration with several tobacco experts and pilot tested with active duty Airmen in Technical Training at Lackland Air Force Base. The content was selected based upon our prior research in the military^{4,5,23} and our previous tobacco control programs for military personnel.^{7,8} Prior to implementation, we conducted four focus groups with Airmen over a 4-month period. Study staff members delivered the BTI to squadrons of Airmen to

assess acceptability, persuasiveness, how it held their interest, and credibility. Using a 5-point Likert scale, participants were asked to rate different components of the intervention (eg, content, relevancy, language, multimedia examples) on persuasiveness in conveying anti-smoking messages. Comments on the different components were also solicited from the Airmen. Results were tallied and submitted for comments to tobacco experts before final multimedia content and text was chosen.

The intervention was approximately 40 minutes and delivered in a group format (eg, by squadrons in groups of 50 Airmen). The format of the BTI was meant to be interactive, utilizing the Socratic teaching style and eliciting participation through the principles of motivational interviewing.²⁴ The goal was to utilize techniques associated with motivational interviewing to facilitate a conversation between the Airmen regarding the main components of the intervention. These techniques were used to enhance Airmen’s intrinsic motivation to maintain a TNCP-free lifestyle following the period of forced abstinence. The BTI uses a Socratic style designed to be evocative through a series of open-ended questions, reflections, and decisional balance, used to increase motivation to remain TNCP-free.²⁴ The BTI had four main goals: (1) evoke increased motivation for Airmen to remain tobacco-free, (2) decrease intentions to use tobacco, (3) facilitate peer discussion regarding the impact of using TNPs (decisional balance), and (4) provide knowledge where lacking. Most Airmen felt very uncomfortable with their knowledge regarding the health impact of hookah and e-cigarettes.

To accomplish these goals, the BTI targeted what we had found from previous studies to be the most prevalent TNCPs: cigarettes, smokeless tobacco, hookah, and e-cigarettes.^{4,5} Guided by the Theory of Planned Behavior, the BTI had five intervention targets: (1) enhancing perceived behavioral control, (2) correcting subjective norms of TNCP use among Airmen, (3) fostering negative attitudes towards TNCPs through peer led discussions, (4) increasing knowledge regarding the health consequences of TNCP use, and (5) delivering the BTI using a motivational interviewing style (Table 1). Discussions focused on Airmen’s Air Force career goals and how tobacco use may interfere with those goals (eg, military readiness). We projected several on line videos from credible sources (eg, Discovery News) discussing both the potential health consequences of these products as well as tobacco industry manipulation of potential users. Finally, the BTI addressed common misperceptions that Airmen had (based on formative assessment) regarding these products (eg, hookah does not contain tobacco).

Statistical Analyses

Data were analyzed using SASv9.4 (SAS Institute Inc, Cary, NC). Descriptive statistics (means, standard deviations and percentages) of key demographic variables and smoking behavior(s) were computed for the overall study population. Descriptive statistics for pretest and posttest measurements, along with the overall changes in harm and intentions to use scores for each TNCP, are reported for TNCP users (32.3%) and nonusers (67.7%). Statistical significance of change in scores was tested with paired *t* test, and results confirmed with its nonparametric equivalent, Wilcoxon Signed Rank test, as a sensitivity measure. Comparison of “don’t know” proportions for perceived harm rating pre to post was performed with exact McNemar’s test. We applied analysis of covariance (ANCOVA) like linear regression models to test the differences in pre-post changes (difference in difference) for harm and intentions to use TNCP scores, between TNCP

Table 1. Active Components of the Brief Tobacco Intervention (BTI)

Intervention target	Strategy	Active component
Perceived behavioral control	Highlight their freedom to choose	Discussion that although it may be unhealthy and negatively affects military readiness, tobacco use is legal
Subjective norms	Correct cognitive misperceptions about TNCP use in the Air Force	Discussion of tobacco industry manipulation of potential users. Goal of the Air Force is to be “tobacco-free” Videos depicting peer groups expressing antitobacco sentiment Airmen consistently report that smoking in uniform looks “unprofessional” and represent a “bad role model”
Attitudes towards TNCP use	Decisional balance	Airmen led discussion of the positive and negative aspects of using TNCPs
Knowledge	Present health consequences associated with hookah and e-cigarette use	Short videos from spokespeople that are highly credible to Airmen present the research regarding health effects of hookah and e-cigarette use.

