Published in final edited form as:

J Adolesc Health. 2012 December ; 51(6): 588–592. doi:10.1016/j.jadohealth.2012.03.011.

Trait Mindfulness Helps Shield Decision-making From Translating Into Health-risk Behavior

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Abstract

Purpose—The cognitive tendency toward mindfulness may influence the enactment of health and risk behaviors by its bringing increased attention to and awareness of decision-making processes underlying behavior. The present study examined the moderating effect of trait mindfulness on associations between intentions to smoke (ITS)/smoking refusal self-efficacy (SRSE) and smoking frequency.

Methods—Self-reports from Chinese adolescents ($N=5,287$; $M_{age}=16.2$, $SD=0.7$; 48.8% female) were collected in 24 schools. Smoking frequency was regressed on latent factor interactions MAAS*ITS and MAAS*SRSE, adjusting for school clustering effects and covariates.

Results—Both interaction terms were significant in cross-sectional analyses and showed high ITS predicted higher smoking frequency among those low relative to high in trait mindfulness while low SRSE predicted higher smoking frequency among those low relative to high in trait mindfulness.

Conclusions—Findings suggest trait mindfulness possibly shields against decision-making processes that place adolescents at risk for smoking.

Keywords

Mindfulness; cigarette smoking; intentions to smoke; smoking refusal self-efficacy

Understanding the antecedents to adolescent cigarette smoking is an essential objective for tobacco prevention. Such efforts are especially pertinent in countries such as China where tobacco use continues to be one of the main causes of morbidity and mortality (1). Elucidating cognitive constructs that modulate decision-making processes commonly believed to induce smoking behavior may show promise in furthering the robustness of

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smoking prevention interventions. A recently explored construct -- *mindfulness* -- defined here as a dispositional trait of an open and receptive awareness of present moment experience might strengthen the translation of behavioral intentions and self-efficacy beliefs into performed behavior by enhancing awareness of these decision-making factors (see (2); for further reading on mindfulness see (3–5)).

This hypothesis is based on previous research which shows that trait mindfulness is orthogonal to habitual responding because it is an orientation of attention and awareness residing in the present moment and not the past (6,7). Moreover, to the extent that one is attentive and aware of momentary cognitions, opportunities for correcting discrepancies between intended and performed behavior remain within the field of awareness (8). Similarly, it has been suggested that mindful people, as compared to those less mindful, have a heightened awareness of their behavioral routines and precursors driving behavior (2), and that because they pay greater attention to their behaviors they have a greater ability to initiate or prevent the performance of a behavior (7).

Studies have found that behavioral intentions predict performed behavior among those who act with awareness but not among those who act out of habit (9,10). For example, (7) found that mindful respondents were not only more likely to enact their physical activity intentions than those less mindful but were also more likely exercise control over counter-intentional binge drinking habits than less mindful respondents. These findings support the notion that heightened attention and awareness oriented to the present moment predicts the performance of behavioral intentions. It is postulated by (7) that trait mindfulness may strengthen one's recall of behavioral intentions and may increase one's ability to remain focused on performing those intentions given an increased capacity for attention and awareness of decision-making processes in the present moment. Further research is needed to verify this pioneering area of research.

The present study examines the moderating role of trait mindfulness on direct predictors (i.e., smoking refusal self-efficacy and intentions to smoke) of adolescent cigarette smoking behavior. This research responds to a formal call for the integration of mindfulness into frameworks of health behavior (11,12) and extends previous research that has tested the moderating effect of trait mindfulness on the intention-behavior link (7) and research that has noted an inverse relationship between trait mindfulness and smoking among adolescents (13). Our Hypothesis I contends mindfulness will strengthen the positive relationship between intentions to smoke and cigarette smoking behavior. As with others (7), we seek to determine if trait mindfulness strengthens the intention-behavior link; however, this is the first study to determine if mindful people are more likely to enact *unhealthy* intentions to smoke. Hypothesis II contends that trait mindfulness will strengthen the inverse relationship between smoking refusal self-efficacy and smoking behavior. Although no studies identified to date have examined how trait mindfulness affects the relationship between self-efficacy and performed behavior, studies have identified a positive relationship between the development of mindfulness and various types of self-efficacy (14–16). Therefore, in the context of smoking refusal self-efficacy we use our same rationale provided for the effect of trait mindfulness on the intention-behavior link whereby an increased awareness and attention should bring greater awareness to self-efficacy cognitions that then help translate self-efficacy into performed behavior.

