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Impact of group motivational interviewing on enhancing treatment engagement for homeless Veterans with nicotine dependence and other substance use disorders: A pilot investigation.

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Abstract

Background: Prior studies have shown that Group Motivational Interviewing (GMI) for dually diagnosed patients holds promise for increasing treatment engagement.

Objectives: The current study evaluated the impact of a novel GMI protocol that included tobacco-specific components (referred to as ‘Tobacco GMI or T-GMI’) targeting enhanced engagement in smoking cessation treatment.

Methods: Thirty-seven primary alcohol and nicotine-dependent cigarette smoking homeless Veterans with co-morbid psychiatric conditions were recruited to receive four GMI sessions over four consecutive days. The first 16 participants received standard GMI, aimed at enhancing engagement in substance abuse treatment and for reducing substance use, while the remaining 21 participants received a modified ‘tobacco-specific’ GMI protocol (T-GMI) that included additional content specific to cessation of tobacco use and enhancing smoking cessation treatment, in addition to the standard substance abuse content of GMI.

Results: Participants in T-GMI were more likely to attend tobacco cessation programming ($p = 0.05$) as well as to attend combined tobacco cessation programming with prescribed nicotine replacement therapy ($p = 0.03$), compared to those in standard GMI. Differences between treatment conditions with respect to alcohol and illicit drug use outcomes were not significant, although overall substance use declined over time in both groups.

Conclusions and Scientific Significance—Results suggest that inclusion of tobacco-specific components in the context of GMI for substance abuse may enhance treatment engagement for tobacco cessation behaviors among dually diagnosed nicotine dependent homeless

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patients, a highly vulnerable population for which interventional resources targeting engagement in smoking cessation treatment has historically been lacking.

Keywords

Motivational interviewing; group motivational interviewing; homeless Veterans; nicotine dependence; substance use disorders

INTRODUCTION

While there has been a reduction in smoking prevalence among the general population within the past two decades, the rate of cigarette smoking among US Veterans (21.1%) remains consistently elevated.¹ This is particularly true among Veterans receiving care for a substance use disorder within the VA system, with smoking estimates ranging from 65 to 80%.^{2–3} Among homeless Veterans, the rate of smoking remains alarmingly high and nearly triple than that of the US general population (21%), with estimates ranging between 70 to 80%.^{4–5} Indeed, homeless Veterans are overrepresented among tobacco-using individuals within community health settings and they are disproportionately represented within the tobacco-using homeless population,⁶ rendering this population particularly vulnerable to smoking-related morbidity and mortality.⁷

Historically, treatment engagement of tobacco use in homeless individuals has been relatively neglected in favor of focusing smoking cessation programs on non-homeless populations; and typically homeless individuals are underrepresented in clinical trials for reasons of retention and sample homogeneity. Other reasons may involve health-care provider behaviors and attitudes toward tobacco use among homeless persons, perpetuating erroneous assumptions that homeless smokers lack interest in smoking cessation.^{8–9} However, contrary to myths that homeless individuals lack interest in smoking cessation, recent studies demonstrate that when provided opportunities to do so, homeless smokers will enroll in smoking cessation programs as well as exhibit high levels of motivation to quit smoking.¹⁰ For example, in a recent survey of 350 homeless adults aged 50 or older, smoking quit attempt rates were similar to the general population; although, successful quitting was lower.¹¹ Staying in a shelter and lower cigarette consumption was associated with greater odds of a making a quit attempt. However, a dearth of efforts targeting smoking cessation treatment engagement for the homeless is a barrier to successful smoking cessation among this population. For example, in a survey of homeless shelters in San Diego County, the majority of staff lacked expertise and resources to support smoke-free policies that would otherwise engage the homeless in smoking cessation treatment.¹² Indeed, according to the National Survey on Tobacco Prevention at Homeless Service Providers, 60% of homeless service organizations fail to engage the homeless in treatment that would otherwise assist them to quit smoking.¹³

Controlled clinical trials evaluating smoking cessation treatment engagement among the homeless are limited. In a small open pilot study, 20 homeless smoking Veterans were treated with combined smoking cessation counseling and pharmacotherapy with an impressive 45% biochemically verified 7-day point-prevalence abstinence rate at 6 months.