TNCP = Tobacco and nicotine containing product.

users and nonusers, while adjusting for pretest differences and demographics (ie, age, gender, education, race, ethnicity and marital status). All differences and associations were considered significant at the alpha level of 0.05.

Results

Among the 1055 Airmen in this study, 77.4% were male with a mean age of 20.1 ($SD = 2.5$) years. Almost 32% of the sample was a racial minority and 18% identified Hispanic ethnicity. Only 9.3% were married or engaged with a partner, and 63.6% had a high school/GED with the remainder having at least some college. The most commonly used products were smokeless tobacco (12.6%), closely followed by cigarettes (12.4%), hookah (12.3%), cigarillos (11%), e-cigarettes (9.4%), and cigars (5.8%). The prevalence of the remaining three products (snus, pipe and roll your own) were under 2%. Across all TNCPs, nearly one third of all Airmen (32.3%) were regularly users of at least one TNCP.

Perceptions of Harm of TNCPs

Table 2 presents pretest and posttest ratings of perceived harm by TNCP use status. For both users and nonusers, perceived harm increased from pretest to posttest for all four targeted TNCPs (ie, cigarettes, smokeless tobacco, hookah, and e-cigarettes; all P values $< .0001$). In addition, perceived harm increased for an additional five TNCPs (ie, snus, cigar, cigarillo, pipe, roll your own) not specifically targeted by the BTI (all $P < .0001$).

Figure 1 presents the frequency that “don’t know harm” was endorsed for each TNCP at pretest and posttest. Airmen significantly decreased in their prevalence of not knowing the perceived harm of all TNCPs except for cigarettes (all $P < .05$). Large changes in “don’t know” response were observed for hookah (12.8% to 1.4%), e-cigarettes (9.9% to 4.2%), pipe (9.4% to 3.6%) and snus (9.3% to 2.8%, all $P < .0001$).

Intention to Use TNCPs

Table 3 reports the pretest and posttest measures of intentions to use TNCPs both in the later phases of Technical Training (when it is allowed) as well as within the next 12 months by TNCP use status. Overall, intentions to use were low. The BTI had a significant effect on lowering intentions to use three of the targeted TNCPs (ie, cigarettes, smokeless tobacco, and hookah) and cigarillos both during the later phases of Technical Training as well as over the next

12 months for both users and nonusers (all $P < .05$). Intentions to use when first allowed in training and over the next year were also reduced with e-cigarettes and cigars among users (all $P < .05$) and when first allowed for nonusers ($P < .05$).

Comparisons Between TNCP Users and Nonusers on Perceived Harm and Intentions to Use

Table 4 shows the difference between change scores for non TNCP users compared to users. Findings indicate that while the intervention was effective for both users and non-TNCP users, non-TNCP users had a comparable increase in perceived harm scores, and a lower decrease in both intention measures. Perceived harm differences reached statistical significance for smokeless tobacco ($P = .0194$). Intentions to use (during the later phases of Technical Training or in the next 12 months) were significant for cigarettes, e-cigarettes, roll your own cigarettes, and hookah (all $P < .05$). Additionally, there was a significant difference between users and non-TNCP users on intentions to use during the later phases of Technical Training for cigars, cigarillos and pipe (all $P < .05$).

Discussion

The results of the current investigation suggest that a motivational interviewing based, 40-minute BTI program was efficacious in significantly increasing perceived harm and decreasing intentions to use TNCPs in a sample of US Air Force trainees. Effects were seen for both targeted (cigarettes, smokeless tobacco, hookah, and e-cigarettes) and nontargeted (snus, cigars, cigarillo, pipe, and roll your own) TNCPs, indicating that the BTI was effective for all products.