METHODS

Participants and Procedures

Data were collected as part of a longitudinal study conducted by collaborating researchers from the Pacific Rim Transdisciplinary Tobacco and Alcohol Use Research Center

(TTAURC). The objective of the TTAURC project was to investigate the determinants of health behavior among adolescents in Chengdu, China. All consent procedures and survey instruments for this study were approved by the Institutional Review Boards (IRBs) of the University of Southern California and Chengdu, China Centers for Disease Control and Prevention. A total of twenty-four schools (N=24) in Chengdu, China enrolled in the study. Within the 24 schools that participated, there were a total number of 1,060 classes. Of those, a total of 338 classes were randomly selected to participate in this study and a very high percent (98.12%) of students within these classrooms agreed to participate in the study.

Parental consent forms were distributed to students within the selected classrooms, and those students acquiring written or verbal parental consent and giving personal assent completed a self-reported paper-and-pencil questionnaire in their classroom during school hours. The students whose parent did not sign the parental participation permission form and/or who did not actively assent were excluded from the study. Participants voluntarily took part in the study and were informed that they could discontinue their participation at any time. Classroom teachers were not present during the survey period so that participating students would feel confident about the confidentiality of their responses. The same participants completed surveys in their respective classroom. Data are analyzed in a cross-sectional model.

Measures

Demographic data included respondent age, gender, parent education, and type of school attended (regular or vocational) (see Table 1).

Mindful Attention Awareness Scale (MAAS (2))—The MAAS is a 15-item single-dimension measure of trait mindfulness, which is operationalized as the frequency of open and receptive attention to and awareness of ongoing events and experience. Response options ranged from 1 (*almost never*) to 6 (*almost always*). To control for social desirability, respondents are instructed to respond to the MAAS in a way that reflects their actual experience rather than in a way they think their experience should be. In this study, a 6-item short version of the MAAS was used based on previous psychometric research (17) that indicates a 6-item MAAS (items 7, 8, 9, 10, 13, 14) has equivalent and in some cases stronger evidence for construct validity relative to the full 15-item MAAS among Chinese adolescents (6-item Cronbach's alpha = .89; 6-item had better model fit and showed stronger gender invariance than the 15-item MAAS; mean item-total correlation = .71). Example items used in the current study included, "I find it difficult to stay focused on what's happening in the present," "I could be experiencing some emotion and not be conscious of it until some time later," and "I rush through activities without being really attentive to them". One item was modified to make it appropriate for adolescents: we change the item "I *drive* places on automatic pilot and then wonder why I went there" to "I *go* places on automatic pilot and then wonder why I went there." Item responses were reverse coded to make higher scores indicate higher trait mindfulness. The original English-language version of the scale was translated into Chinese by a native Chinese speaker and then back translated into English to verify the accuracy of translation. Studies have recently found the MAAS to be valid and reliable measure among the Chinese population (18,19).

Intentions to Smoke (ITS)—ITS measures respondent intentions to smoke cigarettes at a future time. Two items used in previous research studies (20) were used to assess ITS, which included "At any time during the next 12 months do you think you will smoke a cigarette" and "Do you think you will be smoking cigarettes five years from now?" Response options were given on a 4-point scale ranging from 1 (*definitely yes*) to 4 (*definitely not*). Response scores were reverse coded and higher scores indicate higher ITS. The original English-

language version of the scale was translated into Chinese by a native Chinese speaker and then back translated into English to verify the accuracy of translation.

Smoking Refusal Self-Efficacy(SRSE)—SRSE measures the respondents perceived ability to refuse cigarette use. Two items used in previous research studies (21) were used to assess SRSE, which included “If one of your best friends offered you a cigarette, would you smoke it?” and “If someone offers you a cigarette, do you consider it impolite to refuse it?” Response options were given on a 4-point scale ranging from 1 (*definitely yes*) to 4 (*definitely not*). Higher scores indicate higher SRSE. The original English-language version of the scale was translated into Chinese by a native Chinese speaker and then back translated into English to verify the accuracy of translation.

