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Negative Affect in At-Risk Youth: Outcome Expectancies Mediate Relations With Both Regular and Electronic Cigarette Use

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Abstract

Despite the general trend of declining use of traditional cigarettes among young adults in the United States, alternative high school students continue to smoke cigarettes and electronic cigarettes at rates much higher than students attending regular high schools. Challenging life circumstances leading to elevated levels of negative affect may account for increased smoking behavior in this population. Further, a belief in the negative affect reducing qualities of nicotine may mediate this effect. The current study tested the hypothesis that negative reinforcing outcome expectancies mediate the relationship between negative affect on smoking susceptibility in non-users, smoking frequency in users, and smoking experimentation in the overall sample. Results support the hypothesis that negative affect in alternative high school students is correlated with smoking experimentation, smoking willingness, and smoking frequency and that the relationship between negative affect and smoking behavior outcomes is mediated by negative reinforcing outcome expectancies (i.e. beliefs in the negative affect reducing effects of smoking). This finding was supported for both cigarettes and electronic cigarettes and coincides with a rapid increase in the number of high school students nationally who have experimented with electronic cigarettes. Future anti-smoking initiatives directed at at-risk youth should consider integrating healthier negative affect reduction techniques to counter the use of nicotine products.

Keywords

Negative Affect; Outcome Expectancies; Mediation; At-Risk; Nicotine

Smoking is the leading cause of preventable death in the United States, accounting for nearly 480,000 deaths per year (USDHHS, 2014). Despite this continuing epidemic, there are encouraging signs that anti-smoking initiatives have brought about a steady decline in usage rates among adolescents (Johnston, Miech, O'Malley, Bachman, & Schulenberg, 2014). However, while the use of traditional cigarettes, by far the most commonly consumed nicotine product, has declined among youth, the use of electronic cigarettes has increased dramatically over the past several years, such that nearly 1 in 4 high school students reports having experimented with electronic cigarettes (CDC, 2016). Further, alternative high school students have been found to smoke traditional cigarettes at higher rates compared to their regular high school peers (Grenard et al., 2008; Sussman, Dent, & Stacy, 2002). The elevated risk alternative high school students face concerning smoking uptake combined

with the advent of electronic cigarettes, whose marketing campaigns are reaching more and more youth (Duke et al., 2014), warrants investigation of potential risk factors likely to exist in this population with respect to smoking behavior.

Alternative high school students have several factors that place them at increased risk for negative outcomes including academic failure, antisocial attitudes, and difficulty with interpersonal relationships (Fuller & Sabatino, 1996). Nationally representative data found that alternative high school students are at greater risk than regular high school students for a myriad of negative health behaviors including nicotine use (Grunbaum, Lowry, & Kann, 2001). In a more recent survey of alternative high school students in Minnesota, researchers found that after controlling for age, race, and SES, these youth were still significantly more likely to smoke than regular high school students (Johnson, McMorris, & Kubik, 2013). This is in line with similar findings in California showing these students were engaged in multiple risk behaviors (Ruiz de Velasco et al., 2008) including elevated smoking rates (Sussman et al., 2002). While there are many potential intrapersonal and environmental explanations for these findings, a review of the literature suggests that environmental stressors and mental health considerations may contribute to elevated risk taking behavior such as smoking (Johnson & Taliaferro, 2012). Consequently, the current study explores how the relationship between negative affect and outcome expectancies may explain smoking behavior in this population.

