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Sensitivity to Secondhand Smoke Exposure Predicts Smoking Susceptibility in 8 to 13 Year-Old Never Smokers

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Abstract

Purpose—To investigate the sensitivity to secondhand smoke exposure (SHSe) in preteens age 8 to 13 who have never smoked, and to determine whether SHSe sensitivity predicts smoking susceptibility.

Methods—We assessed sensitivity to SHSe using reactions commonly used for assessment of sensitivity to the first smoked cigarette (e.g., feeling dizzy), and investigated the factor structure of these reactions for the purpose of data reduction. We examined the association of each reaction measure and summary score with demographic characteristics and with smoking susceptibility, using logistic regression and ordinal logistic regression.

Results—One factor was identified that captured physical/unpleasant reactions. Older preteens and preteens with more highly educated parents reported fewer reactions to SHSe. More African American preteens reported feeling relaxed or calm compared to all other racial/ethnic groups. Experiencing physical/unpleasant reactions to SHSe predicted lower risk for smoking susceptibility.

Conclusions—This was the first study to extend analytical methodology for sensitivity to active smoking to sensitivity to SHSe in youth who have never smoked. Results suggest a desensitization process with age and lower sensitivity to some reactions in preteens from more highly educated households. Preteens who have more aversive experience s with SHSe tend to be less susceptible to smoking than those who experience fewer aversive reactions. Assessment of sensitivity to SHSe is a novel approach to the study of cigarette use etiology and may contribute to better prediction of smoking initiation.

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Keywords

preteens; secondhand smoke; reactions; sensitivity; smoking susceptibility

INTRODUCTION

Childhood secondhand smoke exposure (SHSe) is associated with deleterious health outcomes [1,2]. Children and preteens under 12 years old are particularly vulnerable because more (61%) are exposed to SHS compared to adolescents (55.4%) or adults (42.2%) [3]. The major source of SHSe in children is parental smoking in the home [4,5]. The overall prevalence of SHSe in the home is around 45% in the US, ranging from 38% in Africa to 80%-90% in countries of South America, Asia, Europe and the Middle East [4-7].

SHSe in children and adolescents is associated with increased risk for initiation of cigarette smoking [6,8], for weekly smoking [9], and for experiencing nicotine dependence-related symptoms [10]. The possible mechanisms by which SHSe is associated with smoking initiation are multiple. First, children who live with one or more smokers could imitate smoking behavior [11]. Second, children with smoking parents may have inherited a genetic predisposition to smoke [12-14]. Third, cumulative SHSe may change physiology [15] to increase risk for smoking initiation. Fourth, individual differences in sensitivity to SHSe, whether due to genetics or experience, may contribute to the relationship between SHSe and smoking initiation [16]. This paper tests the latter mechanism in a sample of high-risk 8-13 year-old preteens who have never smoked and who were living with a smoker in the home.

Sensitivity to SHSe was assessed with reaction measures commonly used to assess subjective reactivity to the first experience with smoking cigarettes. In adolescents, in general, positive subjective reactivity to the first cigarette is associated with continued smoking and nicotine dependence whereas negative subjective reactivity is associated with decreased risk for continued smoking [17-20]. Because there is no published literature on sensitivity to SHSe using reaction measures, and because of long-standing precedent of investigating the factor structure of reaction measures to the first cigarette, which appears to capture “pleasant” and “unpleasant” effects [19,20], we evaluated the factor structure of SHSe reactions and investigated the cross-sectional relationship with demographics and smoking susceptibility. We surmised that SHSe reactions would capture dimensions of sensitivity which would suggest different etiologic mechanisms, and that these dimensions may be differently related to demographics and to smoking susceptibility. The current investigation is a novel approach to the study of early risk for smoking behavior and represents a first step in understanding susceptibility factors for smoking initiation that have not been previously addressed.

MATERIALS AND METHODS

All procedures were approved by the San Diego State University (SDSU) Institutional Review Board.