¹⁴ Smoking cessation programs focused on homeless Veterans may enhance their engagement into treatment though providing increased access of smoke-free living environments, while being flexible in the availability of such tailored pharmacotherapies. Given that tobacco use is the leading preventable cause of morbidity and mortality, and that homeless Veterans are highly vulnerable to dependence on nicotine, researchers have called for increased programs designed to enhance smoking cessation treatment engagement within the VA healthcare system,⁶ as well as increased innovative approaches for engaging larger number of Veterans admitted to VA homeless programs for reducing the high incidence of mortality among this group.¹⁵ Related to this issue is the ability of homeless Veterans to find housing once they seek assistance through VA supported housing (VASH) or other subsidies for permanent housing within the community. Available rental properties are quite limited for smokers, suggesting that smoking cessation may play an important role in increasing housing attainment.

Motivational interviewing (MI), a person-centered, guiding method of counseling to help enhance motivation toward making substantive behavioral changes,¹⁶ has been shown to increase treatment engagement and improve outcomes in Veterans with substance use problems¹⁷ as well as tobacco use disorders.^{10,18} The most comprehensive review to date involving 31 smoking cessation research trials that examined the efficacy of MI showed that MI smoking cessation treatment led to 45% greater odds (OR = 1.45) of smoking abstinence at follow-up (among the 31 studies examined, follow-ups included time periods as short as 4 weeks and as long as 52 weeks) compared to participants in the control conditions.¹⁹ Despite the efficacy of MI for enhancing smoking abstinence, scant research has investigated MI with homeless individuals²⁰ and less so with Veterans, particularly as mental illness and alcohol use disorder serves as the primary competing issue for addressing tobacco use among this population.⁸ Despite recommendations for concurrent treatment of substance abuse with tobacco cessation,²¹ substance abuse treatment has traditionally emphasized treatment of “harder” drugs, such as alcohol, cocaine, and opioids, while largely ignoring the treatment of tobacco use. Additionally, the one-to-one format in which MI is typically provided is time and resource intensive. Adapting MI to a group format affords several advantages that 1) addresses the issue of limited time and resources, and 2) is compatible with most existing treatment delivery structures within healthcare settings.

While Group Motivational Interviewing (hereafter referred to as *GMI*) has not been studied extensively,²² at least one trial compared GMI to an attentional control condition²³ for dually diagnosed inpatients receiving substance abuse treatment. The intervention involved delivering motivational interviewing in a group format over two 120-minute sessions, while the attentional control condition provided psychoeducational sessions of equal length. Results indicated that among participants who attended any aftercare treatment, those who received GMI engaged in more aftercare treatment and evidenced improved substance use outcomes (i.e. reduced alcohol use) up to 3 months after study participation, compared to their counterparts in the control condition. In a second trial, this GMI protocol was modified into four 75-minute sessions delivered over the course of 4 days and examined within a VA outpatient substance abuse treatment setting among Veterans with comorbid substance use and mental health disorders. While the results of the main trial are not yet published, preliminary findings indicated that GMI was similarly more effective for enhancing

treatment engagement and reducing alcohol consumption among participants than an attention control condition consisting of psychoeducational sessions for substance use.²⁴ Moreover, examination of verbal exchanges within study sessions conducted during the trial indicate that GMI was superior to the attention control condition with respect to eliciting *change talk*.²⁵ *Change talk*, often evidenced as verbalizations regarding “need, desire, reasons, ability, and commitment” to change, refers to participants’ speech in favor of change that is associated with higher likelihood of engaging in change behaviors.¹⁶

The original GMI protocol^{26–27} was developed to target patient motivation with regard to enhancing treatment motivation for addressing the substance use and co-existing mental health disorder(s) among dually diagnosed patients. Given the acknowledged recommendations in the literature to address nicotine dependence among homeless Veterans, the present pilot investigation modified the original (standard) GMI protocol to add an additional emphasis on tobacco use. Currently, there are no published studies that have evaluated GMI for enhancing tobacco use cessation treatment engagement among nicotine dependent dually diagnosed homeless Veterans seeking intervention within a specialty substance abuse treatment setting. As such, there is a need for more interventions targeting this area.