Negative affect has long been associated with substance use behavior including nicotine product use (Kassel et al., 2007). Theories such as the negative reinforcement model of addiction motivation (Baker, Piper, McCarthy, Majeskie, & Fiore, 2004) posit that one of the primary reasons that people abuse potentially harmful substances is for their negative affect reduction qualities. Psychologically speaking, smokers may form an expectancy with regards to how smoking will reduce feelings of negative affect. Expectancies at their core represent beliefs about a future state of affairs (Olson, Roese, & Zanna, 1996) and outcome expectancies refer to what a person believes will happen if they perform a given behavior (Maddux, Sherer, & Rogers, 1982). It is therefore not surprising that outcome expectancies are theorized to predict behavior (Bandura, 1986). Indeed, the hypothesis exploring smoking expectancies as a predictor of smoking behavior in adolescents has been examined in previous research. In a longitudinal study of adolescents, researchers found that negative affect relief expectancies were strongly correlated with smoking behavior over time (Heinz, Kassel, Berbaum, & Mermelstein, 2010). In a similar study of a clinical adolescent population at risk of further substance abuse, researchers found that negative reinforcement expectancy (NRE) partially mediated the relationship between negative affect and smoking behavior at 8-yr follow-up (Cohen, McCarthy, Brown, & Myers, 2002). This relationship was further supported by a study that found, among female college students, the relationship between depression and smoking was mediated by negative affect reduction expectancies (Morrell, Cohen, & McChargue, 2010). Given the greater risk profiles of alternative high school youth, this study tested whether negative affect can explain the elevated levels of nicotine use in this population, and also whether NRE might mediate this link.

The goal of this study is to explore the relationship between negative affect, smoking outcome expectancies, and smoking related behaviors in a population of alternative high

school students. This research is designed to expand upon the existent literature by testing the general hypothesis that NRE mediates the relationship between negative affect and smoking related outcomes in three groups of alternative high school students. Specifically, the hypotheses investigated were as follows: First, we tested the hypothesis that NRE mediated the relationship between negative affect and *having ever tried nicotine* among a sample of alternative high school students not restricted in terms of smoking experience. Second, we tested the hypothesis that NRE mediated the relationship between negative affect and *willingness to use nicotine* among the *non-smoking* alternative high school students from this same sample. Third, we tested the hypothesis that NRE mediated the relationship between negative affect and *smoking frequency* among a subsample of alternative high school students who have at least tried nicotine products. For each of these hypotheses, negative affect was assessed using a composite measure of depression, anxiety, and stress. We evaluated these outcomes as they pertained to both cigarettes and electronic cigarettes.

Method

Participants and Procedures

Schools were classified as eligible if they had at least 100 students and were within 100 miles of the program offices in Claremont, California. Using data obtained from the California Department of Education, 183 eligible alternative high schools were identified and contacted. Schools were enrolled on a first-come, first-serve basis until 29 sites agreed to participate. Recruiters visited the 29 schools between October 14th, 2014 and May 18th, 2015. Interest forms were distributed to 6,870 students. 2,726 students returned a completed interest form. Study coordinators contacted interested students and their parents or guardians. Parental consent and student assent was obtained for individuals under the age of 18.

After consent and assent was obtained, a study coordinator arranged a date and time for the participant to complete a web-based survey programmed with Inquisit 4 software (<http://www.millisecond.com/>). All assessments took place between October 23rd, 2014 and September 1st, 2015. After completion of the approximately 90-minute survey, participants were thanked for their time and received a gift card for \$45. A total of 1,060 students completed the survey. The sample was 50.7% male and 75.3% Hispanic with a mean age of 17.5 (S.D. = 0.9). A summary of sample characteristics are depicted in Table 1.

Data were collected on the variables of focus in the present study as well as a number of additional variables on tobacco marketing beyond the scope of this article. The present focus on mediators of negative affect does not overlap with other work on these data. Institutional Review Board approval was obtained for this study prior to data collection. STROBE guidelines were used to ensure the proper reporting of this observational study (von Elm et al., 2007).

