Original Investigation

The effect of a culturally tailored smoking cessation for Chinese American smokers

Dunli Wu, Grace X. Ma*, Kathy Zhou, Dinglun Zhou, Andy Liu, & Adrienne N. Poon

Abstract

Introduction: Tobacco use is a serious public health problem among low-income Chinese Americans with limited English proficiency. Chinese men are at high risk for smoking-related morbidity and mortality. We tested the feasibility of a culturally and linguistically sensitive smoking intervention program with combined counseling and pharmacological components for Chinese smokers in New York City; identified factors and techniques that enhance the administration and appropriateness of the intervention program; and examined the overall impact of this program on quit attempts, quit rates, and overall smoking reduction.

Methods: We were guided by the transtheoretical model and used an adapted motivational interviewing (MI) approach. The study involved a randomized sample with pretreatment assessment and multiple follow-up measures. Eligible participants ($N = 122$) were randomly assigned to intervention (4 individualized counselor-led MI sessions and nicotine replacement therapy [NRT]) or control groups (4 general health education sessions, self-help materials, and NRT).

Results: Quit rate at 6 months in the intervention group was 67% versus 32% for the control group, indicating minimal relapse and a highly successful intervention program. Increase in self-efficacy and decrease in pros of smoking from baseline to 6-month follow-up were positively associated with smoking cessation. The number of cigarette smoked at baseline was inversely related to smoking cessation. Results indicate that a combined intensive behavioral counseling and pharmacological intervention can reduce smoking substantially.

Conclusion: The results of this pilot will be used as a basis for a large-scale randomized trial of an intervention with combined culturally and linguistically sensitive MI and NRT components for Chinese and other Asian ethnic groups.

Introduction

Tobacco use has historically been a serious public health problem in the United States and worldwide. The 2007 National Health Interview Survey reported a smoking prevalence rate of 19.8% among adults (Centers for Disease Control and Prevention [CDC], 2007). A 2007 report by CDC indicated a smoking prevalence rate of 23.9% for males and 18.0% for females (CDC, 2007). Several independent studies have revealed higher smoking rates among Chinese Americans ranging between 22% and 34% (Hu et al., 2006; Ma, Shive, Tan, & Toubbeh, 2002; Ma, Tan, Toubbeh, & Su, 2003; Shelley et al., 2004; Yu, Chen, Kim, & Abdulrahim, 2002). In New York City (NYC), one study of Chinese American smokers reported a prevalence rate of 29% and a lifetime smoking rate of 52% (Shelley et al.).

A large body of epidemiological research has established a relationship between tobacco use and a variety of diseases such as cancer, heart disease, stroke, and chronic obstructive pulmonary diseases (Kumra & Markoff, 2000). Tobacco use today is the single most preventable cause of illness and death and is accountable for more than 438,000 deaths in the United States annually (CDC, 2005). A CDC report of 2005 and an earlier report by the Department of Health and Human Services (U.S. DHHS) indicated that mortality caused by cigarette smoking is higher

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than that attributed to crack cocaine, AIDS, homicides, suicides, and alcohol use combined (CDC, 2005; U.S. DHHS, 1998).

Asian Americans constitute one of the fastest growing ethnic groups in the United States, increasing from 7 to 13 million (about 72%) during the period of 1990–2000. The 2000 Census reported a population of 2.7 million Chinese Americans, an increase of 48% from 1990 (Barnes & Bennet, 2000). NYC's Chinese population, the largest in the United States, is estimated to be 375,000 (Asian American Federation of New York Census Information Center [AAFNYCIC], 2004), which does include many undocumented Chinese immigrants. Analysis of 2000 Census data by the AAFNYCIC indicates that a large subset of this population is foreign born (75%), has limited English proficiency (63%), does not have a high school diploma (42%), and is nearly a quarter (23%) indigent (AAFNYCIC). These factors pose additional barriers to smoking cessation. Lower levels of English proficiency, education level, and acculturation as well as recent immigrant status, for example, are associated with higher levels of current smoking among Chinese American men. These factors provide additional barriers for this population since limited English proficiency supports linguistic isolation and lack of access to health services that may promote smoking cessation. Furthermore, a cultural norm that promotes smoking among men can lead to social pressure that would increase resistance to cessation (Fu, Ma, Tu, Siu, & Metlay, 2003; Hu et al., 2006; Ma et al., 2004; Yu et al., 2002). A large subset of Chinese American males is less likely to report consideration of physician advice to quit smoking and hence is less likely to have adequate knowledge of early cancer symptoms (Fu et al.; Yu et al.). Typically, Chinese American smoking behaviors are culturally bound with adverse health issues related to smoking being dealt within the context of Chinese culture and traditional medicine (Hu et al., 2006; Yu et al.).

There is a dearth of culturally appropriate smoking intervention programs to promote cessation within Chinese American communities. Accessibility to culturally unfamiliar intervention programs has not led to significant changes in smoking behaviors (Spigner, Yip, Huang, & Tu, 2007). Research to date, however, has identified intervention strategies that could effect better quit and cessation outcomes. Two studies have shown that physician-led smoking interventions may lead to higher quit and cessation rates among Chinese Americans (Ferketich et al., 2004; Spigner et al.).