Current Cigarette Smoking—Frequency of current smoking was assessed with the item: “During the past 30 days, on how many days did you smoke cigarettes?”, which is a measure used in the Centers for Disease Control and Prevention (CDC) Youth Risk Behavior Survey. Response options were coded on a 7-point scale ranging from 1 (*0 days*) to 7 (*all 30 days*). Due to a positive skew, this variable was log transformed to normalize its distribution, and higher scores indicate higher smoking frequency. The original English-language version of the item was translated into Chinese by a native Chinese speaker and then back translated into English to verify the accuracy of translation.

Analyses

Data cleaning and descriptive statistics were conducted using SAS 9.2 software. Data were imported into Mplus version 5 and frequencies were cross-examined between Mplus and SAS to assure correctness of transferred data. Each variable’s distribution was assessed for normality via skew and kurtosis and all variables approximated a normal distribution except for the current smoking variable, which was log transformed. The unconditional means models for each dependent variable indicated the presence of smoking behavior clustering within schools ($ICC > .02$). Thus, our moderation models were hierarchical to account for students nested within schools in order to obtain more accurate standard error estimates (22). Latent factor interaction models were tested by the following procedures outlined in the Mplus users manual (23) as follows: 1) baseline smoking frequency was regressed on the baseline latent factor interaction terms MAAS*ITS and MAAS*SRSE in two separate models which controlled for gender, age, parent education, school type (regular or vocational), and enrollment status in a substance use prevention treatment condition that was unrelated to mindfulness; and 2) one-year follow-up smoking frequency was regressed on the baseline latent factor interaction terms MAAS*ITS and MAAS*SRSE in two separate models which controlled for baseline smoking frequency in addition to the same variables adjusted for in step 1. Significant interactions were illustrated in a graphical display. Criteria for significance testing was $p < .05$ using a two-tailed test.

RESULTS

Demographics and Bivariate Correlations

Participant ages ranged from 14 to 20 years-old ($M = 16.2$, $SD = 0.7$; see Table 1), and the ratio of males to females was relatively equivalent (51.1% male). Over 45% of respondents reported ever smoking a cigarette in their lifetime. Over 24% of the sample reported smoking in the past 30 days, and almost 5% of the sample reported daily smoking. Table 2 shows MAAS level was significantly correlated with ITS ($r = -.17$, $p < .01$), SRSE ($r = .14$, $p < .01$), and log smoking frequency ($r = -.14$, $p < .01$).

ITS-MAAS Interaction

In the covariate adjusted cross-sectional model, the estimated equation derived from regressing log smoking frequency on ITS and MAAS latent factor interaction terms was $\hat{y} = .308 + (-.045 * \text{MAAS}) + (.413 * \text{ITS}) + (-.075 * \text{MAAS} * \text{ITS})$. The coefficient for the interaction term ($B = -.073$, $SE = .016$, $p < .01$) was statistically significant, which indicates the association between ITS and smoking differs across levels of MAAS. Figure 1 shows estimated regression trends for the smoking frequency outcome, which are exponents of the log scale to return estimates to the original scale of measurement. The MAAS and ITS latent factors are plotted in standard deviation units (MAAS 1 SD unit = 0.88; ITS 1 SD unit = 0.98). MAAS shows an evident effect modification on the positive linear trend between ITS and smoking frequency beyond the mean level of ITS. As such, the MAAS attenuates the effect of high ITS on smoking frequency (e.g., if ITS is at +3 SD from its mean then the B for MAAS at -1 $SD = 5.79$ and B for MAAS at +1 $SD = 3.63$).

SRSE-MAAS Interaction

In the covariate adjusted cross-sectional model, the estimated equation derived from regressing log smoking frequency on SRSE and MAAS latent factor interaction terms was $\hat{y} = .327 + (-.043 * \text{MAAS}) + (-.450 * \text{SRSE}) + (.112 * \text{MAAS} * \text{SRSE})$. The coefficient for the interaction term ($B = .112$, $SE = .02$, $p < .01$) was statistically significant, which indicates the association between SRSE and smoking differs across levels of MAAS. Figure 2 shows estimated regression trends for the smoking frequency outcome, which are exponents of the log scale to return estimates to the original scale of measurement. The MAAS and SRSE latent factors are plotted in standard deviation units (MAAS 1 SD unit = .82; SRSE 1 SD unit = .85). MAAS shows an evident effect modification on the positive linear trend between SRSE and smoking frequency at values before the mean level of SRSE. As such, the MAAS attenuates the effect of low SRSE on smoking frequency (e.g., if SRSE is at -3 SD from its mean then the B for MAAS at -1 $SD = 5.72$ and B for MAAS at +1 $SD = 3.34$).