It was predicted that participants who received the “tobacco modified” version of the GMI protocol (herein referred to as *T-GMI*) that included specific activities to enhance motivation to quit smoking would be more likely to attend smoking cessation programming relative to participants who received GMI (without the tobacco cessation component), as evidenced by increased treatment engagement in smoking cessation treatment services during follow-up. It was also predicted that participants who received T-GMI, relative to those receiving GMI, would be more likely to choose FDA-approved medications for smoking cessation, as well as to attend smoking cessation classes. We also explored whether T-GMI resulted in a higher number of smoking quit attempts (defined as a voluntary decision to abstain from smoking for at least 24 hours), a lower number of cigarettes smoked daily, and a lower number of smoking days., compared to participants in GMI. As carbon monoxide (CO) measured in expired air is useful for detecting heavy smoking²⁸, we also evaluated potential between group differences in CO levels. Lastly, we explored whether there were any differential outcomes in alcohol consumption levels and self-reported drug use days between treatment groups.

METHODS

Participants:

Eligible participants included male and female nicotine-dependent cigarette smoking Veterans seeking treatment for primary alcohol use disorder and designated as currently homeless. The Stewart B. McKinney Act passed in 1987 by U.S. Congress²⁹ defines homelessness as lacking a fixed, regular, and adequate night-time residence, or primary night-time residence supervised publicly or by a privately operated shelter, transitional housing, or other supportive housing program (including VA homeless services), or a public or private place not meant for human habitation (e.g., on the streets, abandoned buildings, tents, or automobiles). The age range of eligible participants was 18 to 70 years. Eligible

participants had a history of smoking daily, approximately 10 cigarettes per day, for at least the past 12 months. Participants were required to have an expired CO reading of 10 parts/million prior to beginning the study. In addition to having a diagnosis of Tobacco Use Disorder, all participants met criteria for current alcohol use disorder (100%); and 81% met criteria for illicit drug use disorder (cocaine, opioids, sedatives), as drug use was not an exclusionary criterion. Participants were excluded if they had a diagnosis of dementia, active psychosis, or auditory impairment which would interfere with study procedures. Participants were also excluded if they were currently receiving smoking cessation treatment or smoking medications at time of study consent or if they had received either of these smoking interventions at any point in the 3 months prior to the day of study consent. Participants were compensated up to \$85.00 for their participation.

Screening measures:

The Fagerström Test for Nicotine Dependence (FTND)³⁰ was obtained at baseline. The Mini International Neuropsychiatric Inventory³¹ was used to assess psychiatric diagnoses at baseline only. Exhaled Carbon Monoxide (CO) was measured at baseline and follow-up using a professional grade CO monitor.

Outcome measures:

Primary outcome measures for the current study included smoking cessation treatment attendance and receipt of FDA-approved prescription medication (nicotine patch, gum, or lozenge) for smoking cessation. Assessment of treatment engagement within the VA smoking clinic involved counting the number of discrete smoking cessation clinic encounters, as well as reviewing patient medication lists within the patient's local electronic VA medical record. Secondary outcome measures included number of smoking days (any cigarette smoking) and number of cigarettes smoked assessed using the Time Line Follow Back (TLFB),³² and expired CO levels. Both alcohol consumption and number of days of illicit drug use data were assessed using the TLFB procedure. Alcohol consumption levels were converted to Standard Ethanol Content units (SECs) equivalent to 0.5 oz. of ethanol.³³ Number of drinking days (any alcohol use), days of binge drinking (defined as 4 consecutive alcohol beverages on a single use day for women and men over the age of 65, and 5 beverages for men under the age of 65)³⁴, average daily SECs per use day, and highest (peak) SECs (day the patient drank the most) were also calculated. Primary and secondary outcomes measures were assessed at 1 and 3-month follow-up, with the 1-month follow-up occurring 30 days after the day of consent and the 3-month follow-up, which began the day after the 30-day follow-up, occurring 90 days after day of consent.