Participants

A 3-stage screening process was used to recruit low-income families throughout San Diego County, California. Out of 18,673 recruitment contacts made from 2004 to 2007 through the Women Infant and Children's nutrition program and at community events, 2,280 reported a preteen aged 8-13 years old and a smoker living in the home, two eligibility criteria for the overall trial. Of the 2,280 families, 1,837 completed screening interviews and 616 families were eligible for the study based on confirmed preteen age (8-13 years) and resident smoker

status. Of these, 388 families completed the in-home baseline interview. The remaining 228 families either refused to participate (n=116), could not be reached (n=75), or declined for other idiosyncratic reasons (n=37). Parents signed informed consent forms agreeing to participate and giving permission for their preteen to participate. The preteens signed assent forms. One caregiver (84% were the biological mother) was selected to complete the majority of study measures. Participants were compensated for completing the baseline interview ($10 for the preteen and $20 for the participating parent(s)). Data were missing for one preteen; therefore analyses were based on data from 387 families.

Assessments

The parent and preteen completed separate, sequential interviews at the baseline home visit. The interviews included demographics, preteen SHSe and smoking experimentation, and family smoking history. Urine was collected from the preteen during this visit.

Variables

Sensitivity to SHSe—Due to lack of precedent in assessing sensitivity to SHSe, we adapted items used for assessment of sensitivity to the first smoked cigarette [21,22], and selected items most commonly used in those studies, items that would be expected to differ along “pleasant” or “unpleasant” dimensions, and a sufficient number of items that would be informative without adding undue length to the interview. Preteens were asked “When you have breathed other people's smoke, did you ever feel any of the following?” with Yes/No response options to: (1) “Did you feel dizzy?”; (2) “Did you feel like you wanted to throw-up?”; (3) “Did you think it was unpleasant or gross?”; (4) “Did your heart beat faster?”; (5) “Did you feel relaxed or calm?”; (6) “Did you feel a rush or buzz in your head?”; (7) “Did you think it was nice or pleasant?”; (8) “Did you like the smell?”; and (9) “Did you start coughing or choking?”.

Smoking susceptibility—We adopted the gold-standard measure of smoking susceptibility [23]. First, never smoking was defined as answering “No” (response options: Yes/No) to both “Have you ever smoked a cigarette?” and “Have you ever tried cigarette smoking, even a few puffs?” Next, to be classified as a non-susceptible never smoker, preteens had to respond “Definitely not” (response options: Definitely yes/Probably yes/ Probably not/Definitely not), to all three of the following questions: “Do you think you will try a cigarette soon?”, “Do you think you will be smoking one year from now?”, and “If one of your best friends were to offer you a cigarette, would you smoke it?” The measure was identical to that reported by Pierce and colleagues [23] except for one question. The response options for “Do you think you will try a cigarette soon?” were changed from yes/ no in Pierce et al. to the Definitely yes to Definitely not scale, with the latter answer required to be non-susceptible.

Demographic characteristics of the preteen included sex; age, categorized into 3 equivalently sized groups of 8-9, 10-11, and 12-13 year-olds; and race/ethnicity categorized into 5 groups: non-Hispanic white; Hispanic white; African American; Native Americans, Asian, and Pacific Islanders; and mixed. Non-white groups included both Hispanics and non-Hispanics. Parent education (<high school, high school, >high school) reflected socio-economic status.

Family smoking history was defined as the proportion of family members who were smokers among the total number of family members. This ratio measure, termed the family smoking index or FSI, has been proposed as a superior index of familial smoking risk [24,25] compared to categorization of just parents as smokers or non-smokers. We computed one ratio measure which reflected the proportion of parent smokers and a second ratio measure

which reflected the proportion of second degree relatives who were smokers (the preteen's biological aunts, uncles, and grandparents). The two ratios were summed, weighting the second degree relatives ratio half that of the parent ratio because second degree relatives are, on average, half as genetically related to the preteen as parents are. Specifically, the FSI was computed as: FSI = (parents who are smokers/total number of parents) + (0.5)(second degree relatives who are smokers/total number of second degree relatives). This ratio ranged from 0 to 1.5. For ease of interpretation, the ratio was converted to a percentage, where each preteens's FSI ratio was divided by 1.5 and multiplied by 100.

