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Sense of Coherence and Tobacco Use Myths among Adolescents as Predictors of At-Risk Youth Cigarette Use

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Abstract

We examined the association between a general construct of wellness beliefs, sense of coherence, and a specific measure of tobacco-related beliefs, tobacco use myths, as predictors of two smoking -related outcome measures - next year smoking expectation and last 30-day smoking. Self-report questionnaires were administered to 710 adolescents attending California continuation high schools at baseline and at one-year follow-up between 2006 and 2008. Cross-sectionally, predictor and outcome measures were correlated. However, in longitudinal analyses, only tobacco use myths predicted change in outcome measures. We speculate that future smoking interventions among adolescents would achieve relatively efficacious outcomes by targeting specific health beliefs instead of global health beliefs. The study's limitations are noted. Funding: National Institute on Drug Abuse and Tobacco Related Disease Research Program.

Keywords

Sense of Coherence; Tobacco Use Myths; Adolescents; Smoking; Cigarettes

INTRODUCTION

Smoking is the single most preventable cause of death worldwide (Thun, DeLancey, Center, Jemal, & Ward, 2010). Smoking experimentation and smoking-related morbidity start early in adolescence which could be manifested in many ways such as depression, sleep disturbance, and a variety of other health related complaints (Botello-Harbaum, Haynie,

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Declaration of Interest

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Murray, & Iannotti, 2011; Choi, Patten, Christian Gillin, Kaplan, & Pierce, 1997; Patten, Choi, Gillin, & Pierce, 2000). There is ample need for a better understanding of possible predictors of smoking that could better explain individual variation (intrapersonal factors) among adolescents exposed to similar contextual factors (Ames, Sussman, & Dent, 1999; Pinilla, González, Barber, & Santana, 2002; Turner, Mermelstein, & Flay, 2004).

There are a myriad of variables that impact cigarette smoking, amongst which proximal belief variables are likely to be relatively potent predictors (Petraitis, Flay, & Miller, 1995). There exist both global/general beliefs (e.g., about health or the world) and individual, specific beliefs (e.g., about tobacco use) (Glasman & Albarracín, 2006). Adolescents who believe in a commitment to wellness (a global belief, e.g. sense of coherence) or who believe in the negative health consequences of smoking (a specific, behavior-focused belief, e.g. tobacco use myths) may be less likely to engage in cigarette smoking (Myers, MacPherson, McCarthy, & Brown, 2003).

Sense of Coherence: A Global Predictor for Tobacco Use among Adolescents

A widely accepted self-report measure that is a health related general belief is Sense of Coherence (SOC). Antonovsky (Antonovsky, 1987) defines SOC as a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that i) stimuli deriving from one's internal and external environments in the course of living are structured, predictable, and explicable (comprehensibility domain); ii) resources are available to one to meet the demands posed by these stimuli (manageability domain); and iii) these demands are challenges, worthy of investment and engagement (meaningfulness domain). The SOC measure has been used in over 30 countries and languages around the world. The SOC- 13 item questionnaire has shown adequate internal consistency (Cronbach's α ranging from 0.7 to 0.92 in 127 studies of adolescents and adults) and test-retest reliability (r_s range from 0.69 to 0.78 at 1 year, 0.64 at 3 year, 0.42 to 0.45 at 4 year, 0.59 to 0.67 at 5 year, and 0.54 at 10 year intervals). Moreover, it is considered a predictor of health irrespective of age, sex, socio-economic class and ethnicity (Eriksson & Lindström, 2005, 2006)).

Glanz, Maskarinec, & Carlin (2005) used the SOC-13 item measure to examine the cross-sectional relationship between SOC and tobacco use among 7th grade youth attending traditional public middle schools in Hawaii (they also measured the differences in SOC reports as a function of different Hawaiian ethnic groups, unique to their study). Their results indicated a moderate inverse association of SOC with ever smoking and current (last 30-day) smoking across different ethnic groups (Glanz, Maskarinec, & Carlin, 2005). They acknowledged that one major limitation in their study was the use of cross-sectional surveys to assess the association between SOC and adolescent smoking. Thus, they were not able to assess whether or not SOC can predict future smoking related behavior controlling for baseline smoking. In comparison, longitudinal studies provide stronger evidence about the prediction of one variable by another, and are better evidence for informing the decision making process of intervention development (Astin & Lee, 2003).