DISCUSSION

This study demonstrated the moderating effect of trait mindfulness on two cigarette smoking decision-making processes, intentions to smoke and smoking refusal self-efficacy. An overarching theme in this study was to continue a line of research that aims to integrate the construct of mindfulness within established frameworks of health behavior (7,11–13). Contrary to our directional Hypothesis I, the results from our study showed that mindfulness did not strengthen the intention-behavior link for an *unhealthy* behavioral outcome studied here as smoking. Rather, mindfulness had the opposite effect by attenuating the positive association between ITS and smoking frequency. Therefore, it appears that trait mindfulness possibly shields unhealthy intentions from translating into unhealthy habits. Moreover, our findings yielded partial support for our directional Hypothesis 2 whereby our results indicated mindfulness was protective of smoking as it shielded low SRSE cognitions from translating into smoking behavior. However, mindfulness did not strengthen the inverse SRSE-behavior link for adolescents at higher levels of SRSE as we originally hypothesized.

Our findings regarding Hypothesis I provide new and interesting evidence to the growing area of research that examines the moderating influence of trait mindfulness on decision-making processes. For example, our findings both challenge and extend existing evidence that suggests trait mindfulness strengthens the intention-behavior. Our results challenge previous research that indicates behavioral intentions predict performed behavior among those who act with awareness but not among those who act out of habit (9; 10), and that mindful respondents are more likely enact their health promoting behavioral intentions than those less mindful (7). Contrary to the notion suggesting that trait mindfulness strengthens

the intention-behavior link, we found that trait mindfulness attenuated this link in the context of an unhealthy behavioral outcome. Thus, our study extends previous work by showing that trait mindfulness may function not only to strengthen the intention-behavior link in the context of a *healthy* behavioral outcome (e.g., physical exercise; see 7) but also attenuate this link for an *unhealthy* behavioral outcome (e.g., cigarette smoking).

The seemingly paradoxical findings related to Hypothesis I might be explained by mindfulness yielding an enhanced awareness of intentions and behaviors that are harmful to one's health. For example, adolescents are often provided with messages at school and in the popular media that smoking causes disease and mortality. Therefore, mindful adolescents may have greater awareness about the counterpoints (e.g., anti-smoking attitudes, anti-smoking norms) of their intentions to smoke and subsequently engage in the behavior less frequently than those who smoke from a lack of awareness of these counterpoints and from habit. This notion may be at least partially supported by a post hoc analysis of our data, which indicated that mindfulness had a significant inverse correlation with pro-smoking attitudes ($r = -.28, p < .01$). Thus, mindfulness may strengthen one's recall of counterpoints to behavioral intentions and thus increase one's ability to remain focused on enacting those counterpoints (i.e., refraining from smoking, reducing smoking frequency).

Our findings for Hypothesis II are the first to implicate the effect of mindfulness on the association between self-efficacy cognitions and performed behavior. This is an important area of investigation considering that lack of smoking refusal self-efficacy reduces adolescents ability to refrain from smoking (24), and because smoking refusal self-efficacy is a main target of adolescent smoking prevention programs (25). Although mindfulness exerted a protective effect on smoking frequency as predicted, this occurred only among those reporting low SRSE. These findings indicate that mindful adolescents who are at risk for smoking because of their low SRSE have a reduced rate of smoking. Our findings may suggest that mindfulness has a protective role in the context of unhealthy behavior rather than having a health promoting role as has been found with physical exercise intentions in previous work (7)). It remains unclear exactly why mindfulness did not strengthen the SRSE-behavior link among adolescents reporting high levels of SRSE. This may be best interpreted by acknowledging that those with high SRSE already report very low smoking frequency (as evident in Figure 2), and this phenomenon may suggest a floor effect whereby those at the higher levels of SRSE report very low smoking frequency leaving no room for sensitivity to subgroup differences in mindfulness. Although no known previous research has examined the impact of trait mindfulness on the relationship between self-efficacy and performed behavior, this appears to be a promising area of further investigation requiring replication with longitudinal data.