Procedures:

The current study was a prospective repeated measures, quasi-experimental naturalistic A-B design evaluating the relative efficacy of two treatment conditions (tobacco-enhanced T-GMI compared to GMI). To recruit enough participants (i.e., at least 3) to start a group with minimal waiting time, while reducing participant drop out and to ensure discrimination between the two treatment conditions, randomization of participants to treatment conditions at the same time was not feasible, as this study was conducted as part of on-going clinical outpatient services within a VA substance abuse treatment program. Potential participants

were identified during intake interviews or from orientation groups within the Substance Abuse Treatment Center (SATC) of the Ralph H. Johnson VAMC in Charleston, SC. All participants identified as eligible received informed consent followed by a 50-minute baseline diagnostic assessment. The first half of participants who were consented and enrolled over the first 3 months of project recruitment received GMI. After 3 recruiting months, the T-GMI protocol was implemented and was provided for the remaining participants during the final 3 months of project recruitment. Treatment interventions were provided by five Ph.D.-level licensed clinical psychologists and one licensed clinical social worker who received 20 training hours of Group Motivational Interviewing²⁶ delivered over the course of 3-days by an active member of the motivational interviewing network of trainers (MINT; first author ES), as well as an additional 15 hours of training in the T-GMI protocol.³⁵ Training in both protocols consisted of intensive instruction in the GMI and T-GMI treatment manuals²⁶ utilizing video, live demonstration, and role-play practice. Similar to other MI protocols delivered in community substance abuse treatment programs,^{36–37} GMI therapist practice sessions followed within three weeks of workshop training with volunteer outpatients who elected to attend sessions until all therapists demonstrated adequate use of MI skills and implementation of GMI activities before they began to see participants in the clinical trial. To ensure adequate implementation of GMI and T-GMI protocol activities, therapist session checklists for each treatment condition were created and used to evaluate therapist adherence in the delivery of protocol activities and to ensure that there was non-contamination in session activities. Prior to meeting with study participants, therapists were required to facilitate all protocol activities across the 4 sessions during practice sessions. Assessment of MI skills and protocol activities was based on direct observation, as well as audio taped practice sessions rated by the first author. Once participant recruitment commenced, weekly supervision of study therapists for both treatment conditions (provided by the first author) was ongoing throughout the project via review, feedback and coaching based on audio recorded sessions to ensure fidelity of the treatment protocols.

Treatment conditions.

Both GMI and T-GMI interventions were provided within a one-week time frame on four consecutive days (e.g., Tuesday through Friday with each session conducted approximately 24 hours from the preceding session) approximately 1 week after the day of consent. Adequate dose of treatment was defined as attendance of at least 3 of the 4 sessions.

GMI:

The goal of this manualized four-session, 75-minute/session intervention^{26–27} is to resolve ambivalence for making a change, develop a sense of discrepancy between personal goals, values, and current behavior, and enhance change talk amongst participants, particularly for taking responsibility of one’s substance use disorder(s) in three areas: 1) staying clean and sober, 2) attending treatment, 3) taking medications for the substance use disorder(s). In particular, GMI is designed to enhance “*Relatedness*” or the enhancement of change talk between group members.²⁵ Group members are reinforced for MI consistent empathic behaviors, rolling with resistance, supporting group member confidence/personal strengths, and withholding unsolicited advice with other members. While GMI remains consistent with

the goals and principles of MI, the GMI group process is strategically inter-woven with 10 dynamic aspects of group therapy that are described as advantages of group over individual treatment.³⁸ Each process is linked with an MI consistent activity and includes concepts such as Self-Understanding, Group Cohesiveness, Culture Building, Interpersonal Learning, Identification, Guidance, Universality, Catharsis, Altruism, Existential Factors, and Instillation of Hope.³⁸ Each therapeutic session follows a structured agenda while allowing flexibility to elicit feedback from group members, *Relatedness*, and group member empathic responding. The sessions provided the following content: Session 1 explores the difficulty and ambivalence pertaining to change, Session 2 provides personalized motivational enhancement feedback, Session 3 discusses personal values and strengths and the relationship between substance use and co-existing psychiatric disorder, and Session 4 explores engagement in treatment for both problems.