Tobacco Use Myths: A Specific Predictor for Tobacco Use among Adolescents

Tobacco Use Myths (TUM) could be defined as questionable or dysfunctional beliefs that serve to justify tobacco use which may reflect underestimation of negative outcomes from smoking (Stacy, Galaif, Sussman, & Dent, 1996; Sussman et al., 2004). In social psychological attitude-behavior research, specific belief measures have been found to be better predictors of a corresponding specific behavior than general beliefs and attitudes such as SOC (Ajzen & Timko, 1986). For example, smoking behavior has been found to be more strongly predicted by willingness to take "health risks" than by a general willingness to take risks (Dohmen et al., 2011). Additionally, cognitive misperceptions like TUM are of special importance to adolescents as they could function as barriers to learning new information about smoking behavior in an attempt to maintain belief-behavior congruence. As a drug related misperception, TUM could not only affect the change in the smoking behavior, but could also reinforce the maintenance of smoking in adolescents (Sussman, 2010).

In our previous work, pro-drug use myths were found to predict drug use among continuation high school youth over a one-year period controlling for baseline drug use (Ames et al., 1999; Sussman et al., 2004). Another study found that adolescents who held the most negative beliefs about the consequences of smoking reported the lowest levels of smoking initiation at a three year follow-up (Velicer, Redding, Anatchkova, Fava, & Prochaska, 2007). In the current study, our drug use myth measure was adapted to be specific to smoking behavior (TUM).

The Current Study

We provided a replication-extension of the work conducted by Glanz and colleagues (2005) by addressing the association of SOC and smoking related behavior among youth. We attempted to explore the aforementioned limitation in the Glanz study by using a longitudinal design. Similar to the theory used in the Glanz et al. study, we examined the relationships among TUM, SOC, and two outcome measures related to cigarette smoking (next year cigarette smoking expectation and past-month cigarette smoking status). Due to differences in location and school type of where the data was collected between the two studies, the ethnic and age composition of the sample populations differ. Whereas Glanz et al.'s study examined the relationship of SOC and TUM in middle-school Hawaiian students mostly composed of Asian American and South Pacific Islander youth (Glanz et al., 2005), our current study population consists of a sample of Continuation High School (CHS) students of varied ethnicities, mostly Latino adolescents, attending public schools in California.

Purpose

The specific objective of the current study was to examine the association between SOC (global/general belief), TUM (specific belief), and two outcome measures for tobacco use, next-year smoking expectation and last 30-day smoking (specific behavior) both in cross-sectional analysis and longitudinally. In the cross-sectional analysis, we controlled for age, gender, and ethnicity. In the longitudinal analysis, we controlled for age, gender, ethnicity, baseline measures of the outcome variable (next year smoking expectation and last 30-day smoking), and a dummy coding for intervention program to statistically control for potential

impact of a teen tobacco use prevention program that was offered at half of the schools (Sussman, Miyano, Rohrbach, Dent, & Sun, 2007). Next-year smoking expectation is defined as the likelihood that one will smoke within the next year regardless of whether or not the intent of smoking is actually present (Schoenbaum, 2005). Through this approach, we attempt to assess which type of belief is a better predictor of adolescents' smoking-related behaviors. We hypothesized that the specific smoking-related belief, TUM, will be a better predictor than the global health-related belief, SOC, of next-year smoking expectation and last 30-day smoking behavior.