The results suggest the BTI increased perceived harm, an independent predictor of future tobacco use.^{25,26} The BTI produced significant increases in perceived harm, not only with the targeted TNCPs of cigarettes, smokeless tobacco, hookah, and e-cigarettes but also the five TNCPs not targeted by the intervention (snus, cigar, cigarillo, pipe, and roll your own). The notion that the BTI impacted perceived harm for both targeted and nontargeted TNCPs is encouraging but future studies should extend these findings by exploring the effect of the BTI on TNCP use in order to determine the effectiveness of the BTI.

The BTI intervention also reduced the percentage of Airmen who were uncertain of the perceived harm of TNCPs, with the exception of cigarettes. One explanation for the lack of change between pretest and posttest response is most Airmen were already aware

Table 2. Changes in Perceptions of Harm of Tobacco and Nicotine Containing Products (TNCPs; *N* = 1055)

	Nonusers*		Users*	
	Pre	Post	Pre	Post
Cigarettes	6.56(0.86)	6.74(0.79)	6.33(1.04)	6.63(0.78)
Smokeless	6.13(1.18)	6.66(0.88)	5.52(1.56)	6.27(1.23)
Snus	6.28(1.14)	6.65(0.91)	5.69(1.58)	6.28(1.29)
Cigar	6.06(1.31)	6.57(1.01)	5.57(1.57)	6.24(1.28)
Cigarillo	5.99(1.38)	6.55(1.03)	5.57(1.53)	6.3(1.17)
Pipe	6.04(1.33)	6.58(0.97)	5.62(1.53)	6.36(1.19)
E-cigarette	4.75(1.97)	6.18(1.44)	3.89(2.05)	5.68(1.71)
RYO	6.15(1.32)	6.65(0.9)	5.92(1.44)	6.42(1.08)
Hookah	4.68(2.09)	6.69(0.99)	4.12(2.11)	6.46(1.15)
All TNCPs	5.86(1.09)	6.58(0.85)	5.34(1.24)	6.27(0.98)

RYO = roll your own cigarettes. Perceived harm was assessed on a 7-point Likert scale (1 = not at all harmful to 7 = very harmful).

*All paired *t* tests significant at *P* < .0001.

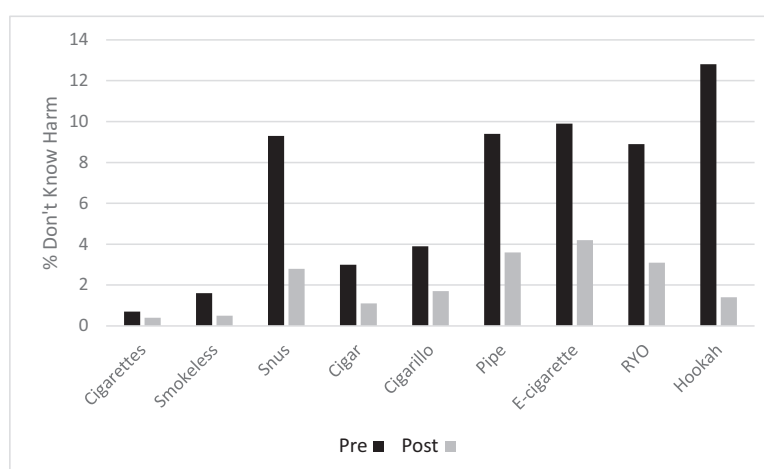


Figure 1. Frequency that “don’t know harm” was endorsed for each TNCP at pretest and posttest (*N* = 1055). *Note:* All differences between pre and post were statistically significant (all *P* < .05) with the exception of cigarettes (*P* = .51). RYO = Roll your own cigarettes; TNCP = Tobacco and nicotine containing product.