T-GMI:

Participants in T-GMI received all the same components and primary activities of GMI, although particular items from the GMI protocol activities were modified (e.g., items were either shortened or replaced) with specific tobacco cessation material as follows: Session 1 specifically addresses ambivalence to quit smoking by exploring emotions related to quitting and providing smoking health-related information in an MI-consistent fashion. Participants were asked open-ended questions how they envision treatment may help them to quit smoking and why they would consider quitting at this time, followed by a decisional balance activity for exploring the pros/cons of changing substance use that included the pros/cons for quitting smoking. In Session 2, participants were provided with a *Personalized Feedback Report (PFR)* that included important aspects of their substance use behaviors and smoking patterns. The smoking feedback in the PFR included financial cost of smoking, CO levels, risk tables (rate of morbidity/mortality), associated medical problems (asthma, CAD, COPD from medical record), personal benefits of quitting (e.g., grandchildren), and a discussion of the relationship between smoking and other substance use disorders. Reports were reviewed one page at a time while questions were answered and *change talk* facilitated. In Session 3, the discussion of personal values and strengths was modified to emphasize health concerns related to smoking that may serve as barriers for life ambitions and which is intended to evoke motivations as well as enhanced self-efficacy for quitting smoking. In Session 4, participants assisted each other to brainstorm obstacles/barriers and challenges for engaging in treatment along with a discussion of specific tobacco cessation treatments available as well as smoking cessation medications such as nicotine replacement therapy (NRT) they have used (e.g., onsite treatment availability).

Statistical approach.

Key demographic, behavioral, and clinical variables were compared between groups using Fisher's exact test and t-test for categorical and continuous outcomes, respectively. Between group differences on treatment engagement and number of individuals who engaged in any quit attempt were examined using Fisher's exact tests. Secondary outcome variables, including tobacco, alcohol, drug use, and all continuous variables were analyzed using mixed model ANOVAs with Group and Assessment Time (baseline, 1-month, 3-month) as

fixed effects with subject as a random effect. SECs were log transformed for analysis to better meet model assumptions. All hypothesis tests were two-sided with $\alpha = 0.05$.

RESULTS

Demographics:

Thirty-nine participants were enrolled, although two participants did not attend any treatment sessions and thus were excluded from main outcome analyses. Of the remaining 37 participants, 16 received GMI (within a total of 6 cohort groups) and 21 received T-GMI (within a total of 7 cohort groups). Participants had a mean age of 53.1 ($SD = 7.7$), 22 were African American and 15 were Caucasian. Only one female participant was recruited, as this is consistent with the demographics (i.e. predominantly male gender) within VA substance use treatment services. Participants reported smoking cigarettes a total number of 34.6 years ($SD = 10.8$), smoking approximately 15.5 ($SD = 6.7$) cigarettes daily and measured on average in the 'medium level' of nicotine dependence as measured by the FTND. Treatment conditions did not differ significantly on any demographic variables (see Table 1). Two participants (one participant in each condition) did not return to provide data at the third month follow-up assessment.

Participant Attendance:

Mean number of treatment sessions attended was 3.6 ($SD = 0.6$) in GMI and 3.8 ($SD = 0.5$) in T-GMI and the median number of sessions attended was 4 for both groups. The percentage of participants that completed 4 sessions was 69% and 78% in the GMI, and T-GMI groups, respectively, while the percentage of participants who attended 3 or more treatment sessions was 94% and 91%, respectively. All participants attended at least 2 sessions. The amount of GMI and T-GMI time exposure to sessions in minutes did not substantially differ (71 vs. 76 minutes per session, respectively). Overall, the T-GMI protocol consisted of an average of 25 minutes of protocol material directly addressing smoking cessation.