Although knowledge about the adverse impact of tobacco use on the health of Chinese Americans in NYC is low, general awareness of the city's restrictive ordinances against smoking in public places has created a need in the community for culturally and linguistically specific smoking prevention and cessation programs. The city's Chinese community is composed largely of new immigrants, who, like their predecessors, adhere to Chinese cultural norms (Shelley et al., 2004). Two studies by Spigner et al. (2007) and Yu et al. (2002) found that former Chinese smokers may not consider prevailing approaches to prevention and cessation, particularly nicotine replacement therapy (NRT), to be effective, which may have led to limited uptake in comparison with "cold turkey" methods. The authors note that the effectiveness of culturally appropriate therapies, especially those that relate to introduction of NRT, need further study.

Prochaska and DiClemente's (1983) Transtheoretical Model (TTM) has often been applied to smoking cessation programs to stimulate behavior change. The core constructs of TTM,

around which other dimensions are organized, are the stages of change: precontemplation, contemplation, preparation, action, and maintenance. These represent ordered categories to change problem behavior along a continuum of motivational readiness. Matching interventions to the specific stage of change is important to promoting retention in smoking cessation interventions (Prochaska, 1996).

Few intervention studies, however, have targeted Chinese Americans, the largest subset of Asian ethnic groups in the United States. A generic Asian QUIT program was first developed and later tailored to specifically meet the cultural and linguistic needs of several Asian American ethnic communities, including Chinese (Ma, 1999). Chinese QUIT is a smoking cessation intervention specifically tailored for Chinese American smokers. We not only developed all the smoking cessation protocols and participant materials in the Chinese language but also incorporated social and cultural factors that are critical for Chinese smokers, including Chinese values, Yin–Yang balance, male social status, coping with separation from extended families, availability of social support, role and relationship changes, limited language proficiency, and stigma in seeking smoking cessation services among others.

Our previous study (Ma et al., 2005), which focused on Chinese and Korean American smokers, found that the 3-month quit rate for this ethnically mixed group was 59% and between 57% and 68% of participants had successfully moved from precontemplation to action and maintenance stages. In addition, Chinese and Korean American smokers showed increases in self-efficacy at 3 months and an initial (1-month) quit rate of 52.6%. This rate dropped significantly at 3-month postintervention, suggesting a need to incorporate the prevention of smoking relapse into cessation strategies (Fang et al., 2006).

This study was guided by constructs from TTM (Prochaska & DiClemente, 1983) and adapted motivational interviewing (MI) strategies (Miller & Rollnick, 2002). Transitions between stages of change are effected by a set of independent variables known as the processes of change. The TTM further incorporates a series of intervening or outcome variables that include decisional balance (the pros and cons of change), self-efficacy (confidence in the ability to change across problem situations), situational temptations to engage in problem behavior, and behaviors that are specific to the problem area. Also included among these intermediate or dependent variables would be any other psychological, environmental, cultural, socioeconomic, physiological, biochemical, or even genetic or behavioral variables that are specific to the problem being studied.

Motivational interviewing (MI) has been used extensively to help individuals overcome ambivalence, assist them in making behavioral changes through a collaborative relationship with counselors, recognize individual autonomy, and incorporate individual goals and values (Miller & Rollnick, 2002). Based upon constructs of TTM, multiple sessions of MI can move individuals through the various stages of change using a combination of NRT (Mallin, 2002) and education, recommendations, a list of options, the discussion of reactions, and follow-ups. Although the use of MI for smoking cessation has shown some promise, there is a need to test its effectiveness across different clinicians and populations (Dunn, Deroo, & Rivara, 2001).

The specific aims of this study were (a) to pilot test the feasibility of Chinese QUIT, a combined culturally tailored smoking cessation program, which uses an AMI and a pharmacological NRT intervention among Chinese American smokers residing in NYC; (b) to examine the impact of Chinese QUIT on smoking reduction and quit rates specifically for the improved cognition of risk perceptions, self-efficacy, decisional balance (pros and cons of smoking), emotional distress, and nicotine dependence; and (c) to identify factors and techniques that can be used to modify or improve Chinese QUIT as well as assess potential long-term effects of this intervention among Chinese and other Asian American smokers.

Methods

Subjects

Participants were recruited through the Asian Community Health Coalition's Chinese member organizations in NYC by experienced bilingual staff from Temple University's Center for Asian Health in cooperation with trained community volunteers. All recruits were screened for eligibility by trained staff and volunteers. Primary eligibility criterion for inclusion in the study cohort was current smoking status. Other inclusion criteria were (a) self-identification as ethnic Chinese, (b) aged 18 years and older, (c) having smoked or puffed on a cigarette during the previous week, (d) willingness to participate in the smoking cessation study, (e) access to a functional telephone, (f) expected presence in the study geographic area for a year or more, and (g) not having been enrolled in the past or at the current time in any smoking cessation treatment programs. Exclusion criteria, primarily to avoid potential adverse effects of NRT, included (a) being currently pregnant and (b) having had a recent diagnosis of cardiovascular disease. The study protocols were approved by the Institutional Review Board of Temple University.