Measures

Depression, Anxiety, and Stress (DASS-21).—A 21-item measure was used to assess the constructs of depression, anxiety, and stress as a composite measure of negative affect. The Depression Anxiety Stress Scale (DASS-21) short-form has been shown to possess excellent construct validity (Henry & Crawford, 2005) and psychometric properties (Cronbach's $\alpha = .94$) in an adolescent sample (Szabo, 2010). Participants were asked to indicate how much the following statements applied to them over the past week on a 4-point scale with the response options 0: 'Did not apply to me at all', 1: 'Applied to me to some degree, or some of the time', 2: 'Applied to me to a considerable degree, or a good part of time', 3: 'Applied to me very much, or most of the time'. Example items for each subscale included Depression: 'I felt I wasn't worth much as a person' (7-items, $\alpha = .89$), Anxiety: 'I felt I was close to panic' (7-items, $\alpha = .85$), Stress: 'I felt that I was using a lot of nervous energy' (7-items, $\alpha = .90$).

Smoking Consequences (S-SCQ): Negative Reinforcement Expectancy (NRE).

—The Short Form Smoking Consequences Questionnaire (S-SCQ) is a 21-item measure of perceived expectancies of smoking adapted for use with adolescent samples (Myers, MacPherson, McCarthy, & Brown, 2003). Participants were asked to read each statement and answer how likely or unlikely each consequence is for them when they smoke, or in the case of non-smokers, how likely they believed each consequence would be if they chose to smoke. The response options were altered from the original measure using work previously published by Ajzen & Fishbein (1980) so that the scale points were easier to understand. All items were answered on a 5-point Likert scale ranging from 'Extremely Likely' to 'Extremely Unlikely'. For this study, analyses only included the Negative Reinforcement (7 items, $\alpha = .92$: e.g. 'Cigarettes help me deal with anger.') subscale as the mediator between negative affect and smoking related outcomes.

Smoking Experimentation.—Two items were used to assess participants' initial experiences with nicotine products. These items were adapted from the National Youth Tobacco Survey (CDC, 2014). Using a 'Check all that apply' format, participants indicated whether or not they had tried even once 'Cigarettes' and 'Electronic Cigarettes'.

Smoking Willingness.—Two items were adapted from a previous study on health risk decision making (Gerrard, Gibbons, Houlihan, Stock, & Pomery, 2008). Participants were asked to imagine that they were at a party with friends and that there were nicotine products available. They were then asked 'If it were offered by one of your friends, how willing would you be to try...?'. The participant then selected from the response options 'Definitely No', 'Probably No', 'Probably Yes', and 'Definitely Yes' for the categories 'Cigarettes' and 'Electronic Cigarettes/Vaporizers/Vape Pens'.

Smoking Frequency.—Participants were asked questions relating to their past and current substance use. Two items were adapted from a previously validated drug use questionnaire (Graham et al., 1984) and asked participants 'How many times have you used each of the substances below in the PAST YEAR?'. Categories of substances included 'Cigarettes' and 'Electronic Cigarettes, Vaporizers, or Vape Pens'. Response options for

each category included '0', '1–10 times', '11–20 times', '21–30 times', '31–40 times', '41–50 times', '51–60 times', '61–70 times', '71–80 times', '81–90 times', and '91+ times'.

Results

The results presented here are divided into two sets of analyses. The first set uses regression analysis to explore the influence of negative affect and NRE on our three outcomes of interest, namely smoking experimentation, willingness, and frequency. The second set tests the hypothesis that NRE mediates the relationship between negative affect and smoking related outcomes in our sample. Figure 1 illustrates the general framework for the hypothesized mediation relationship between negative affective states, NRE, and nicotine use (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). All analyses were conducted using SPSS version 24. Mediation analysis was conducted using Model 4 of the PROCESS 2.13 package for SPSS (Hayes, 2013). A 1,000 iteration, bias corrected bootstrap was selected because this nonparametric approach has consistently proven to be a powerful test (Fritz & Mackinnon, 2007; Mackinnon, Lockwood, & Williams, 2004). For all mediation analyses the total effects of the DASS-21 on all outcome variables were significant.

