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Moderation of gender on smoking and depression in Chinese Americans

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Abstract

This study examined the moderating role of gender in the association between smoking status and depression in a nationwide convenience sample of Chinese American current, former and never smokers ($N = 1393$). Participants were recruited in smoker-supporter dyads. Multilevel modeling was used to take into account the dyadic nature of the data. Depressive symptoms were measured by a 10-item CES-D (Center of Epidemiological Studies-Depression Scale). Results showed significant effects of smoking status by gender interaction and smoking status on depression after adjusting for acculturation and social support. Among Chinese females, current smokers reported elevated depression level than both former and never smokers. Among Chinese males, current smokers reported more depressive symptoms when compared to former smokers only. Chinese females reported higher depression level than males among current smokers; no gender difference in depression was observed among former or never smokers. The association between smoking and depression is moderated by gender among Chinese Americans where substantial gender difference in smoking prevalence exists. Findings highlight the importance of addressing depression in treating tobacco use among Chinese American smokers, especially among females.

Keywords

gender; smoking; depression; Chinese Americans; moderation

1. Introduction

The association between smoking and depression is well documented in various populations including Asian populations (Khaled, Bulloch, Exner, & Patten, 2009; Kinnunen et al., 2006;

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Contributors

Dr. Janice Tsoh was the Principal Investigator of the parent study who formulated the research questions and conceptualized the design of the current study. Jeremy Luk conducted literature searches and provided summaries of previous research studies. Data analysis was conducted by both authors. Jeremy Luk wrote the first draft of the manuscript and both authors contributed to and have approved the final manuscript.

Conflict of Interest

None.

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McClave et al., 2009; Pratt & Brody, 2010). In Japan, Nakata and colleagues (2008) found that current smoking and passive smoking at work were both associated with elevated depressive symptoms. In Hong Kong, smoking was linked to higher levels of depression in Chinese adolescents and elderly (Lam et al., 2004; Lam et al., 2005). Among Chinese Americans, elevated depressive symptoms were observed among smokers who reported high temptation to smoke when experiencing negative emotions and significant nicotine withdrawal at previous quit attempts (Tsoh, Lam, Delucchi, & Hall, 2003).

Mixed findings have been reported on the moderating role of gender in the association between smoking and depression cross-culturally. Two studies conducted in Western populations found that smoking was associated with depressive symptoms in females only (Poulin et al., 2005) or more so in females than in males (Husky et al., 2008). However, other studies have reported contradictory findings including the absence of moderation by gender (Khaled et al., 2009) or an interaction with males smokers reporting elevated depression (Korhonen et al., 2007). Among Chinese Americans, Tsoh and colleagues (2003) showed that female smokers reported elevated depressive symptoms as compared to male smokers. Yet Lam and colleagues (2004; 2005) did not find gender differences in the association between smoking and depression among Hong Kong adolescents and elderly.

The present study examined whether gender moderated the association between smoking and depression in Chinese Americans. Three research questions were investigated: (1) Do current smokers report more depressive symptoms than former and never smokers? (2) Do females report more depressive symptoms than males? (3) Does the association between smoking and depression differ by gender?

2. Methods

2.1 Participants

Participants included 1393 Chinese Americans (43.8% females) who completed the baseline survey of a nationwide, family assisted smoking cessation study online or by mail. General eligibility criteria for participating in the study were: (1) 18 years old or above, (2) self-identified as ethnic Chinese, (3) resided in the United States, and (4) could read Chinese and/or English. Participants were recruited in smoker-supporter pairs. Smoker participants had to smoke at least 5 cigarettes in the past 7 days, were not engaged in another smoking cessation program, and must have a family member or friend who would participate as a supporter participant. The supporters could be smokers or nonsmokers, who agreed to participate with a family member or a friend who met the smoker eligibility criteria of the study. Each participant received \$20 for completing the baseline survey. This study was conducted in compliance with the Institutional Review Board at the University of California, San Francisco.

2.2 Measures

Smoking status was assessed by two questions: (1) Have you ever smoked 100 cigarettes or more in your lifetime? (2) When was the last time that you had smoked a cigarette? Never smokers were those reported never smoked more than 100 cigarettes in their lifetime. Former smokers had smoked more than 100 cigarettes in lifetime but did not smoke in the past 30 days. Current smokers had smoked more than 100 cigarettes in lifetime and smoked in the past 30 days. The classification resulted in 547 (39.3%) never smokers, 102 (7.3%) former smokers, and 744 (53.4%) current smokers. *Depression* was measured by a 10-item version of the *Center of Epidemiological Studies—Depression Scale (CES-D; Radloff, 1977; Andresen, 1994)*; Cronbach's $\alpha = .85$. *Social Support* was assessed by the 12-item *Interpersonal Support Evaluation List (ISEL; Cohen & Hoberman, 1983)*; Cronbach's $\alpha = .83$. The ratio of life in the U.S. as a proxy for *acculturation* and was calculated based on participants' self-reported

age and their length of time they have lived in the United States. For example, participants who were born in the U.S. would have a life ratio of 1.0. Other *demographic characteristics* included age, gender, education, employment, income and marital status. All measures underwent forward and backward translations and were reviewed by 4-6 focus groups to ensure linguistic and cultural equivalence of each item. The items were presented in a Chinese-English bilingual format.