of the harm associated with smoking cigarettes. In fact, the uncertainty regarding the perceived harm was lowest for cigarettes at both pretest and posttest (0.7% and 0.4%, respectively). Conversely, the highest percentage of Airmen’s uncertainty regarding harm was hookah use with nearly 13% reporting uncertainty at baseline. These findings are consistent with other research that has found that young adults underestimate the harm associated with using hookah.^{19,27,28} However, between pretest and posttest there was a 90% decrease in the percent of Airmen reporting they were unaware of the harm (from 12.8% to 1.4%), suggesting that the BTI had a particularly strong impact on Airmen’s perceptions of perceived knowledge and perceived harm of the consequences of hookah use.

Regarding intentions to use tobacco, the BTI produced strong, significant reductions in intentions to use the four targeted TNCPs, as well as a number of TNCPs not targeted by the BTI. These results are important given that intentions to use TNCPs is a proximal, valid outcome measure of future tobacco use among youth and young adults.^{29–32} Similar to the findings on perceived harm, the BTI had an impact on some nontargeted TNCPs as well (eg, cigars, cigarillos). However, unlike the results on perceived harm, some nontargeted TNCPs intention to use did not change (eg, pipe, roll your own, and snus in one of two comparisons). This could likely be the result of low prevalence of use of these specific products (≤2%), representing

a possible floor effect. While intentions to use did not universally impact both targeted and nontargeted TNCPs, the fact that there were strong, significant reductions in intention to use among the four targeted products is encouraging. Future studies should evaluate longer term effects of both intentions to use as well as perceived harm on TNCP initiation and relapse.

Additionally, the results suggested that prior tobacco users and nonusers experienced a differential effect in terms of intentions to use. Similar to previous BTIs in the military,^{7,8} we found that prior TNCP users (though not all statistically significant) tended to have larger decreases in intentions to use, compared to nonusers. While the intervention was effective for both prior users and nonusers, the results suggest that the BTI may be more effective for TNCP relapse prevention among prior users, following a period of forced abstinence. Given that 25% of Airmen are TNCP users prior to enlistment,⁵ the BTI has the potential for a nontrivial public health impact on this population.

One way to strengthen the BTI for TNCP nonusers might be to enhance discussions about the negative aspects of TNCP use and place a greater emphasis on Airmen’s control over the decision to smoke. Focusing on the benefits associated with being tobacco-free and avoiding the costs of TNCP use is in line with behavioral economic approaches.³³ For instance, adding a component that begins

Table 3. Changes in Intention to Use Tobacco and Nicotine Containing Products (TNCPs; *N* = 1055)

TNCP	Intentions following the ban				Intentions in the next 12 months			
	Nonusers		Users		Nonusers		Users	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Cigarettes	1.11(0.63)	1.09(0.63)	2.33(2.04)	2.13(1.95)*	1.14(0.69)	1.09(0.61)*	2.54(2.21)	2.26(2.07)*
Smokeless	1.13(0.71)	1.10(0.68)	2.83(2.45)	2.52(2.31)*	1.17(0.82)	1.12(0.71)*	3.05(2.54)	2.59(2.37)*
Snus	1.06(0.48)	1.05(0.52)	1.45(1.33)	1.39(1.25)	1.07(0.51)	1.06(0.49)	1.50(1.40)	1.36(1.21)
Cigar	1.16(0.71)	1.12(0.65)	1.87(1.68)	1.69(1.52)*	1.19(0.80)	1.13(0.68)*	2.25(2.00)	1.90(1.77)*
Cigarillo	1.20(0.82)	1.13(0.70)*	2.12(1.79)	1.84(1.59)*	1.24(0.94)	1.15(0.79)*	2.48(2.05)	1.98(1.77)*
Pipe	1.04(0.41)	1.03(0.42)	1.20(0.80)	1.16(0.72)	1.04(0.34)	1.03(0.34)	1.29(0.99)	1.22(0.90)
E-cigarette	1.20(0.82)	1.19(0.86)	2.26(2.09)	2.10(1.92)*	1.25(0.98)	1.19(0.86)	2.52(2.23)	2.22(2.04)*
RYO	1.04(0.41)	1.03(0.43)	1.15(0.75)	1.18(0.79)	1.02(0.24)	1.03(0.36)	1.20(0.78)	1.22(0.90)
Hookah	1.46(1.21)	1.20(0.84)*	2.66(2.23)	2.06(1.82)*	1.54(1.35)	1.22(0.87)*	3.05(2.42)	2.17(1.93)*