The variables representing age, gender, SES, and ethnicity were entered as controls for all of the analyses presented in this study. Results of the effects of covariates can be found in Tables 2 and 3 corresponding to the regression analyses for cigarettes and e-cigarettes respectively. All covariates had less than 2.7% missing data, all outcomes had less than 4.6% missing data, and all predictors had less than 7.6% missing data. Guidelines in the literature for dealing with missing data suggest that levels less than 10% are acceptable (Dong & Peng, 2013) and thus listwise deletion was utilized.

Regression analyses

Cigarettes—For the entire sample logistic regression was conducted to explore the relationship between negative affect and NRE on smoking experimentation. A test of the model with covariates was statistically significant ($\chi^2 = 164.47$, $df = 11$, $p < .001$). Nagelkerke's R^2 of .22 indicated a moderate relationship between predictor variables and smoking experimentation with overall classification accuracy totaling 70.7%.

For the portion of the sample who had never smoked conventional cigarettes ($n = 577$) a logistic regression was conducted to explore the relationship between negative affect and NRE on smoking willingness. A test of the model with covariates was statistically significant ($\chi^2 = 38.69$, $df = 11$, $p < .001$). Nagelkerke's R^2 of .13 indicated a small relationship between predictor variables and smoking experimentation with overall classification accuracy totaling 88.7%.

For the portion of the sample who had smoked conventional cigarettes ($n = 354$) an ordinary least squares (OLS) regression was conducted to explore the relationship between negative affect and NRE on smoking frequency. A test of the model with covariates was statistically significant ($F(11,342) = 19.01$, $p < .001$). An $R^2 = .38$ suggests a sizable portion of the variance associated with smoking frequency was explained by the current model. See Table 2 for additional results of these analyses.

Electronic Cigarettes—The analyses for electronic cigarettes proceeded in exactly the same fashion as those for cigarettes with two notable differences. The first difference was that each outcome refers to the use of e-cigarette products versus traditional cigarettes. The second difference is that for smoking willingness and smoking frequency, participants were included only if they had never smoked e-cigarettes (for willingness) or if they had smoked e-cigarettes (for frequency).

For the entire sample a logistic regression was conducted to explore the relationship between negative affect and NRE on e-smoking experimentation. A test of the model with covariates was statistically significant ($\chi^2 = 142.62$, $df = 11$, $p < .001$). Nagelkerke's R^2 of .20 indicated a moderate relationship between predictor variables and smoking experimentation with overall classification accuracy totaling 73.5%.

For the portion of the sample who had never smoked electronic cigarettes ($n = 635$) a logistic regression was conducted to explore the relationship between negative affect and NRE on e-smoking willingness. A test of the model with covariates was statistically significant ($\chi^2 = 62.22$, $df = 11$, $p < .001$). Nagelkerke's R^2 of .13 indicated a small relationship between predictor variables and smoking experimentation with overall classification accuracy totaling 63.6%.

For the portion of the sample who had smoked electronic cigarettes ($n = 297$) an OLS regression was conducted to explore the relationship between negative affect and NRE on e-smoking frequency. A test of the model with covariates was statistically significant ($F(11,285) = 4.23$, $p < .001$). An $R^2 = .14$ suggests a modest portion of the variance associated with e-smoking frequency was explained by the current model. See Table 3 for additional results of these analyses.

Mediation analyses—The mediation analyses presented here all follow the same basic logic and format. In each analysis, negative affect (DASS-21) is entered as the predictor variable, NRE is entered as the mediator, with only the outcome variable changing based on the segment of the sample under investigation and the product category (i.e. cigarettes vs. e-cigarettes). The same covariates included in the regression analyses were also included in the mediation analyses. The results of all mediation analyses can be found in Table 4 with the results of electronic cigarettes presented in brackets.

The first set of mediation analyses among the entire sample used a logistic regression model and found that the relationship between negative affect and smoking experimentation is mediated by NRE (Loton, Borkoles, Lubman, & Polman, 2016). The second set of mediation analyses among non-smokers also used a logistic regression model and found that the relationship between negative affect and smoking willingness is likewise mediated by NRE. The third set of mediation analyses among smokers used an OLS regression model and found that the relationship between negative affect and past year smoking behavior is mediated by NRE.