One hundred and ninety Chinese smokers in NYC were recruited and contacted for the project. All 190 smokers were screened for eligibility, with a total of 139 eligible smokers electing to participate in the study and signing the informed consent form, while 51 smokers were found not eligible and did not sign the consent form. All 139 smokers completed the baseline assessment with none withdrawing before this assessment. Among the 139 smokers, 67 were randomly assigned to the intervention group and 72 were assigned to the control group. Sixty in the intervention group and 62 in the control group completed the follow-up assessments at 1 week, 1, 3, and 6 months. Only seven smokers (10% dropout rate) in the intervention group and 10 smokers (13.8% dropout rate) in the control group dropped out of the program due to loss of contact and/or health status (Figure 1).

The majority of smoker participants were male, married, middle aged, and of low-income status. Most participants had a high school or equivalent education. At baseline, the majority of participants were current regular and heavy smokers and nearly half had never attempted to quit. Demographic data are presented in Table 1.

Study design and procedures

A two-group experimental random design, with baseline assessment and follow-up measures, was used. Eligible participants/smokers aged 18 years and older were randomly assigned to MI

or to the general health-counseling program. Both groups received NRT, as well as four separate in-person counseling sessions conducted in Chinese. NRT consisted of four Nicoderm CQ patches for 8 weeks. Participants had the option of deciding when to start the NRT during the 6-month study period. The design had five assessment timepoints composed of an in-person baseline assessment, telephone follow-ups at 1 week, 1, and 3 months, followed by a 6-month in-person postintervention assessment. Follow-up measures captured potential changes in decisional balance and stage of change, as well as NRT usage and adherence.

Intervention condition. Intervention consisted of four 60-min in-person sessions of AMI counseling and a packet of self-help smoking cessation materials. The deleterious effects of tobacco use, secondhand smoke, as well as participants' experiences with smoking were discussed within various cultural contexts as, for example, hosting friends or in business transactions. Additionally, participants were counseled about the addictive nature of nicotine, encouraged to conduct a decisional balance exercise to examine the pros and cons of smoking, and encouraged to contemplate quitting behavior (Miller & Rollnick, 2002). Participants were provided NRT packs and counseled on their use.

Control condition. Participants in this condition were provided with four in-person 60-min health education sessions and packets of general health self-help information, nutrition, exercise, and the harmful effects of tobacco. Strategies for quitting smoking were also provided to participants in this group as well as a supply of NRT and counseling on its use.

Measures

The measurement instrument used for this study included 70 items that had been tested and validated in Asian American communities (Fang et al., 2006; Ma, Fang, Toubbeh, Choi, & Feng, under review). These items include demographics and smoking history (baseline variables), decision balance, health risk perceptions and self-efficacy, stages of change, and smoking status.

Demographics and smoking history. Demographic data at baseline included age, gender, marital status, annual income, and education level. Smoking history included self-reported data and information on number of quit attempts to date, current smoking behavior, average number of cigarettes smoked over the past 7 days, nature of advice that participants received regarding quitting smoking, if any, and the relative impact of such advice on participant's intention to quit.

Decisional balance. Eight items were used to assess participants' pros and cons of smoking. These were derived from Velicer, DiClemente, Prochaska, and Brandenburg's (1985) Smoking Decisional Balance Scale. A composite score for each construct (Cronbach's α ranged from .79 to .85) was determined by summing up the items within each scale. The four "con" items of quitting were "Smoking cigarettes is pleasurable"; "I like the image of a smoker"; "Smoking helps me concentrate and do better work"; and "Smoking cigarettes relieves tension." The four "pro" items were "My smoking affects the health of others"; "Smoking cigarettes is hazardous to my health"; "My cigarette smoking bothers other people"; and

Figure 1. Flow chart of recruitment and participation of Chinese smokers in the Chinese QUIT smoking cessation intervention.

“People close to me disapprove of my smoking.” Participants responded to each item using a 4-point Likert-type scale with endpoints ranging from 1 = “*strongly disagree*” to 4 = “*strongly agree*.”

Health risk perception and self-efficacy. Participants completed questionnaires with responses rated on a scale of 1 = *strongly disagree* to 4 = *strongly agree*. Risk perceptions (four items) and self-efficacy in quitting (four items) were assessed at multiple timepoints. Items within each scale were summed to create a composite score for each construct (Cronbach’s α ranged from .79 to .85). For health risk perception, we asked questions such as “Smoking increases the risk for medical problems such as reproductive problems, respiratory problems, or heart disease.” “I feel capable of not smoking when I am with friends at a party” is an example of a self-efficacy item.

Stages of change. Prochaska and DiClemente’s (1983) Stages of Change model has proven successful in interventions aimed at the mediation of behavioral change, including those focused on increasing smoking cessation efforts among participants. In this study, individuals are categorized into one of five stages, which characterize the individual’s readiness to change his or her behavior. The stages are as follows: precontemplation (the individual has no intention to make a behavior change), contemplation (the individual is considering a behavior change in the next 6 months), preparation (the individual is ready to make a behavior change in the immediate future—within 30 days), action (the individual has actively made a behavior change within the last 6 months), and maintenance (the individual has maintained a behavior change for more than 6 months). Within the framework of the smoking cessation program, this model served as a guide to determine a smoker’s treatment plan.