METHODS

School Selection and Experimental Design

The State of California mandates youth to receive at least part-time education until they are 18 years of age. The CHS system functions as an alternative high school diploma program for students aged 16 and older who are unable to remain in the traditional public high school. Students who typically enroll in CHS require flexible school schedules because of functional problems such as difficulties in attendance, extracurricular obligations like work or familial responsibilities, or substance misuse (California-Department-of-Education, 2011). In comparison to traditional high schools, CHSs offer larger teacher-to-student ratios, more psychological and guidance services, and more job placement and apprenticeship resources (Wiest, Wong, & Kreil, 1998).

We recruited twelve continuation high schools from three counties in southern California (Los Angeles, Ventura, and Orange). We selected our sample in the study using convenience sampling technique. Schools were assessed at baseline and one-year later as part of a teen tobacco use cessation study (EX-4).

Subjects

For the 12 CHSs in the study, an average of 8 classes was selected per school with a range of 5 classes (smallest schools) to 13 classes (largest schools). Of the 2020 students enrolled in the classes selected, 1367 were consented for participation in the study (67.7% of the total enrolled). Of the 1367 consented students, 1097 took the pretest survey (86.2%). Among the 1097 students that participated in the pretest survey, 710 students completed questionnaires one year later (64.7% retention rate) and served as the analysis sample.

Among the analysis sample of 710 students, participants varied from 13 to 19 years of age (mean age= 16.5 years, SD =1.0 years) at pretest. The sample was 62.3% male; 13.4% white, 74.9% Hispanic, 3.1% Asian, 4.4% African American, and 4.2% other ethnicity. Furthermore, 57.4% of the students lived with both parents; and approximately 43% of youths' fathers and 46% of youths' mothers completed high school. Approximately 39% of the subjects had smoked a cigarette in the last month, and 50% reported that they may smoke in the next 12 months.

Data Collection and Measures

Pretest measures were collected from students using a self-report, closed-ended response questionnaire. Questionnaires were administered over one class period. Demographic items included age (in years), gender, ethnicity (dummy coded as non-Hispanic white, Hispanic, Black, Asian, and other), mixed ethnicity (y/n), current living situation (dummy coded, with parents, alone, other), and parents' education (mean response across father's [or stepfather's] and mother's [or stepmother's] educational levels based on categories derived from Hollingshead and Redlich (Hollingshead & Redlich, 1958).

Smoking behavioral items included past 30-day use of cigarettes as in Glanz, Maskarinec, & Carlin [2005], which was assessed with the item asking "How many cigarettes have you smoked in the last 30 days?". Responses were asked on a 12-point scale that was represented by numeric intervals from "0 cigarettes" to "100+ cigarettes" (i.e., 0, 1–10, 11–20, ...90–100, 100+) (Glanz et al., 2005). A dichotomous 30-day smoking indicator was employed to divide subjects into current smokers and non-current smokers. The prevalence of past-month smoking was 41.9% at baseline. Next-year smoking expectation was assessed in the survey with the question "How likely is it that you will smoke cigarettes in the next 12 months? Would you say…," with response categories of "1=definitely not", "2=probably not", "3=a little likely", "4=somewhat likely", and "5=very likely". The dichotomous smoking expectation status was coded as 'yes' if subjects answered anything other than "definitely not" for smoking in the next 12 months (Sussman, Dent, Stacy, Burton, & Flay, 1995).

The SOC-13 items questionnaire was used in the present study. Five of the items are reverse-scored to enable easy computation of the overall score by adding up all items, so that higher score indicates higher level of SOC. Students were asked to answer SOC questions on a scale from 1 (never had this feeling) to 7 (always had this feeling). Following Antonovsky's (Antonovsky, 1987) recommendations, the 13 items were summed up to yield a total SOC score which was used for our present study. Respondents had to specify, on a 7 point bipolar-scale ranging from (Never = 1) to (always = 7); or as otherwise indicated, to which degree they agree with the given statements. For example, the first two statements were "Do you have the feeling that you don't really care about what goes on around you?" and "Has it happened in the past that you were surprised by the behavior of people whom you thought you knew well?". The mean response was 4.06 (SD = 1.23).