Discussion

To our knowledge, this is the first study that examines the relationship between negative affect, outcome expectancies, and smoking behavior in a sample of alternative high school students. The results of this study point to the robust nature of the relationship between negative affect, NRE, and smoking related behavior in a sample of at-risk youth. The pattern of findings supports the general hypothesis that NRE mediates the relationship between negative affect and smoking susceptibility, experimentation, and frequency. This study expands upon previous findings in the literature showing that smoking outcome expectancies mediate the predictive relationship between negative affect and smoking behavior (Cohen et al., 2002; Johnson & McLeish, 2016). With respect to negative affect in general, the pattern of results found in alternative high school students mimics similar results found in post-partum depressive women (Cano et al., 2014; Correa-Fernández et al., 2012), smokers exhibiting trait anxiety (Audrain, Lerman, Gomez-Camirero, Boyd, & Orleans, 1998), and veterans suffering from PTSD (Carmody et al., 2012). The results of this study are of further interest for the parsing of this sample of alternative high school students based on their prior experience with smoking. In so doing, we were able to examine not only the relationship between NRE and experience with smoking but also how negative affect and NRE are related to susceptibility in non-smokers and frequency of use in current smokers. Evidence of such relationships could prove useful for both prevention and cessation interventions targeted at this population.

When first evaluating the entire sample of alternative high school students we found that levels of negative affect and NREs were associated with smoking experimentation. This relationship was in line with research showing that depressive symptoms are linked to use of nicotine among adolescents (Espada, Sussman, Medina, & Alfonso, 2011). This suggests that adolescents experiencing negative affect are at elevated risk of trying nicotine products. Our results point to the belief in negative affect reduction as an explanation for this phenomenon. Adolescents who believe that smoking will help to alleviate feelings of negative affect may be more willing to try nicotine products. A similar study on the relationship between depressive symptoms and substance use initiation found that negative urgency (i.e. the tendency to act rashly when emotionally aroused) was a mediator similar to NRE in the current study (Pang, Farrahi, Glazier, Sussman, & Leventhal, 2014). Both studies underscore how the desire to reduce negative affect may facilitate nicotine experimentation in adolescents.

Once we had examined the link between negative affect, smoking outcome expectancies, and smoking experimentation, we tested the hypothesis that the same relationship would predict susceptibility among non-smokers. This was done for three reasons. First, the results from the entire sample could be due to an artifact of initiators experience with smoking causing them to endorse smoking outcome expectancies more strongly. Second, because this was a cross-sectional study, we do not know if the participants' smoking behavior led to an increase in negative affective symptoms. Third, we were interested in whether or not non-smokers beliefs about smoking, uninformed by actual experience, could influence the relationship between negative affect and smoking willingness. Previous research on this population, while not exclusively done with non-smokers, found not only that positive self-

generated outcomes were common, but that they were not predicted by previous substance use (Stacy, Galaif, Sussman, & Dent, 1996). Combined with more recent research on the correlation between depressive symptoms and smoking intentions and experimentation (Nezami et al., 2005) results from this study show how smoking outcome expectancies can function as a mediator between negative affect and smoking willingness even among a population of non-smokers. It seems plausible that adolescents who are experiencing negative affect may be more likely to believe that nicotine use will help with negative affect reduction, especially given portrayals in the media of the stress-reducing effects of nicotine which are associated with a desire to smoke among non-smoking youth (Shadel, Martino, Haviland, Setodji, & Primack, 2010). This finding highlights the importance of risk factors (negative affect) and belief structures (outcome expectancies) and how they function in concert to potentially predict smoking experimentation in adolescents.