Smoking cessation and reduction. As a baseline measure, participants were asked whether they had smoked or had a puff on a cigarette and the number of cigarettes smoked in the past 7 days. A participant self-report of the number of cigarettes smoked at 1 week, 1, 3, and 6-month timepoints was used as a measure of smoking reduction.

Biomarker of smoking status. Carbon monoxide (CO) concentration in parts per million (ppm) from expired air was measured by Micro CO meter (Micro Direct Inc., Lewiston, ME). An expired CO reading of 6 ppm or higher was used as an indicator of current smoking (Wald, Idle, Boreham, & Baily, 1981). All participants were measured by breath CO as cross validation of their smoking status at two timepoints: baseline and 6-month follow-up.

Statistical analyses

Data were analyzed using SPSS Version 14.0. Demographic and psychosocial variables were characterized by descriptive statistics. Participants who did not report their smoking status were categorized as “smokers.” One-way analysis of variance (ANOVA) and chi-square analysis were used to assess potential differences between study conditions (intervention and control) on demographic and psychosocial variables. We conducted 2 (Study Conditions) $\times$ 5 (Timepoints) repeated measures of ANOVAs to evaluate changes in psychosocial variables over time by study group. Significant interactions were examined using a simple main effects analysis with pairwise comparisons and Bonferroni correction. The kappa (κ) statistic was used to measure agreement between the smoking status of self-reported and the biomarker CO. Finally, univariate and multivariate logistic regression analyses were performed to examine predictors

Table 1. Characteristics of study participants

	Control (N = 62)	Intervention (N = 60)	p Value
Gender ^a			
Male	89.1	86.2	.778
Female	10.9	13.8	
Age (SD) ^b	43.9 (12.1)	45.0 (12.8)	.622
Annual income ^c			
<\$20,000	77.4	72.4	.291
\$20,000–\$30,500	3.2	5.2	
\$30,500–\$40,500	8.1	17.2	
\$40,500–\$50,000	11.3	5.2	
Education			
Less than high school	35.4	33.3	.115
High school and similar	32.3	18.4	
College and up	32.3	48.4	
Marital status ^d			
Unmarried	21.7	16.1	.442
Married	78.3	83.9	
Times of quit attempts in your life ^e			
Never	45.8	40.7	.839
1	28.8	29.6	
≥2	25.4	29.6	
Current smoking behavior ^f			
Smoke regularly	46.2	56.0	.204
Smoke regularly but cut down	34.6	20.0	
Smoke every once in a while	19.2	24.0	
Advised by a physician to quit	54.1	60.0	.564
How much physician's advice motivated to quit			
Not at all	41.5	45.2	.569
A little bit	31.7	38.1	
Moderately	17.1	11.9	
Quite a bit	9.8	4.8	
Very much	0.0	0.0	

Note. ^aSeven missing in control group and two missing in intervention group.

^bThree missing in control group and one missing in intervention group.

^cTwo missing in intervention group.

^dTwo missing in control group and four missing in intervention group.

^eThree missing in control group and six missing in intervention group.

^fOne missing in control group.

of smoking cessation at 6-month follow-up. In the multivariable analysis, the treatment group was forced to enter into the regression models, whereas all other factors were selected into the models by stepwise forward method.

Results

Comparison of baseline measures for treatment and control conditions

No significant differences in gender (89.1% male vs. 86.2% male), age (43.9 vs. 45.0 years), annual income (large majority 72%–77% earning <\$20,000 per year), education (majority 33%–35% with less than high school education), marital status (majority 78%–84% married), smoking status (majority 46%–56% smoke regularly), or influence of physician's advice in motivating to quit (majority 41%–45% considered themselves not at all influenced) were found between intervention and control groups at baseline (Table 1). In terms of baseline psychosocial

measures, no significant differences were found between intervention and control groups.

Overall, most participants were favorable toward the NRT. About 32% of the control had ceased smoking by the end of the study period, suggesting that NRT affected the cessation rate. However, NRT combined with MI produced a much higher cessation rate of 67% for the intervention group.

Effect of treatment conditions on psychosocial variables over time

All participants over time showed increased risk perceptions, Huynh–Feldt, $F(2.7, 305) = 29.756$, $p < .001$; self-efficacy, $F(2.5, 282.4) = 83.837$, $p < .001$; and cons of smoking, $F(3.3, 347.5) = 19.538$, $p < .001$. Participants also showed decreasing pros of smoking over time, $F(3.3, 352) = 6.451$, $p < .001$ (Table 2).