The preteen's biological parents were defined as smokers based on self-report of having smoked 100 or more cigarettes lifetime. In the total sample of 387 families, self-report on smoking was obtained from both biological parents of 95 preteens (24.5%), from the biological mom only of 238 preteens (61.5%), from the biological dad only of 29 preteens (7.5%) and from neither biological parent of 25 preteens (6.5%). For cases in which one or both biological parents were not interviewed, a proxy report from whoever knew the individual's smoking history was obtained (e.g., a single biological mother reporting about the preteen's biological father). For these proxy reports, a smoker was defined as someone who had “smoked regularly in the past” or was a “current smoker.” Data on the number of siblings in the household was obtained from the parent interviews. Unfortunately, information on the biological relationship of the siblings (e.g., full, half, step, adopted) to the preteen was not obtained precluding inclusion of sibling smoking data in estimation of the FSI. The preteen's biological aunts, uncles, and grandparents were defined as smokers if they had ever smoked regularly, based on report by the preteen's biological parent.

Other covariates—Analyses controlled for demographics and for other confounders that have been shown to be associated with smoking susceptibility [26,27] including preteen report of school grades in the past year (dichotomized as “mostly A's and B's” versus all others); preteen report of whether any of their friends smoke cigarettes (Yes/No); and preteen urine cotinine level.

Urine cotinine, a metabolite of nicotine, was analyzed at the SDSU Chemistry Laboratory, using isotope-dilution liquid chromatography-tandem mass spectrometry with a limit of detection (LOD) of approximately 20 parts per trillion (0.02 ng/mL) and limit of quantitation (LOQ) of 100 parts per trillion (0.10 ng/mL). Values falling below the LOQ were recoded to 0.06 ng/mL, the midpoint between the LOQ and LOD. The variable was log transformed to reduce positive skew. Reliability correlations for blinded split-half urine samples exceeded $r=0.99$ ($p < 0.001$).

Data analysis

Exploratory factor analysis is a data reduction technique commonly used to determine the extent to which a set of measured variables (such as reactions to SHSe in this study) are indicators of a smaller number of unmeasured, or latent, variables called factors. This technique was used in the present study to examine whether SHSe reactions capture “pleasant” and “unpleasant” dimensions or factors. Factor analysis with promax rotation (to allow correlated factors) was performed using SAS software version 9.1 [28]. The choice of the final factor solution was based on empirical guidelines including: (a) the common variance accounted for by each factor; (b) the scree plot; (c) a factor had to include at least two items with factor loadings ≥0.3; and (d) items with high loadings (≥0.3) on one factor had to have lower loadings on all remaining factors [29].

The relationship between SHSe reactions and demographics was investigated in a series of unadjusted and covariate-adjusted regressions using Stata v.9 [30] where the dependent variable was either each reaction (logistic regression) or a 3-category summary score

(ordinal logistic regression). Pairwise comparisons between categories of the independent variables were computed using Wald's chi–square test. For the ordinal regression, the proportional odds assumption was tested using the Brant test. The assumption was not violated in any of the models.

The relationship between SHSe reactions and smoking susceptibility was investigated using logistic regression, modeling smoking susceptibility as the dependent variable. Due to the exploratory nature of the analyses, to reduce Type II error, significance was set at $p<.10$

RESULTS

Sample description

Of 387 preteens who completed the baseline assessment, 354 (91.5%) reported never trying a single puff of a cigarette and composed the never smoking sample. Preteens were about 10 years old on average, of both genders, and from diverse racial/ethnic backgrounds (Table 1). On average, 65.1% of the preteens' parents and second degree family members were smokers. Among parents, about a quarter had less than high school education, a third had a high school diploma or equivalent, and the remainder had more than high school education.