TUM pertaining to tobacco use consisted of 6 items with binary response categories. One of the two responses suggested the myth and the other response suggested the reality about tobacco use. These items were as follows: "What happens when a person 'gets used' to tobacco?" (responses were "Body warning signals are giving up and addiction is beginning" indicating the fact and "One has learned how to enjoy using tobacco, to control its effects" indicating the myth); "What happens to you after repeated tobacco use?" (responses were "You get less comfortable, less emotionally protected, less happy as a person" indicating the fact and "You get more comfortable, more emotionally protected, more happy as a person" indicating the myth); "When one uses tobacco, is one showing independence?" (responses were "No, one usually is showing lack of ability to control other aspects of his/her life" indicating the fact and "Yes, one is making a decision about his/her body" indicating the myth); "Does tobacco use hurt others?" (responses were "Yes" indicating the fact and "Not

often" indicating the myth); "If one uses tobacco in private" (responses were "Others can still tell and will avoid the tobacco user" indicating the fact and "No one will know so no one gets troubled" indicating the myth); and "Does one achieve friendships through tobacco use?" (responses were "No, most such friendships are centered on tobacco use" indicating the fact, and "Sure, tobacco users become lifelong and trusting friends" indicating the myth). The mean response was 0.32 (SD = 0.26).

Data Analysis

Cross-sectional and longitudinal relationships between SOC, TUM, and the two tobacco smoking related outcomes were analyzed. To account for the potential within-school clustering of students on the outcomes, the data analysis was conducted with a generalized mixed-logistic model (Murray & Hannan, 1990) using the SAS statistical package v. 9.2. The variables evaluated in this analysis include the dichotomous indicators for tobacco use (past-month smoking status and next-year smoking expectation), and the key independent variables (SOC and TUM). See Table 1. The variables adjusted for in the analyses included age, gender, and ethnicity (Sussman et al., 2007). Average percent for next-year smoking expectation from baseline to follow-up dropped by 6.92% (CI: 3.00%, 10.84%) from 52.39% to 42.96%, respectively. Average percent of those who answered "Yes" for past 30 day smoking from baseline to follow-up dropped by 8.3% (CI: 4.53%, 12.14%) from 41.93% to 30.56%, respectively. For the predictive models, the baseline measures of the outcome variable and the school-level intervention condition (2-group research design of program versus control condition) were also adjusted.

RESULTS

Potential sample bias due to differential attrition at one-year follow-up was studied with a multiple logistic regression. In the analysis, the follow-up attrition status (retain vs. lost) was predicted by a total of eight baseline measures : next year smoking expectation, past 30 day cigarette use, sense of coherence, tobacco use myth, gender, age, intervention/control group, and ethnicity. Of these eight variables, ethnicity was the only one significantly ($p<0.05$) related to differential attrition at follow-up. Between the 5-level ethnicity (Asian, African American, Hispanic, Non-Hispanic White, and Others), the odds of Hispanics to be retained at 1-year follow-up was 1.9 times ($p=.04$) that of others and 1.7 times ($p=.01$) that of the Non-Hispanic whites. Ethnicity, together with other covariates, were thus statistically controlled in the main analysis.

For the full sample (N=1090) at baseline, SOC was correlated with baseline cigarette smoking and next-year smoking expectation. See Table 2. For each standard deviation increase in baseline SOC, the odds for baseline next-year smoking expectation was 1.22 times higher ($p<0.01$), and the odds for baseline past-month smoking was 1.24 times higher ($p<0.01$). For each standard deviation increase in baseline TUM, the odds for baseline next-year smoking expectation and past-month smoking was 1.48 times higher ($p<.0001$), and 1.60 times higher ($p<.0001$), respectively.

The results of the longitudinal sample is shown in Table 2; although SOC was significantly correlated with next-year smoking expectation (marginally) and past-month smoking,

baseline SOC did not predict change in cigarette smoking or change in next-year smoking expectation from baseline to the one-year follow-up survey. On the other hand, baseline TUM was both correlated with baseline tobacco use outcomes, and was predictive of the change in both outcomes from baseline to the one-year follow-up survey. In sum, the cross sectional findings were significant for both independent variables in the study. However, on attempting to validate the cross sectional findings with a longitudinal design, SOC failed to predict both outcome variables while TUM predicted both outcome variables at one year follow up.