Our findings in this novel area of investigation regarding the impact of mindful awareness on decision-making processes and health behavior have implications for future research and programing in adolescent health promotion and disease prevention. Mindfulness is considered to be a skill that can be cultivated by mindfulness-based practices (i.e., mindfulness meditation, Mindfulness-Based Stress Reduction, and related adaptations for youth, see 26). Therefore, if mindfulness-based practices are found to routinely enhance trait mindfulness over time among youth, such interventions may be able to strengthen the effects of smoking prevention programs that intervene upon smoking-related decision making processes, specifically ITS and SRSE.

Certain limitations in our study require comment. First, our sample consisted of Chinese adolescents, which implies that our findings may not generalize to adolescents in other countries. We recommend that studies replicate our proposed model with data from adolescents and adults representing various socio-cultural and ethnic characteristics. Second,

our study relied on the self-report data that may be vulnerable to respondent bias; however, research have shown little discrepancy between self-reports and biochemical assessments of adolescent cigarette smoking (27) and respondents were continually assured that their responses were confidential prior to questionnaire completion. However, it is possible that social desirability bias may have led respondents to over report trait mindfulness and under report smoking thus bolstering inverse relationships between these two variables. Third, we used a 6-item short form of the MAAS to assess mindfulness. Although this short measure has been validated in previous research (17), there remains the possibility that the measure may not have robust construct validity, or adequately reflect the construct of trait mindfulness to the same degree as the 15 item MAAS. Finally, our results stem from cross-sectional analysis, thus causality cannot be assumed.

In summary, results from this study indicate that trait mindfulness moderates both the intention-behavior link and the self-efficacy-behavior link in the context of cigarette smoking among adolescents based on cross-sectional data. Our results suggest that trait mindfulness helps shield high intentions to smoke from translating into smoking behavior and helps shield low smoking refusal self-efficacy from translating into smoking behavior. This study identifies mindfulness as a characteristic that may modulate decision-making processes that are commonly targeted in adolescent smoking prevention efforts.

Acknowledgments

Funding support for this work includes the National Institutes of Health [7 P50 CA084735 to C.A.J.], the National Cancer Institute [T32 CA09492 to D.S.B.], and the UCLA Cousins Center for Psychoneuroimmunology [T32-MH19925 to D.S.B.].

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Figure 1.

Moderating effect of the MAAS on the association between ITS and smoking

Notes. MAAS = Mindful Attention Awareness Scale; ^ain standard deviation units; estimates are exponents of the log scale to return estimates to the original scale of measurement

Figure 2.

Moderating effect of the MAAS on the association between SRSE and smoking

Notes. MAAS = Mindful Attention Awareness Scale; ^ain standard deviation units; estimates are exponents of the log scale to return estimates to the original scale of measurement

Table 1

Demographic characteristics (N=5,287)

<i>Variable</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>%</i>	<i>Range</i>
Gender					
Female			2,583	48.9	
Male			2,704	51.1	
Age	16.2	0.7			14–20
Parent Education	4.1	1.6			1–7
^a Lifetime Smoking					
Yes			2,426	45.8	
No			2,871	54.2	
Past 30-day					
Smoking					
0 days			3,977	75.8	
1–2 days			350	6.7	
3–5 days			151	2.9	
6–9 days			138	2.6	
10–19 days			200	3.8	
20–29 days			184	3.5	
all 30 days			248	4.7	

Notes.

^aResponse to the measure “Have you ever tried cigarette smoking, even a few puffs?”

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Table 2

Descriptive t statistics and correlations

Variable	M (SD) ^a	Range	MAAS	ITS	SRSE	Smoke
MAAS	4.4 (1.1)	1–6	1.0			
ITS	1.8 (1.0)	1–4	–.17	1.0		
SRSE	3.0 (1.0)	1–4	.14	–.75	1.0	
Smoke	0.3 (0.6)	0–1.95	–.14	.70	–.64	1.0

Notes. *r* > .05 is significant at *p* < .01; MAAS = Mindful Attention Awareness Scale; ITS = Intention to Smoke, SRSE = Smoking Refusal Self-Efficacy, Smoke = log of past 30-day smoking frequency