Results of Outcome Measures:

Results indicated that 8 of 21 participants (38%) in T-GMI attended one or more smoking cessation classes at follow-up, while only 1 of 16 participants (7%) in GMI attended one or more classes; a marginally significant with Fischer Exact test result of $p = 0.05$. Within T-GMI, 10 participants (48%) received a prescription for an FDA-approved medication for smoking cessation from a VA provider (all prescriptions were for NRT), while 3 participants (19%) in GMI received a prescription for smoking cessation ($p < .09$). Within T-GMI, 6 participants (29%) attended at least one smoking cessation class combined with receiving FDA-approved smoking cessation medication, while no participants in GMI had done so, with a Fisher exact test result of $p = .03$. Regarding smoking quit attempts, 47% ($n = 10$) of participants in T-GMI made a quit attempt, compared to 25% ($n = 4$) of participants in GMI, although this difference was not statistically significant. No treatment condition differences were noted for continuous outcome measures; however, several measures showed decreases over time: Across both groups, number of daily cigarettes smoked decreased over time, $F(2,71.2) = 5.3$, $p < .001$, although no significant changes were noted in CO levels, or number

of Smoking Days ($p < .11$ and $.26$, respectively). Reported alcohol consumption levels were significantly reduced in both T-GMI and GMI, with a reduction in Number of Drinking Days, $F(2,70.5) = 38.5$, $p < .001$, Number of Binge Drinking Days, $F(2,77.2) = 36.9$, $p < .001$, SEC levels per Alcohol Use Day, $F(2,66.19) = 97.4$, $p < .001$, and PEAK SECs, $F(2,61.7) = 97.4$, $p < .001$. Number of self-reported Drug Use Days also showed significant reductions, $F(2,66.2) = 36.9$, $p < .001$. Table 2 presents the means and standard deviations of the continuous secondary outcomes measures, along with their associated p -values.

DISCUSSION

The results from the current pilot investigation indicate that the tobacco modified version of the GMI protocol (i.e. T-GMI), which included specific activities and components to enhance motivation to quit smoking, increased engagement in treatment for tobacco cessation among homeless Veterans with substance use and co-existing psychiatric disorders. The availability of both counseling and pharmacotherapy within substance abuse treatment services likely contributed to the decline in CPD and treatment engagement in both groups. However, there was a trend towards significance with respect to attendance in tobacco cessation classes in T-GMI compared to GMI. Of note, significantly more T-GMI participants engaged in combined smoking cessation classes along with prescribed FDA-approved smoking cessation medication, an evidenced-based combination known to increase the likelihood of successful smoking cessation.³⁹ Furthermore, while differences in the number of individuals prescribed with medications and number of individuals who made smoking quit attempts were not significantly different across treatment conditions, the numbers were consistently in favor of T-GMI, as nearly twice as many participants in T-GMI reported quit attempts relative to their counterparts in GMI. Taken together, these results suggest that increased engagement in smoking cessation treatment efforts occurred when relatively small modifications to our existing GMI protocol were implemented.

It should also be noted that while T-GMI is intended to enhance motivation for patients to *consider* making changes to their cigarette smoking, the primary focus of *both* GMI and T-GMI is to encourage patients with substance abuse disorders to change their patterns of alcohol and drug abuse. Overall, the self-reported data indicated that both groups indeed reported robust reductions on number of days of alcohol and drug use; as well as dramatically reduced levels of alcohol consumption in terms of SECs (standard drinks). Although the majority of the homeless Veterans in both groups resided in VA supportive housing, which possibly contributed to some attenuation of drug and alcohol use, these results are consistent with those reported by Santa Ana and colleagues²³ and provide continued support for the potential efficacy of group-delivered Motivational Interviewing for the treatment of substance use disorder(s). It is also important to note the potential positive impact of smoking cessation behaviors on alcohol use. Prior studies have demonstrated that behaviors involved with quitting smoking may reduce drinking behavior among individuals with alcohol use disorders.⁴⁰ Our data suggest that efforts targeting smoking cessation as a potential avenue for impacting these more primary goals (substance use sobriety) are relevant for this population.