Prevalence of reactions to SHSe

The most prevalent SHSe reaction was feeling unpleasant or gross (76.6%), followed by coughing or choking (56.6%) (Table 1). The least prevalent reactions were thinking SHSe was nice or pleasant (2.3%) and liking the smell (2.3%). Each of the remaining reactions was endorsed by about one fifth of the sample. The prevalence of missing data was low (n=1 to 5 missing data points across reaction items or 0.3%-1.4%), except for the item "heart beat faster" for which 23 preteens (6.5%) had missing data.

Factor analysis

Factor analysis of SHSe reaction items resulted in a single factor on which six of nine items had loadings ≥0.30 (Table 2). These six items (dizzy, wanted to throw up, unpleasant or gross, heart beat faster, rush or buzz in your head, and start coughing or choking) were physical reaction items, with the possible exception of unpleasant or gross feelings, and together they explained 23.0% of the factor variance. Items not loading on this or a second factor were relaxed or calm, nice or pleasant, and liked the smell. The six-item factor had acceptable internal consistency (Cronbach alpha=0.63). The unpleasant or gross feelings item had the lowest correlation with the factor score (0.24) but excluding this item did not improve internal consistency. A summary score of these six items – computed as the number of items endorsed – ranged 0 to 6, indicating endorsement of none to all six reactions, with a median of 2 and mean of 2.15 (SD=1.53). Because of the positive skew of this variable, a discrete variable was created in which the summary score was categorized as roughly the lower third (scores 0 and 1, 36.9%), median (score 2, 27.4%), and upper third (score ≥3, 35.7%) of the distribution, respectively (Table 2).

Forcing a two-factor solution resulted in the reaction feeling relaxed or calm to load on the second factor (factor loading=0.41). The two other items that could be considered to capture a "pleasant" dimension had low loadings on this second factor (0.23 for thinking SHS is nice or pleasant; and 0.25 for liking the smell). Thus the second factor did not meet criteria for contributing to the factor structure solution.

Relationship of reactions to SHSe and demographic characteristics

There were statistically significant associations between SHSe reactions and preteen age, race/ethnicity, and parent education (Table 3). No significant associations were seen

between SHSe reactions or summary scores and preteen sex (Table 3) or FSI (Table 4). Prevalence estimates are shown in Tables 3 and 4. Significantly different prevalence estimates are shown in bold and associated statistical tests and p values are in the text below.

Fewer older preteens reported wanting to throw up (OR=0.49, 95%CI 0.25, 0.96, p=0.039), feeling relaxed or calm (OR=0.39, 95%CI 0.19, 0.79, p=0.009 for 12 and 13 year-olds; and OR=0.52, 95%CI 0.29, 0.93, p=0.028 for 10 and 11 year-olds relative to 8 and 9 year-olds), coughing or choking (OR=0.51, 95%CI 0.30, 0.89, p=0.017), and endorsing 3 or more physical/unpleasant reactions (regression coefficient= -0.55, 95%CI -1.06, -0.04, p=0.035).

More African American preteens reported feeling relaxed or calm relative to the non-Hispanic White group, which was the referent category (OR=5.6, 95%CI 2.2, 14.4, p<0.001) and relative to the remaining racial/ethnic groups (Wald χ^2=11.13, p<0.001 relative to Hispanic White, χ^2=4.18, p<0.041 relative to Native American, Asian, and Pacific Islanders, and χ^2=5.21, p=0.022 relative to the mixed group). Fewer African American preteens reported feeling a head rush or buzz compared to preteens of Hispanic/White background (χ^2=7.41, p=0.007).