A main effect of study condition was found for risk perceptions, $F(1, 115) = 9.891$, $p < .01$; self-efficacy, $F(1, 113) = 5.318$,

Table 2. Changes in psychosocial variables over time by study condition M (SD)

	Baseline	Postintervention follow-up				Time Effect <i>F</i> value	Group Effect <i>F</i> value	Interaction <i>F</i> value
		1 week	1 month	3 months	6 months			
Risk perception								
Control	12.6 (2.4)	12.6 (2.5)	13.0 (2.8) ^a	13.7 (2.9) ^a	14.1 (2.9) ^a	29.756***	9.891**	1.551
Intervention	13.1 (2.1)	13.3 (2.2)	14.1 (2.1) ^a	14.9 (1.8) ^a	15.2 (1.7) ^a			
Self-efficacy								
Control	8.9 (2.3)	9.9 (2.3)	11.1 (2.7)	11.6 (3.3) ^a	11.7 (3.6) ^a	83.837***	5.318*	6.014**
Intervention	8.9 (2.4)	10.2 (2.9)	11.5 (2.4)	13.3 (2.9) ^a	13.7 (3.1) ^a			
Pros of smoking								
Control	10.9 (1.7)	10.8 (1.8)	10.9 (2.3)	10.6 (1.9)	10.3 (2.3)	6.451***	0.407	2.225
Intervention	11.3 (2.3)	11.0 (2.1)	10.8 (2.3)	10.1 (2.6)	9.6 (3.2)			
Cons of smoking								
Control	12.8 (1.9)	13.1 (2.0) ^a	13.3 (2.0) ^a	13.6 (2.1) ^a	14.1 (2.0) ^a	19.538***	10.047**	0.517
Intervention	13.3 (1.9)	14.0 (1.8) ^a	14.2 (1.6) ^a	14.3 (1.8) ^a	15.0 (1.5) ^a			

Note. ANOVAs = analyses of variance.

Repeated measures ANOVAs: * $p < .05$, ** $p < .01$, *** $p < .001$.

^aANOVA at each timepoint: $p < .05$.

$p < .05$; and cons of smoking, $F(1, 107) = 10.047$, $p < .01$. Intervention participants reported increased risk perceptions, self-efficacy, and cons of smoking compared with control group (Table 2). In comparison with controls, intervention participants reported greater risk perceptions at 1, 3, and 6 months ($p < .05$), while reporting greater self-efficacy at 3 and 6 months ($p < .05$). In addition, intervention participants reported more cons of smoking with differences maintained throughout the entire follow-up period ($p < .05$). In contrast, the two treatment groups did not differ in pros of smoking at any timepoint.

Study Condition $\times$ Time interaction was significant in self-efficacy, $F(2.5, 282.4) = 6.014$, $p < .01$, indicating that self-efficacy in the intervention group increased at higher speed over time than that in the control group, whereas the interaction for risk perceptions, pros of smoking, and cons of smoking was not significant (Table 2).

Stages of change

Precontemplation and contemplation are combined into one group due to small number of participants in precontemplation stage. No participants were in the stage of maintenance as none

of them were followed up beyond 6 months. Majority participants (77% in intervention group and 65% in control group) were in preparation stage and no participants were in action stage at baseline. The percentage of participants in action stage increased for both intervention and control groups during the follow-up period, while the percentage of preparation decreased. A proportion of participants also transited from the stage of preparation back to precontemplation/contemplation after relapse. By the end of 6-month follow-up, it was reported 31.7%, 1.7%, and 66.6%, respectively, for the percentage of precontemplation/contemplation, preparation, and action in the intervention group and 61.3%, 6.4%, and 32.3% in the control group. The difference of the distribution of the stages of change was statistically significant between the two groups at 3- and 6-month follow-up, indicating participants were more likely to move to the stage of action in the intervention group compared with those in the control group ($p < .001$; Table 3).

Smoking cessation rates and number of cigarettes smoked

Smoking cessation verified that rates for the intervention group at 3 (66.1%) and 6 months (66.7%) were approximately equivalent

Table 3. Stages of change over time by study condition (%)

	Baseline	Postintervention follow-up			
		1 week	1 month	3 months	6 months
Intervention					
Precontemplation/contemplation	23.3	33.3	28.3	23.3	31.7
Preparation	76.7	51.7	33.3	11.7	1.7
Action	0.0	15.0	38.4	65.0	66.6
Control					
Precontemplation/contemplation	35.5	35.5	46.8	62.9	61.3
Preparation	64.5	56.4	19.3	4.8	6.4
Action	0.0	8.1	33.9	32.3	32.3
<i>p</i> Value	.141	.485	.075	<.001	<.001

and were nearly double and significantly different from those of the controls (32%; Table 4). No significant differences between the groups were observed at 1 week or 1 month, but the intervention group reported higher rates of cessation than the control.

With respect to smokers who had not quit, the average number of cigarettes smoked by participants during the last 7 days appeared to have decreased from baseline to 6 months in both control ($M = 107.2$, $SD = 86.5$ to $M = 75.5$, $SD = 55.7$) and intervention groups ($M = 102.4$, $SD = 75.9$ to $M = 73.1$, $SD = 66.2$; Table 3). No significant differences were found between the numbers of cigarettes smoked by participants in both groups. The number of smokers in the control decreased at 1 month ($N = 62-41$) and stabilized thereafter, while in the intervention, the number of smokers continued to decrease at 3 months and remained relatively stable thereafter ($N = 59-20$). Thirty-four percent of the participants in the intervention group who continued to smoke at 3-month timepoint increased their cigarette consumption ($M = 82$, $SD = 64.8$) from that of 1 week ($M = 76$, $SD = 67.6$) and 1 month follow-up ($M = 67$, $SD = 63.6$).