While the results are encouraging, there are a number of weaknesses in design that reduce our ability to make strong conclusions regarding enhanced tobacco cessation treatment engagement. Firstly, therapists were not blinded to the study hypotheses, thus the possibility of demand characteristics may have encouraged participants to engage in smoking cessation treatment. In addition, the study was not randomized, although it is important to note that this was a pilot study designed to inform future work in this area. We utilized a naturalistic A-B design where participants in the earlier phase of the study received GMI, while those recruited in the latter part of the study received T-GMI. While it is possible that motivation to quit smoking was highest just after the New Year, only one of the T-GMI treatment groups consisting of four participants was conducted during the month of January during the recruitment phase, thus making it unlikely that receiving treatment in the New Year significantly impacted results. Nevertheless, it is difficult to rule out subtle effects that could have occurred over time. Thirdly, generalizability of findings to the population at large is limited, since the sample consisted of homeless Veterans with co-existing alcohol use and other psychiatric disorders. Fourth, the sample size is small and the possibility of Type II error exists in that there may not have been enough power to detect differences among the secondary outcomes. Fifth, it is also possible that since 73% of the sample was recruited from VA Housing requiring sobriety from alcohol as a 'house rule', this may have confounded results. Nevertheless, in order to be eligible for the study, all participants were required to have current alcohol use disorder (100%) and to self-report alcohol consumption of at least one day in the preceding 30 days prior to the day of consent. Finally, it is unknown which particular components among the T-GMI four session protocol led to increased smoking cessation treatment engagement. It is possible that including the 'tobacco modified' components in the GMI protocol may have been the "active ingredients", although alternatively it may be that providing the proper contact information to smoking cessation services led to the treatment effect. CO levels, as well as self-report were used to assess smoking status and behavior. CO level is a nonspecific measure of smoking status and behavior and is better at detecting abstinence than smoking reduction. Future studies should involve examination of tobacco cessation smoking change talk that may predict behavior change to better elucidate active ingredients of the intervention, along with a longer follow-up assessment (e.g., out to 6 or 8 months), as well as a larger sample size, to evaluate effect on alcohol use and other substance use.

Despite these limitations, given that individual MI can improve smoking-related outcomes¹⁹ and GMI can increase treatment engagement for other forms of substance abuse,²³ there is reason to speculate that T-GMI may indeed have provided the unique active ingredients needed to enhance smoking cessation treatment engagement in our sample of nicotine dependent dually diagnosed homeless Veterans. The homeless population struggles with several treatment engagement issues for smoking cessation, including lack of treatment resources integrating both SUD and smoking cessation treatment and an absence of smoking cessation treatment in most organizations serving the homeless.^{41,13} The present study suggests that small and relatively simple tobacco-specific modifications can be easily layered onto existing substance use disorder treatments to enhance engagement in tobacco cessation among homeless Veterans seeking SUD treatment.

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Table 1:
Participant Characteristics by Group