Fewer preteens from more highly educated households reported wanting to throw up (OR=0.50, 95%CI 0.27, 0.92, p=0.027), feeling a rush or buzz (χ^2=5.16, p=0.023), and reporting 3 or more physical/unpleasant reactions (regression coefficient= -0.54, 95%CI -1.05, -0.03, p=0.039 compared to preteens with parents with less than high school education and χ^2=4.07, p=0.044 compared to preteens with parents with a high school/ equivalent degree).

Relationship between reactions to SHSe and smoking susceptibility

In unadjusted and covariate-adjusted analysis, unpleasant or gross feelings predicted a 40-43% decrease in smoking susceptibility risk (Table 5). In contrast, liking the smell predicted nearly 5-fold increased risk for smoking susceptibility. Endorsing 3 or more physical/unpleasant reactions predicted a 46% decrease in smoking susceptibility risk, which did not remain significant in covariate-adjusted analysis.

DISCUSSION

To the best of our knowledge, this is the first investigation of reactions to SHSe. We hypothesized that sensitivity to SHSe as measured by reported reactivity may be one mechanism that explains the relationship between SHSe and smoking susceptibility [6,8]. Toward this end, we evaluated the prevalence and factor structure of reactions to SHSe and investigated the relationship of SHSe reactions with demographic characteristics and with smoking susceptibility. Because of the novel research question addressed in this study, we consider these results exploratory.

We found that physical reactions loaded on a common factor while what may be considered affective/pleasant reactions did not load on any factor. The single factor explained a small proportion of the total variance and had moderate internal consistency, suggesting that the six items that loaded on it were not strong indicators of a common underlying dimension of sensitivity to physical/unpleasant effects of SHSe. Sensitivity to SHSe should be further investigated by expanding the list of reactions in preteens to identify groups of items that capture different dimensions of SHSe sensitivity. Despite the limitations, factor analysis results demonstrated predictive validity by showing that higher sensitivity (i.e., endorsing 3 or more physical/unpleasant reactions) predicted lower risk for smoking susceptibility.

We found decreasing sensitivity to SHSe as preteens age. These results could be due to biological changes in sensitivity as a function of development or they could represent secular trends in cultural factors and/or desensitization to SHSe over time. These possibilities are important but longitudinal analyses are required to tease out age-related processes.

Prevalence of reactions to SHSe was equal across racial/ethnic groups with the exception of more African American preteens reporting feeling relaxed or calm. It is difficult to know what this result might mean. No consistent difference in susceptibility rates between African American adolescents and other racial/ethnic groups has been reported that may help explain the higher reported prevalence of feeling relaxed or calm in our sample [26,27,31,32]. It is tempting to suppose that feeling relaxed or calm in response to SHSe is a mediator or moderator of the relationship between racial/ethnic background and smoking susceptibility risk but such a suggestion is tentative at best.

More preteens of parents with lower education reported physical/unpleasant reactions. This was found for two individual reactions and for the total summary score. In the literature, lower educational achievement is associated with higher rates of cigarette smoking [33,34]. It could be that preteens in such homes are exposed to greater amounts of SHSe, which might account for the elevated rate of physical/unpleasant SHSe reactions. However, urine cotinine levels, a marker of SHSe in children [35], were equivalent across education groups, suggesting that differences in recent (and presumably cumulative) SHSe did not account for the observed sensitivity differences.

The lack of association between SHSe reactions and the FSI suggests that variability in reactions is not influenced by familial factors, at least in a high-risk sample selected for having at least one smoker in the household.

Of the six reactions that composed the summary score, experiencing SHSe as unpleasant or gross was the only individual item that predicted lower risk for smoking susceptibility. This item had the highest overall prevalence suggesting that it may be of limited utility in terms of assessment of sensitivity to SHSe. On the other hand, its association with smoking susceptibility in the absence of such association with any other individual item suggests that it may index mechanisms that protect against smoking behavior. Experiencing SHSe as unpleasant or gross also had the lowest factor loading, suggesting overall weak relationship with other items that loaded on the physical reactions factor. Words such as “unpleasant” or “gross” may capture more of an affective response to SHSe than a physical one. When examined together as a summary score, endorsement of three or more reactions tended to be protective against smoking susceptibility.