Agreement between smoking status of biomarker CO measure and self-reported

Of 122 participants, 88 had biomarker measure of smoking at 6-month follow-up. Of these, 40% (35/88) were detected with 6 ppm or higher of CO, indicating current smoking, and 60% had less than 6 ppm CO, indicating nonsmoking. Forty-one (47%) and 31 (35%) were classified as nonsmoking and smoking, respectively, using both biomarker and self-reporting. Another 12 (14%) were classified as smoking using self-reporting but not biomarker and 4 (4%) were classified as smoking using biomarker but not self-reporting. The agreement rate was 82%, and a strong agreement was found between these two methods ($\kappa = .63$; 95% CI: 0.48–0.79).

Univariable and multivariable logistic regression analyses of smoking cessation

Univariable logistic regression analyses suggested that treatment, change of risk perception from baseline to 6 months, change of self-efficacy from baseline to 6 months, change of

pros of smoking from baseline to 6 months, and change of cons of smoking from baseline to 6 months significantly predicted smoking cessation at 6-month follow-up. After adjusting confounding factors, the number of cigarette smoked at baseline, change of self-efficacy from baseline to 6 months, and change of pros of smoking from baseline to 6 months as well as treatment remained significant. The increase in self-efficacy and decrease in pros of smoking from baseline to 6 months were positively associated with smoking cessation, whereas the number of cigarette smoked at baseline was inversely related to smoking cessation (Table 5).

Discussion

Tobacco consumption among Chinese Americans in the eastern region of the United States is higher than among the general population, notwithstanding restrictive ordinances in large metropolitan areas like NYC, Philadelphia, and Boston. Studies, including our own (Hu et al., 2006; Ma et al., 2002; Shelley et al., 2004; Yu et al., 2002), have shown that rates can vary between 22% and 34%. This high rate may be attributed to the historical insularity of Chinese Americans, unique demographics, such as recent immigration status, low socioeconomic and educational status, and strong attachment to traditional culture and language that can hinder accessibility to a range of services available to the public sector, among others. These factors, coupled with the unfamiliarity of Chinese Americans with mainstream intervention practices, have contributed to diminished or partially successful tobacco cessation outcomes (Spigner et al., 2007).

The aims of this study were to test the feasibility of a culturally and linguistically sensitive combined counseling (MI) and pharmacological smoking intervention (Chinese QUIT) program for Chinese smokers in NYC; identify factors and techniques that enhance administration and appropriateness of the combined intervention program; and examine the overall impact of the program on quit attempts, quit rates, and overall smoking reduction in the target group, which may lead to specific hypotheses for the long-term effects of this combined intervention. The study was guided by core constructs of the TTM, particularly its dimensions of stages of change and concepts of and experiences with AMI (Miller & Rollnick, 2002; Prochaska & DiClemente, 1983).

Table 4. Smoking cessation rates and numbers of cigarettes smoked over the past 7 days by study condition

Timepoint	Smoking cessation rates		Numbers of cigarettes smoked over the past 7 days			
	Control ($n = 62$)	Intervention ($n = 60$)	Control		Intervention	
	%	%	N	$M (SD)$	N	$M (SD)$
Baseline			62	107.2 (86.5)	59	102.4 (75.9)
1 week	8.2	13.6	56	92.8 (68.7)	51	76.4 (67.6)
1 month	32.3	38.3	41	66.7 (60.0)	37	67.4 (63.6)
3 months	32.3 ^a	66.1 ^a	42	66.6 (50.9)	20	82.0 (64.8)
6 months	31.7 ^a	66.7 ^a	41	75.5 (55.7)	20	73.1 (66.2)

Note. ^aIndicates a significant difference between intervention and control groups.

Table 5. Logistic regression model for self-reported smoking cessation at 6-month follow-up

Variable	Category	Total N	Cessation rate (%)	Univariable		Multivariable	
				OR	95% CI	OR	95% CI
Treatment	Control	60	31.7	1.00		1.00	
	Intervention	60	66.7	4.32***	2.01–9.27	7.60*	1.33–43.37
Age	1 year increase			0.99	0.96–1.02		
Gender	Male	97	51.5	1.06	0.35–3.26		
	Female	14	50.0	1.00			
Education	Less than high school	42	42.9	1.00			
	High school and similar	30	46.7	1.17	0.46–2.99		
	College and up	48	56.2	1.71	0.74–3.96		
Marital status	Unmarried	27	40.7		1.00		
	Married	93	51.6	1.55	0.65–3.70		
Number of cigarette at baseline	<10	40	57.5	1.00		1.00	
	~10	31	41.9	0.53	0.21–1.38	0.10*	0.01–0.99
	~20	41	46.3	0.64	0.27–1.54	0.11*	0.02–0.82
Number of attempting to quit	No	47	48.9	1.00			
	1 time	33	48.5	0.98	0.40–2.39		
	2 or more	31	51.6	1.11	0.45–2.76		
Change of risk perception ^a	One score increase			1.22*	1.06–1.41		
Change of self-efficacy ^a	One score increase			2.08***	1.63–2.67	2.09***	1.45–2.99
Change of pros of smoking ^a	One score decrease			1.59***	1.32–1.96	1.52*	1.04–2.22
Change of cons of smoking ^a	One score increase			1.35**	1.12–1.64		

Note. OR = odds ratio.