RYO = roll your own cigarettes. Intentions to use were assessed on 7-point Likert scales (1 = not at all likely to 7 = very likely).

**P* < .05.

Table 4. Differences in Perceived Harm and Intentions to Use, Between non-TNCP Users and Users (*N* = 1055)

TNCP	Perceived harm		Intentions when allowed		Intentions in the next 12 months	
	β	<i>SE</i>	β	<i>SE</i>	β	<i>SE</i>
Cigarettes	0.04	0.05	-0.13	0.06*	-0.15	0.06*
Smokeless tobacco	0.15	0.06*	-0.10	0.06	-0.02	0.06
Snus	0.07	0.07	-0.07	0.04	-0.05	0.04
Cigar	0.10	0.07	-0.16	0.06*	-0.10	0.06
Cigarillo	0.02	0.07	-0.13	0.06*	-0.06	0.06
Pipe	0.02	0.07	-0.07	0.03*	-0.07	0.04
E-cigarettes	0.14	0.10	-0.15	0.07*	-0.17	0.07*
RYO	0.12	0.07	-0.12	0.04*	-0.09	0.04*
Hookah	0.11	0.08	-0.33	0.07*	-0.32	0.08*

RYO = Roll your own cigarettes; *SE* = standard error; TNCP = Tobacco and nicotine containing product. Analysis of covariance (ANCOVA) models were adjusted for pretest differences and demographics (ie, age, gender, education, race, ethnicity, and marital status). Beta indicates the change among non-TNCP users compared to users. Intentions to use and perceived harm were both rated on 7-point Likert scales (Intentions: 1 = not at all likely to 7 = very likely; Perceived harm: 1 = not at all harmful to 7 = very harmful).

**P* < .05.

by eliciting Airmen's goals for the next 5 years across career, financial and personal domains and then asking Airmen how TNCP use aligns with their goals could strengthen Airmen's resolve to remain TNCP-free. These strategies have been effective in improving alcohol use related outcomes in brief interventions with civilian and veteran populations.³⁴ Another way to enhance the prevention effects of the intervention could be to enhance Airmen's refusal self-efficacy and brainstorm ways to avoid situations where the pressure to smoke might be heightened, such as smoke pits. In the US Air Force, smoking on base is restricted to only designated smoke areas, commonly referred to as smoke pits. In our discussions with Airmen, smoke pits are often seen as a place to interact socially with both male and female Airmen on base. Aside from the smoke pits there are few convenient, unsupervised areas to engage in heterosexual contact. Fostering a conversation with Airmen about positive social activities on base could help Airmen avoid situations where there might be pressure to use TNCPs.

Our study has several strengths. To our knowledge, it presents the first evaluation of a BTI designed to impact multiple TNCPs simultaneously in a military population. Moreover, the study was conducted in a large sample of military personnel. All branches of the military have BMT and all services branches are tobacco-free

for the first 8 ½ to 14 weeks of training. As such, generalization to other active duty branches is not only possible but most services have military personnel remain abstinent for a longer period of time. Additionally, an effective brief intervention could be disseminated to other settings with civilian populations.