Finally we turned our attention to the alternative high school students who had previous experience with smoking. This time the outcome of interest was total number of times the participants had smoked in the past year. We hypothesized that higher reported negative affect and stronger endorsement of NRE would correlate with a higher frequency of smoking. Not only was this hypothesis supported, but the relationship between negative affect and frequency of smoking behavior was mediated by NRE. This finding mirrors the results of a recent study of adult daily smokers, which found a similar link (Ameringer, Chou, & Leventhal, 2015). While this result is not surprising, it is important to note that the mediated relationship between negative affect, outcome expectancies, and elevated levels of smoking is evident even in a sample of adolescents. Once adolescents experience or at least believe that smoking helps with negative affect reduction, escalation may occur.

Limitations

This study has several strengths, including the robust pattern of findings among a particularly vulnerable sample of adolescents. However, certain limitations should be noted to put the findings in context. The cross-sectional nature of the study design prevents a causal interpretation of the results. Yet, this study complements previous research in this population that found a longitudinal relationship between such variables as perceived stress and intentions to smoke as predictive of progression from experimental to regular smoking (Skara, Sussman, & Dent, 2001). Another potential limitation involves the geographic limitation of the sample. The scope of this study was constrained to alternative high schools in southern California. Future studies may attempt to replicate these findings nationally to bolster the generalizability of the results.

There were also limitations related to the sample included in the current study. Although every effort was made to obtain a representative sample of the alternative high school population, we found that females were overrepresented compared to previous studies. In addition, our sample had a very high percentage of students identify as Hispanic (75.3%) which might further limit generalizability. Finally, missing data varied across measures such that while any one measure had an acceptably low amount of missing data, analyses utilizing multiple variables were subject to missing data levels on the border of acceptability.

Future Directions

Future research could expand the meaningfulness of these findings in a number of ways. First, studies could include students from the general high school population to see if the prevalence of negative affect in the alternative high school population explains the disparity in substance use rates. Second, longitudinal work could test the hypothesis that negative affect precedes smoking experimentation in this population and that outcome expectancies mediates this causal link. Third, this study design could be expanded to include a transdiagnostic framework (Leventhal & Zvolensky, 2015) in this population specifically to see if alternative high school students are at greater risk of smoking due to higher prevalence of emotional vulnerabilities. Fourth, there are still more variables which may qualify the mediation results presented here. For example, outcome expectancy as a mediator may itself be moderated by accessibility, something future studies may wish to consider. Fifth, more research should look at how well these relationships play out with respect to electronic cigarettes. There is limited research on smoking outcome expectancies and e-cigarette use; however, there is evidence to suggest that both positive and negative outcome expectancies predict e-cigarette use willingness and experimentation (Pokhrel, Little, Fagan, Muranaka, & Herzog, 2014). Finally, the results from this study corroborate the body of research that suggests at-risk youth may benefit from interventions that include an emotion regulation component (Black, Sussman, Johnson, & Milam, 2012; Pierce et al., 1996; Sussman, Dent, & Galaif, 1997).

Conclusion

This study examined how NRE mediates the relationship between negative affect and smoking outcomes in a population of alternative high school students. Our results suggest that belief in the negative affect reduction potential of smoking (both cigarettes and e-cigarettes) is related to smoking experimentation, smoking willingness, and smoking frequency. Given the recent rise in adolescent experimentation with electronic cigarettes, the findings that demonstrate the hypothesized relationship between negative affect, outcome expectancies, and electronic cigarette use are of particular concern. If vulnerable populations such as at-risk adolescents believe electronic cigarettes possess the same negative affect reducing qualities as cigarettes with less of the adverse health consequences, we may begin to see e-cigarette usage rates increase in this population. Interventions designed to help this population should target both the belief structure (outcome expectancies) as well as constructive ways to cope with negative affect that do not include substance abuse.