2.3 Data Analyses

Descriptive statistics were reported for all variables of interest, stratified by gender and smoking status. To take into account the dyadic nature of the data, multilevel modeling was used (Kenny, Kashy, & Cook, 2006). The outcome variable was depression score, with smoking status, gender, and the smoking status by gender interaction as the main predictors. A variable was selected for inclusion as a covariate when it attained a p -value of ≤ 0.05 in bivariate associations with depression score and one of the main predictors (gender or smoking status). Acculturation was included as an *a priori* covariate due to its interaction with gender in the association with depression as documented among Chinese Americans (Takeuchi et al., 1998). Based on these criteria, the covariates selected were acculturation and social support. The dyad members (i.e., smokers and supporters) were treated indistinguishable in each pair of dyads. For pairwise comparisons among current, former and never smokers, an alpha level of 0.0167 was set using Bonferroni correction. Analyses were conducted using SPSS version 17.

3. Results

Table 1 presents participant characteristics by gender and by smoking status. As an assessment of nonindependence between a smoker and his/her supporter, the Intraclass Correlation Coefficient (ICC) for the participation role in this study was 0.22, with a confidence interval ranging from .15 to .29, $F(744,660) = 1.57$, $p < 0.001$. The ICC indicated that CES-D scores within a dyad were correlated, suggesting the need to conduct multilevel analysis to take into account the interdependence between smokers and supporters.

The multilevel model revealed a significant smoking status by gender interaction in the association with depression score, $F(2,998.46) = 4.80$, $p = 0.008$. The main effect of smoking status was also significant, $F(2,947.60) = 17.11$, $p < 0.001$. No gender main effect was observed in the model, $F(1,942.48) = 1.99$, $p = 0.159$. Figure 1 shows the depression score by smoking status and gender.

Simple effect tests by gender showed that the effect of smoking status was significant in females, $F(2,269.54) = 16.65$, $p < 0.001$. Pairwise comparisons suggested that female current smokers ($M = 12.84$, $SE = 0.59$) reported significantly more depressive symptoms than female never ($M = 9.33$, $SE = .24$; $p < 0.001$) and former smokers ($M = 8.64$, $SE = 0.99$; $p < 0.001$). The effect of smoking status was also significant in males, $F(2,264.99) = 5.70$, $p = 0.004$. Pairwise comparisons suggested that current smokers ($M = 11.18$, $SE = 0.22$) reported significantly more depressive symptoms than former smokers ($M = 9.01$, $SE = 0.62$; $p = 0.001$) but similar depressive symptoms as in never smokers ($M = 10.70$, $SE = 0.62$; $p = 0.456$). Differences between former and never smokers were nonsignificant for both females ($p = 0.499$) and males ($p = 0.054$).

Simple effect tests by smoking status revealed that among current smokers, females ($M = 13.34$, $SE = 0.53$) reported more depressive symptoms than males ($M = 11.24$, $SE = 0.22$), $F(1,565.92) = 13.43$, $p < 0.001$. Among former smokers, no gender difference in depressive symptoms was found (female: $M = 8.54$, $SE = 0.87$; male: $M = 8.37$, $SE = 0.61$), $F(1,73.28) = 0.03$, $p = 0.875$.

Among never smokers, females ($M = 9.28$, $SE = 0.25$) and males ($M = 10.55$, $SE = 0.66$) reported similar depression scores, $F(1, 509.58) = 3.20$, $p = 0.074$.

4. Discussion

This study examined the interaction between gender and smoking status on depressive symptoms in a convenience, nationwide sample of Chinese American current, former, and never smokers. We found that gender moderated the association between smoking and depression in Chinese Americans. In Chinese females, current smoking was associated with a higher depression level than either former or never smoking. In Chinese males, current smoking was associated with a higher depression level in comparison to former smoking only.

The significant association between current smoking and depression level in Chinese females was consistent with previous studies conducted in Western cultures (e.g., Kinnunen et al., 2006; McClave et al., 2009). As female gender is considered a risk factor for depression in Western cultures, the observed elevated depression level in Chinese female current smokers largely followed the patterns found in Western populations (e.g., Husky et al., 2008). The elevated depression level in Chinese female current smokers could be understood in terms of the additive effects of current smoking and female gender. Despite low prevalence of smoking in Chinese females (Carr, Beers, & Chen, 2005; Chae, Gavin, & Takeuchi, 2006), results suggested that Chinese female smokers were similar to female smokers in Western cultures and tended to report a higher level of depression.