Our study also has several weaknesses that must be acknowledged. First, we did not directly measure changes in TNCP use behavior. Rather we used latent cognitive constructs (perceived harm and intentions) for tobacco behavior that are highly predictive of future tobacco use in youth and young adults.^{11-16,18} Therefore, the impact of the BTI on actual TNCP use behavior is unknown and should be the focus of future research. Conducting research in military populations can be challenging, given that research is not part of the mission of the military and as such the time offered is often necessarily limited. As a result, researchers must be judicious in selecting the measures to assess. However, given that these constructs are key aspects of the Theory of Planned Behavior, a guiding theory of the BTI, it would have been desirable to include a more detailed assessment of the theory. Future evaluations should include a more detailed assessment of these theoretical components, specifically subjective norms, perceived behavioral control and attitudes towards TNCP use. Another limitation is that the assessments were

conducted immediately before and after the BTI was administered. Conducting a follow-up assessment several weeks after the initial intervention could have strengthened the results presented in the current study. Unfortunately, logistical restraints prevented us from conducting another assessment during Technical Training. Another limitation to the current study is the lack of a control group. Because the BTI is currently mandated as part of Technical Training, and all Airmen receive the BTI, we were unable to have a comparison group. While such a control group would have strengthened the current study, it seems unlikely that shifts in perceived harm and intentions to use would occur as a result of happenstance. Third, while we intervened on four highly prevalent TNCPs (cigarettes, smokeless tobacco, hookah, e-cigarettes), the prevalence of cigarillos (11.0%) was actually higher than one of the products we targeted (e-cigarettes, 9.4%). While e-cigarette use continues to dramatically increase in prevalence, particularly in this population,^{4,5} targeting cigarillos may be warranted. We also did not assess fidelity of implementation. Fidelity of implementation has been shown to influence program outcomes.³⁵ Therefore, while it is possible that the fidelity varied across squadrons, the patterns of results suggest that this was not an issue in the current study. Additionally, the intervention was delivered by trained study staff, making this less likely. However a full scale test of the BTI would necessitate an assessment of fidelity of implementation.

Lastly, since the BTI was delivered during a protracted time of complete tobacco and nicotine abstinence, our results may not generalize to civilian populations. During this period, Airmen are placed in a new environment and are voluntarily making huge changes in their lives. Joining a military service requires adherence to stricter standards, and a more uniform and restrictive standard of conduct. Previous research has documented that the ban alone produces 15%–20% long-term cessation among users,^{7,8} suggesting that this is an important time in the lives of these Airmen. While it is unclear exactly how this period of abstinence influences their long-term TNCP use, it is evident that this is a unique situation that does not exist for most civilians. However, since all military branches have similar protracted tobacco bans, our results should generalize to all military branches. Given that the Department of Defense is the nation's largest employer, employing approximately 1.4 million active duty personnel and over 700 000 civilian personnel,³⁶ while the military represents a specific population of interest, the public health implications of an effective BTI intervention for military personnel is considerable. However, generalizability to other military branches and civilian sub-populations of similar characteristics should be the focus of future research.

It might be possible that some of the effects of the assessment might reflect social desirability bias in response to the intervention. However we took several steps to decrease the likelihood of this occurring. Although the study was conducted during Technical Training, the Airmen were made aware of the fact that their participation in the study would be kept completely confidential, and their responses were anonymous. In fact, no one from the Air Force was allowed in the room during the administration of the BTI or data collection. Additionally, our staff wore civilian clothes and Airmen were explicitly told that their participation or lack thereof would not affect their military career in any way and was completely voluntary. Furthermore, the assessment was completely anonymous. For these reasons, we feel that social desirability bias was not a significant factor in explaining our results.

In summary, a BTI intervention has significantly increased perceived harm and decreased intentions to use TNCPs, impacting both those targeted by the BTI as well as several other TNCPs. Based on these findings there appears to be sufficient preliminary data to recommend a large scale test of the BTI on both short and long-term tobacco use in a military population.

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Declaration of Interests

JOE is the only author with conflicts of interest to report. JOE reports grants from JHP Pharmaceuticals, Orexigen, and Pfizer outside the submitted work.

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