The association between higher SHSe sensitivity and lower smoking susceptibility might reflect unmeasured social contingencies. For example, a preteen may report SHSe as “gross” because her grandparents frequently describe SHSe as “gross.” She may also avoid SHSe and be more likely to resist peer offers to try smoking as a result of similar family influence. In this case, the preteen's report of “gross” may be more socially than physiologically determined. This possibility may also help explain why there was low endorsement of some of the positive SHSe effects. Future studies of SHSe reactions would benefit by assessing parent, other adult, and peer influences on SHSe reactions.

Measurement of SHSe sensitivity in preteens had no precedent and we therefore used methods developed for sensitivity to the first cigarette in adults. Our results suggest that additional work is needed to capture pleasant reactions to SHSe in preteens, and that pleasant and unpleasant reactions should distinguish between affective and physical reaction

domains. Findings should be confirmed and extended with more precise measures and larger sample size.

In conclusion, experiencing physical/unpleasant reactions to SHSe may serve as a marker for mechanisms associated with protection against smoking initiation (as predicted by smoking susceptibility). Combined with evidence of possible desensitization to SHSe over time, and differences in sensitivity as a function of parent education and racial/ethnic background, these results suggest that the preteen years and earlier may be an ideal time for targeted prevention strategies, including educating parents about the harmful effects of SHSe on their children and counseling them to assist in reducing the child's exposure [36-40].

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Table 1

Demographic characteristics and prevalence of reactions to SHSe in 8 to 13 year-old never smokers

Demographics	**Mean/Prevalence**	**n**
Age (SD; range)	10.3 (1.61; 8-13)	354
Sex (% girls)	54.8	354
Race/ethnicity (%)		354
non-Hispanic white	18.1	354
Hispanic white	34.5	354
African American	24.9	354
NA/Asian/PI	8.5	354
Mixed	14.1	354
Parent education (%)		354
< HS	25.7	354
HS/equivalent	31.9	354
> HS	42.4	354
FSI percent (SD; range)	65.1 (26.2; 0-100)	354
Reactions	**(%)**	
Dizzy	24.1	353
Wanted to throw up	21.7	351
Unpleasant/gross	76.6	351
Heart beat faster	17.5	331
Relaxed/calm	20.9	349
Rush/buzz in head	21.7	350
Nice/pleasant	2.3	350
Liked smell	2.3	353
Coughing/choking	56.6	350

SHSe=secondhand smoke exposure; NA=Native American; PI=Pacific Islander; HS=High School; FSI = Family Smoking Index

Table 2

Exploratory factor analysis of reactions to SHSe and summary score variables in 8 to 13 year-old never smokers

Reactions	**Factor Loadings**
Dizzy	**0.52**
Wanted to throw up	**0.56**
Unpleasant/gross	**0.31**
Heart beat faster	**0.47**
Relaxed/calm	-0.07
Rush/buzz in head	**0.56**
Nice/pleasant	0.17
Liked smell	-0.13
Coughing/choking	**0.41**
Cronbach's alpha (bold items)	0.63
Summary Score Categories	%
Low (score 0 or 1)	36.9
Medium (score 2)	27.4
High (score ≥3)	35.7

Table 3

Relationship of SHSe reactions and summary scores with demographic characteristics in 8 to 13 year-old never smokers