^aChange from baseline to 6-month follow-up.

* $p < .05$, ** $p < .01$, *** $p < .001$.

Overall, our combined intervention strategy was highly successful. Majority participants when recruited were in the stage of preparation for smoking cessation. After intervention, participants moved forward to the stage of action, although a proportion relapsed back to the stage of precontemplation/contemplation. Nearly two thirds of participants in the intervention group had a significant reduction in cigarette consumption and verified abstinence, stabilizing thereafter. They also maintained high levels of risk perceptions, self-efficacy, and decisional balance's cons of smoking across all time periods of follow-ups. These changes in processes are consistent with the TTM's theoretical underpinnings (given the needs for in-depth analysis of stages of change and the relation with smoking cessation, this research team is currently working on a separate paper examining this topic). Although the control group showed a positive pattern with a cessation rate of about 32%, the cessation rates of 67% for participants who have quit smoking and maintained cessation throughout the 6-month follow-up period was significantly higher. In addition, changes began to be apparent post 1-month time period for both conditions. We conclude that this period is critical in change processes. Earlier studies of Chinese Americans have shown similar initial trends to our intervention and control results but indicated relapses into

smoking at 3-month postintervention (Fang et al., 2006). We are of the opinion that our combined intervention strategy was the crucial element that facilitated the progression of the majority of participants in the intervention condition through the stages of change. The high level of success for the Chinese QUIT model supports its continued use and adoption by smoking cessation efforts targeting Chinese American smokers.

There were not only significant differences, however, in patterns of change processes between intervention and control groups but also within the former group. This variability in interaction raises a number of questions that merits further study.

Specifically, we observed that intervention group reached a higher level of self-efficacy than that of the control group over time from baseline to 6-month follow-up. The multivariable logistic regression analysis indicated that those smokers who have increased scores in self-efficacy and decreased scores in pros of smoking over time from baseline to 6-month follow-up are more likely to quit at the 6-month assessment. There is a strong correlation between increased self-efficacy/decreased pros of smoking and smoking cessation rates.

In addition, those heavy smokers at baseline (who smoked 10 or more cigarettes/day) are less likely to quit smoking at 6-month follow-up compared with lighter smokers (who smoked 10 or less cigarettes/day at baseline). This important information indicated that future studies may consider additional dosage of treatment that is specifically tailored to the needs of Chinese heavy smokers.

Extreme addiction, cultural concepts of destiny, peer pressure, and especially fear of alienation outside the context of the intervention group, among other factors, may override factors related to the preservation of health and offer explanations for barriers faced by smokers who did not quit or reduce smoking. The large majority of Chinese in the NYC area are new immigrants and hence are more culturally bound. A compounding factor also may be the relative strength of the nicotine. Heavily addicted smokers often believe that they had crossed the Rubicon of smoking where treatment is no longer an option for a healthier lifestyle (destiny). This subset of smokers may benefit from extended counseling focused on healing rather than the adverse consequences of tobacco on health.

The fact that nearly all study participants had shown movement toward reduction in the rate of smoking and cessation indicated that the physician role was not as important as we thought it would be. The role may be an important adjunct to counseling, effecting higher rates of cessation especially for serious problem behavior individuals as found in our intervention group.

Several limitations to this study should be noted. First, a longer follow-up period of 1 year would better ensure that those who have quit do not relapse over time. Second, study participants are mostly males because majority of smokers in this community are male smokers. Thus, the intervention may not have the same level of effects in females. Third, a majority of the participants are from low-income background, which may not be generalizable to all Chinese American smokers with various socioeconomic statuses. Despite these limitations, the intervention has successfully improved psychosocial facilitators and motivated Chinese smokers to quit smoking and maintain cessation.

In conclusion, despite the demographic homogeneity of the intervention and control groups, there were significant differences between the groups' change processes. Although both groups showed similar patterns initially, the control group with equivalent level of risk perceptions, self-efficacy, and decisional balance's cons of smoking as those of intervention did not achieve the higher levels of reduction in rate of cigarettes smoked or rates of quitting at 3- and 6-month periods of assessment. These findings indicated promising effects of our evidence-based combined strategy. We consider this study as a pilot intervention and plan to evaluate the sustainable effects on the Chinese smoking behaviors in a larger randomized sample and for a longer term. We will also further explore the association between acculturation factors and smoking cessation status over time among Chinese smokers.

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Declaration of Interests

None declared.