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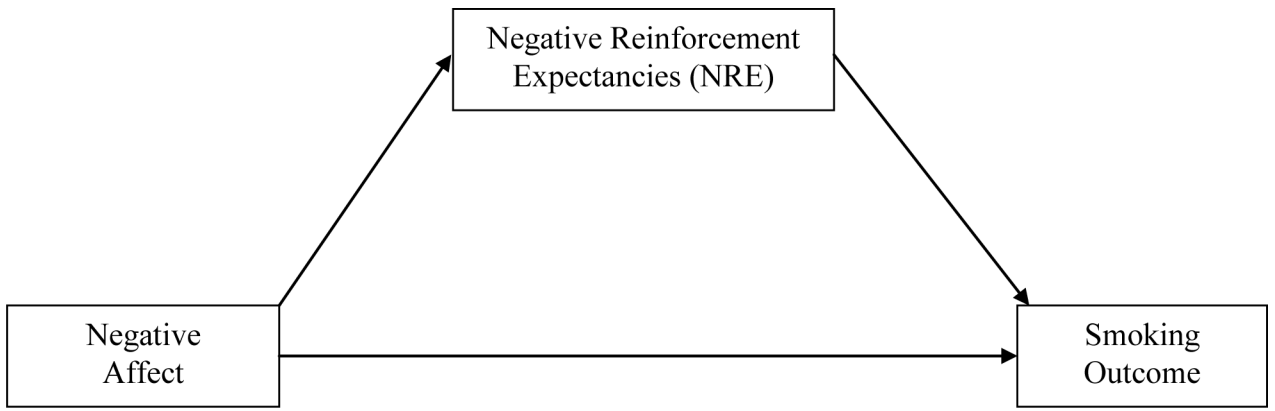


Figure 1. Conceptual mediation model under investigation (Cohen et al., 2002)

Table 1.

Sample Characteristics

Variable	Level	N	%	
Gender	Male	537	50.7	
	Female	523	49.3	
	Ethnicity	Hispanic	798	75.3
		White	125	11.7
		Black	94	8.9
Asian		11	1.0	
SES	NHPI	8	0.7	
	AIAN	4	0.4	
	Other	20	1.9	
	No Free and Reduced Lunch	285	26.9	
Smoking Experimentation N=1052	Free and Reduced Lunch	775	73.1	
	<0 Cigarettes smoked in lifetime	647	61.5	
E-Smoking Experimentation N=1052	>1 Cigarettes smoked in lifetime	405	38.5	
	<0 E-Cigarettes smoked in lifetime	720	68.4	
Smoking Willingness (Among non-smokers N=647)	>1 E-Cigarettes smoked in lifetime	332	31.6	
	“Firm abstainers”	574	88.7	
E-Smoking Willingness (Among non-“e”smokers N=720)	“Susceptible”	73	11.3	
	“Firm abstainers”	426	59.1	
	“Susceptible”	294	40.9	
	Mean	SD		
Age		17.47	0.88	
Smoking Frequency (among smokers N=405)		2.40	3.43	
E-Smoking Frequency (among “e”smokers N=332)		2.62	3.33	
DASS-21		2.95	3.70	
Depression		3.16	4.47	
Anxiety		2.60	3.60	
Stress		3.10	4.03	
NRE		14.23	8.66	

Table 2.

Logistic regression weights and odds ratios for smoking experimentation among total sample and smoking willingness among non-smokers. Standard regression weights for smoking frequency among smokers.

Variable	Smoking Experimentation			Smoking Willingness			Smoking Frequency		
	B	SE	OR	B	SE	OR	B	SE	Beta
Constant	-4.813 **	1.548	.008	-3.453	2.862	.032	-3.314	3.204	
Ethnic group									
<i>Hispanic</i>	-.196	.233	.822	.666	.515	1.946	-2.035 ***	.420	-.253
<i>Black</i>	-.600	.359	.549	-.476	.881	.622	-1.994 **	.752	-.128
<i>Asian</i>	-1.058	.854	.347	.368	1.201	1.445	-3.286	1.989	-.072
<i>AIAN</i>	-.460	1.079	.631	-19.255	NA	.000	-3.345	1.988	-.073
<i>NHPI</i>	-.674	1.433	.510	-18.145	NA	.000	2.332 *	2.787	.036
<i>Other</i>	-.106	.666	.899	.577	1.268	1.780	-2.979	1.292	-.103
Gender	.276	.151	1.318	.038	.283	1.039	.143	.300	.021
SES	-.411 *	.176	.663	.044	.317	1.045	-.321	.357	-.039
Age	.165	.087	1.179	-.039	.161	.962	.230	.178	.056
DASS-21	141 ***	.040	1.151	.186 **	.071	1.205	.063	.083	.035
NRE	087 ***	.009	1.091	079 ***	.017	1.083	.180 ***	.017	.496