DISCUSSION

The overall cross-sectional findings are consistent with Glanz and colleagues (Glanz et al., 2005). However, in the longitudinal analysis, only TUM predicted current smoking and next-year smoking expectation in the study population. The findings in this study supplements evidence that a specific belief is a better predictor of the related behavior. This is consistent with previous literature that assessed the relationship between general versus specific beliefs and behaviors (Ajzen & Timko, 1986; Rosenberg, Schooler, Schoenbach, & Rosenberg, 1995). Smoking behavior is better predicted by a specific related belief like TUM rather than a global health related belief like SOC. Both outcome measures were significantly predicted during one-year follow- up by the presence of cognitive misconceptions associated with TUM.

These findings have specific implications for future tobacco prevention and cessation programs, as well as implications for future studies to address the gaps that we encountered in our findings. Cross sectional results, consistent with Glanz et al, suggest that both general and specific beliefs associated with smoking are related to next year smoking intentions and past 30 day smoking. These results suggest that programming which changes both general and specific beliefs could change later smoking behavior. However, we did not investigate whether or not earlier general and specific beliefs might alter later behavior, which is stronger evidence of such an effect. Our longitudinal analysis attempted to address the limitations in Glanz et al's study and our results suggest that altering more specific beliefs associated with smoking may exert longer-term effects on next year smoking intentions and past 30 day smoking among youth. Differences between the two study populations suggest interventions that target a single-outcome focus (e.g. TUM) may be more useful in tobacco use prevention or cessation targeted programming specifically for older teens and for a predominantly Hispanic population. These program implications reflect previously studied programs that show multi-risk and life modification oriented programs to be more successful in younger teens, while single-substance and single risk oriented programs are more successful in older teens (Johnson, MacKinnon, & Pentz, 1996). Future studies are needed to compare the impact of multi-risk, life modification, and single-risk programs best suited for adolescents in specific age groups.

One limitation of our study is generalizability. The participants of this study are from continuation high schools who do not reflect the general population of adolescent students in southern California. Additionally, CHS students are thought to have higher risk profiles than students in the regular school system in California, and could present biases in drug use

knowledge and drug-related behaviors. Attrition rates for non-Hispanics and those who scored lower on TUM may further limit the generalizability of our study. However, differences in ethnicity have been controlled for in our analysis and remain inconsequential to the results of our study. Another limitation in this study is the potential to generate cognitive recall biases. That is, asking questions about TUM may be misinterpreted as facts and reinforce smoking behaviors in these adolescents as familiar words and images can induce smoking behavior recall. Likewise, those who find smoking pleasurable may have distorted views of what is myth versus what is reality (Sussman, 2010). Future studies should consider analyzing the effects of cognitive information errors on program-related behavioral outcomes (e.g., using a TUM-type measure).

Future studies should evaluate the effectiveness of integrating specific beliefs in adolescent smoking cessation programs. It is not unorthodox to attempt to find a measure that would be predictive over many behaviors for issues pertaining to study design such as practicality and cost (e.g., questionnaire length), as well as theoretical considerations (e.g., notions of general wellness). However, this study provides evidence that due to differing impacts on adolescents' smoking behavior, it might be more relevant to target programs that alter specific smoking beliefs in adolescents rather than programs that attempt to alter a general belief. It is postulated that correcting cognitive misperceptions in adolescents can positively change or delay drug use (Ames, Krank, Grenard, Sussman, & Stacy, 2012). Thus, for long term smoking prevention and cessation results in an older adolescent populations, specifically, altering specific beliefs could be considered a "low hanging fruit" in modifying the prospective risky behavior of adolescents and provides better results in altering the smoking behavior in adolescents.