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References

- Asian American Federation of New York Census Information Center. (2004). *Census profile: New York City's Chinese American population*. New York: Asian American Federation of New York.
- Barnes, J. S., & Bennet, C. E. (2000). *The Asian population: 2000. Census 2000 brief*. Washington, DC: US Department of Commerce, Economics and Statistics Administration.
- Centers for Disease Control and Prevention. (2005). Annual smoking-attributable mortality, years of potential life lost, and productivity losses—United States, 1997–2001. *MMWR Morbidity and Mortality Weekly Report*, 54, 625–628.
- Centers for Disease Control and Prevention. (2007). Cigarette smoking among adults—United States, 2006. *Mmwr Morbidity and Mortality Weekly Report*, 56, 1157–1161.
- Dunn, C., Deroo, L., & Rivara, F. P. (2001). The use of brief interventions adapted from motivational interviewing across behavioral domains: A systematic review. *Addiction*, 96, 1725–1742.
- Fang, C. Y., Ma, G. X., Miller, S. M., Tan, Y., Su, X., & Shive, S. (2006). A brief smoking cessation intervention for Chinese and Korean American smokers. *Preventive Medicine*, 43, 321–324.
- Ferketich, A., Wewers, M. E., Kwong, K., Louie, E., Moeschberger, M., Tso, A., et al. (2004). Smoking cessation interventions among Chinese Americans: The role of families, physicians, and the media. *Nicotine & Tobacco Research*, 6, 241–248.
- Fu, S. S., Ma, G. X., Tu, X. M., Siu, P. T., & Metlay, J. P. (2003). Cigarette smoking among Chinese Americans and the influence of linguistic acculturation. *Nicotine & Tobacco Research*, 5, 803–811.
- Hu, K. K., Woodall, E. D., Do, H. H., Tu, S. P., Thompson, B., Acorda, E., et al. (2006). Tobacco knowledge and beliefs in Chinese American men. *Asian Pacific Journal of Cancer Prevention*, 7, 434–438.
- Kumra, V., & Markoff, B. A. (2000). Who's smoking now? The epidemiology of tobacco use in the United States and abroad. *Clinics in Chest Medicine*, 21, 1–9, vii.
- Ma, G. X. (1999). *The culture of health: Asian American communities in the U.S.* Westport, CT: Greenwood Publishing Group.
- Ma, G. X., Fang, C., Shive, S. E., Su, X., Toubbeh, J. I., Miller, S., et al. (2005). A culturally enhanced smoking cessation study

- among Chinese and Korean smokers. *International Electronic Journal of Health Education*, 8, 1–10.
- Ma, G. X., Fang, C., Toubbeh, J. I., Choi, J., & Feng, Z. (under review). Decisional balance and stage of change of quitting behaviors among Korean American smokers. *Ethnicity & Disease*.
- Ma, G. X., Shive, S., Tan, Y., & Toubbeh, J. (2002). Prevalence and predictors of tobacco use among Asian Americans in the Delaware Valley region. *American Journal of Public Health*, 92, 1013–1020.
- Ma, G. X., Tan, Y., Toubbeh, J., & Su, X. (2003). Differences in stages of change of smoking behavior among current smokers of four Asian American subgroups. *Addictive Behaviors*, 28, 1431–1439.
- Ma, G. X., Tan, Y., Toubbeh, J. I., Su, X., Shive, S. E., & Lan, Y. (2004). Acculturation and smoking behavior in Asian-American populations. *Health Education Research*, 19, 615–625.
- Mallin, R. (2002). Smoking cessation: Integration of behavioral and drug therapies. *American Family Physician*, 65, 1107–1114.
- Miller, W. R., & Rollnick, S. (2002). *Motivational interviewing: Preparing people for change*, 2nd ed. New York: The Guilford Press.
- Prochaska, J. O. (1996). A stage paradigm for integrating clinical and public health approaches to smoking cessation. *Addictive Behaviors*, 21, 721–732.
- Prochaska, J. O., & DiClemente, C. C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology*, 51, 390–395.
- Shelley, D., Fahs, M., Scheinmann, R., Swain, S., Qu, J., & Burton, D. (2004). Acculturation and tobacco use among Chinese Americans. *American Journal of Public Health*, 94, 300–307.
- Spigner, C., Yip, M. P., Huang, B., & Tu, S. P. (2007). Chinese and Vietnamese adult male smokers' perspectives regarding facilitators of tobacco cessation behavior. *Asian Pacific Journal of Cancer Prevention*, 8, 429–435.
- U.S. Department of Health and Human Services. (1998). *Tobacco use among U.S. racial/ethnic minority groups—African Americans, American Indians and Alaskan Natives, Asian Americans and Pacific Islanders, and Hispanics: A report of the surgeon general*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. Document Number.
- Velicer, W. F., DiClemente, C. C., Prochaska, J. O., & Brandenburg, N. (1985). Decisional balance measure for assessing and predicting smoking status. *Journal of Personality and Social Psychology*, 48, 1279–1289.
- Wald, N. J., Idle, M., Boreham, J., & Baily, A. (1981). Carbon monoxide in breath in relation to smoking and carboxyhaemoglobin levels. *Thorax*, 36, 366–369.
- Yu, E. S., Chen, E. H., Kim, K. K., & Abdulrahim, S. (2002). Smoking among Chinese Americans: Behavior, knowledge, and beliefs. *American Journal of Public Health*, 92, 1007–1012.