Reference groups: Ethnic Group reference category = "White"; Gender reference category = "Female"; SES reference category = "Did receive free and reduced lunch"

*
p < 0.05;

**
p < 0.01;

p < 0.001

Note: "NA" indicates an unstable Standard Error due to underrepresentation from this subgroup.

Table 3.

Logistic regression weights and odds ratios for “e”-smoking experimentation among total sample and “e”-smoking willingness among non-smokers. Standard regression weights for “e”-smoking frequency among smokers.

Variable	Smoking Experimentation			Smoking Willingness			Smoking Frequency		
	B	SE	OR	B	SE	OR	B	SE	Beta
Constant	-3.012	1.585	.049	2.677	1.760	14.535	-.437	3.681	
Ethnic group									
<i>Hispanic</i>	-.670**	.227	.512	.420	.325	1.523	-1.424**	.437	-.206
<i>Black</i>	-1.301**	.380	.272	.138	.414	1.148	-.905	.899	-.060
<i>Asian</i>	-2.141	1.106	.118	.409	.778	1.505	6.276*	2.948	.119
<i>AIAN</i>	-1.699	1.214	.183	.512	1.114	1.668	-2.712	2.995	-.051
<i>NHPI</i>	-.655	1.464	.519	.872	1.462	2.391	-4.734	2.951	-.089
<i>Other</i>	-.667	.674	.513	-20.309	NA	.000	-2.028	1.510	-.076
Gender	.536**	.156	1.709	.129	.173	1.138	-.535	.352	-.086
SES	.237	.174	1.268	-.296	.205	.744	-.217	.379	-.032
Age	.068	.090	1.070	-.250*	.100	.779	.187	.205	.051
DASS-21	.100*	.041	1.105	.160**	.047	1.173	.204*	.095	.128
NRE	.074***	.009	1.077	.053***	.012	1.054	.059**	.019	.181

Reference groups: Ethnic Group reference category = “White”; Gender reference category = “Female”; SES reference category = “Did receive free and reduced lunch”

*
p < 0.05;

**
p < 0.01;

p < 0.001

Note: “NA” indicates an unstable Standard Error due to underrepresentation from this subgroup.

Table 4.

Bootstrapped mediation analyses of DASS-21 and ever smoked cigarettes [e-cigarettes] among all participants, cigarette [e-cigarette] use willingness among non-smokers, and past year cigarette [e-cigarette] smoking frequency among smokers mediated by NRE beliefs.

Mediation Model	Point Estimate	Product of coefficient		BC 95% CI	
		SE	Z	Lower	Upper
Indirect effect - Negative affect and smoking experimentation n=937[937]					
NRE	.1036 *** [.0881 ***]	.0178 [.0156]	6.2795 [5.8472]	.0717 [.0613]	.1459 [.1208]
Indirect effect - Negative affect and smoking willingness n=577[635]					
NRE	.0425 ** [.0409 **]	.0162 [.0134]	2.7240 [3.2838]	.0168 [.0190]	.0825 [.0707]
Indirect effect - Negative affect and smoking frequency n=354[297]					
NRE	.2764 *** [.0887 **]	.0568 [.0397]	5.2616 [2.6147]	.1727 [.0194]	.3976 [.1718]

Note: All analyses conducted with the covariates of gender, ethnicity, SES, and age in the model.

Bc = bias corrected. CI = confidence interval.

*
p < 0.05;

**
p < 0.01;

p < 0.001