In conclusion, our findings identify a number of gaps to be addressed in future studies along with possible opportunities for planning future programs addressing adolescent smoking. Collectively, there is a need to better understand the impact of specific beliefs versus general beliefs in different age groups and ethnicities when addressing adolescents' smoking. In so doing, we will be better poised to plan more effective and efficient adolescent smoking prevention and cessation programs.

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GLOSSARY

Tobacco Use Myths	Questionable or dysfunctional beliefs that serve to justify tobacco use which may reflect underestimation of negative outcomes from smoking

Next year smoking expectancy	Estimate of the likelihood that someone will be smoking in the next year, as opposed to smoking intention, which addresses the degree to which one plans to smoke

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Table 1

Correlation Table of Study Variables at Baseline

	Next Year Smoking Intention	Past 30 Day Smoking	Sense of Coherence (Mean Score)	Tobacco Myth (Mean Score)	Male	Age	Latino	Black	Asian	Other
Past 30 Day Smoking	0.614^{***}	-	-	-	-	-	-	-	-	-
Sense of Coherence (Mean Score)	0.090^{*}	0.091^{*}	-	-	-	-	-	-	-	-
Tobacco Myth (Mean Score)	0.170^{***}	0.201^{***}	-0.051^{ns}	-	-	-	-	-	-	-
Male	-0.019^{ns}	0.036^{ns}	-0.156^{***}	0.131^{**}	-	-	-	-	-	-
Age	0.012^{ns}	0.080^{*}	-0.053^{ns}	-0.052^{ns}	0.044^{ns}	-	-	-	-	-
Latino	-0.098^{**}	-0.121^{*}	-0.056^{ns}	-0.038^{ns}	-0.034^{ns}	-0.094^{*}	-	-	-	-
Black	-0.074^{*}	-0.058^{ns}	-0.020^{ns}	0.007^{ns}	-0.004^{ns}	0.040^{ns}	-0.377^{***}	-	-	-
Asian	0.002^{ns}	0.024^{ns}	0.006^{ns}	0.022^{ns}	0.040^{ns}	0.014^{ns}	-0.316^{***}	-0.039^{ns}	-	-
Other	-0.030^{ns}	-0.022^{ns}	-0.010^{ns}	-0.071^{+}	0.001^{ns}	0.033^{ns}	-0.330^{***}	-0.040^{ns}	-0.034^{ns}	-
Mixed Ethnicity	0.041^{ns}	0.012^{ns}	0.035^{ns}	0.051^{ns}	0.008^{ns}	-0.026^{ns}	-0.193^{***}	0.095^{*}	0.099^{**}	0.259^{***}

Note: Statistical significance is marked:

^{ns}> 0.05, +: < 0.10,

*<.05,

**<0.01,

***<0.0001

Table 2

Relationships [a] between SOC, TUM and Cigarette Smoking Outcomes

	Cross-sectional Relationship[b]		Predictive Relationship[bc]	
	Next- Year Smoking Expectation (Yes vs. No)	**Past-month Smoking (Yes vs. No)**	**Next- Year Smoking Expectation (Yes vs. No)**	**Past-month Smoking (Yes vs. No)**
Sense of coherence (+1std)	1.15 $^{+}$ (0.97–1.37)	1.22 * (1.02–1.46)	1.04 ^{ns} (0.87–1.25)	1.09 ^{ns} (0.90–1.32)
Tobacco use myth (+1std)	1.36 **** (1.15–1.61)	1.48 **** (1.24–1.75)	1.32 ** (1.10–1.58)	1.20 * (1.00–1.44)

Notes:

[a] Analyses were conducted among the subjects retained at the 1-year follow-up (N=710)

OR and 95% CI is presented. Statistical significance is also marked:

^{ns} > 0.05,

$^{+}$ < 0.10,

* <.05,

** <0.01,

*** <0.0001

[b] Adjusted for age, gender, and ethnicity.

[c] For the longitudinal models, the baseline measure of the outcome (next year smoking and past 30 day smoking, respectively), and a dummy coding for intervention program was also adjusted for.