Among Chinese males, the absence of a significant difference in depression level between current and never smokers was unexpected and contradicted previous studies (e.g., Pratt & Brody, 2010), suggesting that the association between current smoking and depression level cannot be generalized to Chinese males as found in Western cultures. In light of the high prevalence of smoking in Chinese males when compared to that observed among Chinese females, smoking may serve more purposes in social contexts for Chinese males (Spigner, Shigaki, & Tu, 2005; Spigner, Yip, Huang & Tu, 2007). However, given the small proportion of male never smokers in the current sample, this speculation remains to be tested. Conversely, the significant difference between current and former smoking emphasized the potential benefits for male current smokers to quit smoking, which may decrease their levels of depression.

Our findings on gender and depression replicated a population-based study of Chinese Americans using diagnostic interviews (Takeuchi et al., 1998) to the extent that we observed no gender difference in depression among former and never smokers. Among current smokers, Chinese females reported a significantly higher level of depression than males as reported previously (Tsoh et al., 2003). Along with other studies on ethnic minority groups (e.g., Brown et al., 1995; Levav et al., 1997), evidence suggests the existence of ethnic variations in gender differences in depression. Further, prior epidemiological research (e.g., Takeuchi et al., 1998) did not account for smoking status in the examination of the association between gender and depression. Our findings underscore the significance of taking smoking status into account when considering gender differences in depression, particularly in populations where substantial gender difference exists in smoking prevalence such as the Chinese population. Current explanations for gender differences in depression have largely focused on the roles of cognitive vulnerabilities, ruminative response style, negative affect and weight concerns (Holen-Hoeksema, 2001; Piccinelli & Wilkinson, 2000). Future research should examine how ethnicity and smoking status may be related to gender differences in depression.

Limitations of this study should be noted. First, data were collected from primarily first generation immigrants and may not be generalized to U.S. born or other generations of Chinese

Americans. Second, current smokers were over-sampled since we utilized baseline data from a smoking cessation study. The small sample size of Chinese former smokers might have provided limited statistical power to detect other potential interaction effects. Third, former and never smokers in this sample were mostly supporters of smokers in the smoking cessation study and may not be representative of never smokers in the population. Other limitations included the self-report method and the use of cross-sectional data.

Despite these limitations, this study contributes to the literature in several ways. First, results highlight the value of considering smoking status in understanding gender differences in depression, particularly in populations where a substantial gender difference exists in smoking prevalence. Second, clinicians should pay specific attention to elevated depressive symptoms when treating Chinese female current smokers. Moreover, this study suggests cross-cultural consistency of the association between smoking and depression, over-and-above the effects of acculturation and social support. Findings of this study underscore the need to address depression in treating tobacco use among Chinese American current smokers, and particularly among females.

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Figure 1.
Depression Score by Smoking Status and Gender (N = 1393)

Table 1

Participant Characteristics by Gender and Smoking Status

	Comparisons by Gender				Comparisons by Smoking Status			
	Whole Sample (N=1393)	Females (n=610)	Males (n=783)	p	Never Smokers (n=547)	Former Smokers (n=102)	Current Smokers (n=744)	p
Female	43.8%	100%	0%	--	87.0%	30.4% ^b	13.8% ^a	<0.01
Age Mean (SE)	40.5 (0.4)	39.9 (0.5)	40.9 (0.5)	0.15	39.3 (0.5)	40.6 (1.5)	41.3 (0.5)	0.03
Education: ≥ Some college	63.5%	63.6%	63.4%	0.93	64.4%	74.3%	61.3%	0.03
Employed	64.0%	57.0%	69.5%	<0.01	59.4%	56.9%	68.4% ^b	<0.01
Income: ≥ 20K/Year	52.7%	53.9%	51.8%	0.45	54.3%	45.5%	52.6%	0.27
Married / living with partner	74.4%	75.7%	73.4%	0.31	76.1%	64.7%	74.5%	0.05
Lived in the US ≥ 10 Years	46.7%	50.2%	44.0%	0.03	47.6%	49.5%	45.6%	0.66
Ratio of life spent in the US Mean (SE)	0.29 (0.01)	0.30 (0.01)	0.28 (0.01)	0.07	0.29 (0.01)	0.31 (0.03)	0.28 (0.01)	0.42
Smoking status								
Current	53.4%	16.9%	81.9%		0%	0%	100%	
Former	7.3%	5.1%	9.1%	<0.01	0%	100%	0%	--
Never	39.3%	78.0%	9.1%		100%	0%	0%	
ISEL [*] Mean (SE)	36.0 (0.2)	36.6 (0.3)	35.4 (0.2)	<0.01	36.7 (0.3)	36.6 (0.6)	35.3 (0.2)	<0.01
CES-D ^{**} Mean (SE)	10.5 (0.2)	9.9 (0.2)	10.9 (0.2)	<0.01	9.4 (0.2)	8.8 (0.5)	11.5 (0.2) ^a	<0.01

^{*} ISEL: Interpersonal Support Evaluation List

^{**} CES-D: Center of Epidemiological Studies — Depression Scale

^a $p < 0.01$ compared to former and never smokers

^b $p < 0.01$ compared to never smokers