<u>Demographics</u>	<u>GMI (n = 16)</u>	<u>T-GMI (n = 21)</u>	<u>Significance Level</u>
Age, mean years (sd)	51.1 (8.2)	54.5 (6.8)	$p = .17$
Race, n (% African American)	7 (44%)	15 (71%)	$p = .11$
Gender	15 M/ 1 F	21 M/ 0 F	$p = .43$
<u>Number of years homeless, n (%)</u>			$p = .19$
< 1 to 4 years	13 (82%)	17 (81%)	
5 years	3 (19%)	4 (19%)	
<u>Homeless Setting, n (%)</u>			
VA Housing Services	11 (69%)	18 (85%)	$p = .29$
Unstable 'couch surfing' with friend or relative	4 (25%)	1 (5%)	
On the street, tent, or car	1 (6%)	2 (10%)	
<u>Education, n (%)</u>			$p = .26$
high school grad. or some college	16 (100%)	20 (95%)	
college graduate	0 (0.0%)	1 (2%)	
<u>Baseline Smoking Characteristics, mean (sd)</u>			
FTND	4.8 (2.7)	4.9 (2.2)	$p = .84$
# Cigarettes smoked/day (past 30 days)	14.2 (6.2)	15.7 (5.0)	$p = .43$
<u># smoking years, n (%)</u>			$p = .99$
10 to 19 years	3 (19%)	5 (24%)	
20 years	13 (81%)	16 (76%)	
<u>Comorbid Disorder, n (%)</u>			$p = .43$
Depression (Major, other)	10 (63%)	10 (48%)	
Bipolar I Disorders	0 (7%)	1 (5%)	
Mood Disorder	2 (13%)	5 (24%)	
Schizophrenia/ Psychotic Disorder	2 (13%)	0 (0%)	
Anxiety Disorder (PTSD, Panic, GAD)	3 (19%)	11 (52%)	
<u>Alcohol Use Disorder, n (%)</u>	16 (100%)	21 (100%)	$p = .75$
<u>Drug Use Disorder, n (%)</u>	11 (69%)	19 (90%)	$p = .19$

Table 2:
Results of Continuous Secondary Outcome Variables

		GMI (n = 16)	T-GMI (n = 21)	Effect	F	p
# Days Smoked	Baseline	27.9 (3.9)	26.8 (5.2)	Group	<0.01	0.98
	1 Month FU	24.5 (11.2)	25.0 (9.8)	Time	1.41	0.25
	3 Month FU	24.6 (11.3)	25.4 (9.7)	Group × Time	0.20	0.82
# Cigarettes per day	Baseline	15.1 (8.5)	15.7 (5.3)	Group	0.27	0.61
	1 Month FU	10.9 (8.7)	11.6 (7.6)	Time	5.27	<0.01
	3 Month FU	10.0 (6.0)	10.8 (7.2)	Group x Time	<0.01	0.99
CO Levels	Baseline	18.3 (6.5)	20.1 (7.7)	Group	1.42	0.24
	1 Month FU	15.1 (6.9)	15.8 (8.3)	Time	2.33	0.11
	3 Month FU	15.7 (8.9)	18.9 (9.7)	Group x Time	0.17	0.85
# Days Drinking	Baseline	13.1 (8.0)	14.3 (5.9)	Group	2.54	0.11
	1 Month FU	2.9 (7.8)	0.3 (0.9)	Time	38.48	<0.01
	3 Month FU	5.0 (9.0)	0.7 (1.9)	Group x Time	1.63	0.20
# Binge Drink Days	Baseline	12.4 (7.9)	12.2 (6.6)	Group	1.83	0.18
	1 Month FU	1.9 (6.5)	0.3 (0.9)	Time	36.87	<0.01
	3 Month FU	2.7 (6.1)	0.2 (0.5)	Group x Time	0.39	0.68
SECs per Day	Baseline	20.7 (17.1)	16.2 (11.0)	Group	2.23	0.14
	1 Month FU	2.1 (4.2)	2.9 (8.8)	Time	81.29	<0.01
	3 Month FU	3.6 (4.9)	2.0 (4.2)	Group x Time	0.37	0.70
Peak SEC Day	Baseline	29.4 (19.8)	24.7 (17.0)	Group	2.13	0.15
	1 Month FU	2.1 (2.8)	3.5 (10.9)	Time	97.39	<0.01
	3 Month FU	5.1 (7.7)	3.1 (7.0)	Group x Time	0.36	0.70
Drug Use Days	Baseline	2.9 (2.2)	6.8 (8.5)	Group	3.43	0.07
	1 Month FU	0.1 (.3)	0.1 (.5)	Time	9.46	<0.01
	3 Month FU	0.3 (0.8)	1.5 (6.2)	Group x Time	1.64	0.20

Note: All values are Means with Standard Deviations in parentheses. Values for Days Smoked, Days Drinking, and Binge Drinking Days at Three Month Follow up refer to the average of Months 2 and 3. For Three Month Follow up, data for one participant was missing in GMI for all measures, and one participant missing for the CO level reading in T-GMI.