	Sex		Age Groups			Race/Ethnicity					Parent Education		
Reactions (% endorsed)	**Boys n=150-160**	**Girls n=181-194**	**Age 8-9 n=120-125**	**Age 10-11 n=124-137**	**Age 12-13 n=87-92**	**non-Hisp White n=60-64**	**Hisp White n=114-122**	**AA n=82-88**	**NA, Asian, PI n=29-30**	**Mixed n=46-50**	**<HS n=85-91**	**HS/Equiv n=107-113**	**>HS n=139-150**
Dizzy	24.5	23.7	28.2	22.6	20.7	21.9	29.8	20.5	26.7	18.0	27.8	28.3	18.7
Wanted to throw up	18.2	24.5	**28.5**[1]	19.1	**16.3**[2]	17.5	24.8	17.2	20.0	28.0	**30.0**[1]	20.4	**17.6**[2]
Unpleasant/gross	74.7	78.2	76.6	77.0	76.1	82.8	72.5	77.0	73.3	80.0	74.2	77.9	77.2
Heart beat faster	16.7	18.2	19.2	16.9	16.1	18.3	14.9	18.3	20.7	19.6	18.8	16.8	17.3
Relaxed/calm	23.6	18.8	**29.5**[1]	**17.8**[2]	**14.1**[2]	**9.7**[1]	**16.7**[1]	**37.5**[2]	**16.7**[1]	**18.4**[1]	23.9	18.0	21.3
Rush/buzz in head	24.7	19.3	23.4	23.7	16.5	24.2	**28.9**[1]	**12.6**[2]	16.7	20.0	25.6	**27.0**[1]	**15.4**[2]
Nice/pleasant	4.5	1.0	4.9	1.5	1.1	0.0	2.5	4.6	3.3	2.0	1.1	1.8	4.0
Liked smell	1.9	2.6	2.4	0.7	4.4	0.0	3.3	2.3	0.0	4.0	2.2	0.9	3.3
Coughing/choking	55.7	57.3	**62.6**[1]	58.1	**46.2**[2]	59.7	54.6	54.6	60.0	59.2	52.8	61.6	55.0
Summary Score Categories (%)	**n=149**	**n=179**	**n=118**	**n=123**	**n=87**	**n=59**	**n=113**	**n=82**	**n=29**	**n=45**	**n=84**	**n=107**	**n=137**
Low (score 0 or 1)	36.9	36.9	30.5	37.4	44.8	40.7	35.4	37.8	34.5	35.6	33.3	29.9	44.5
Medium (score 2)	26.9	27.9	29.7	26.0	26.4	23.7	23.9	37.8	34.5	17.8	23.8	32.7	25.6
High (score ≥3)	36.2	35.2	**39.8**[1]	36.6	**28.7**[2]	35.6	40.7	24.4	31.0	46.7	**42.9**[1]	**37.4**[1]	**29.9**[2]

Note: Different sample sizes are due to different number of missing values across SHSe reactions. Values with different superscripts are significantly different from each other at $p<0.05$; Abbreviations as follows: Hisp=Hispanic, AA=African American, NA=Native American, PI=Pacific Islander, Mixed=respondents who endorsed two or more racial/ethnic categories; HS=high school, HS/Equiv=high school or equivalent degree

Table 4

Mean family smoking index (FSI) across response categories of SHSe reactions and across SHSe reactions summary score categories

	Mean (SD) FSI Across Reaction Response Categories			
Reactions	**Yes**	**n**	**No**	**n**
Dizzy	65.3 (24.8)	85	65.3 (26.4)	268
Wanted to throw up	63.6 (26.7)	76	65.6 (25.9)	275
Unpleasant/gross	65.6 (26.2)	269	64.3 (25.6)	82
Heart beat faster	60.7 (31.1)	58	65.6 (25.0)	273
Relaxed/calm	64.7 (24.8)	73	65.1 (26.3)	276
Rush/buzz in head	63.9 (24.4)	76	65.4 (26.4)	274
Nice/pleasant	61.6 (31.4)	9	65.4 (25.9)	371
Liked smell	68.2 (22.5)	8	65.2 (26.1)	345
Coughing/choking	64.3 (25.9)	198	66.4 (26.3)	152
Summary Score Categories	**Mean (SD) FSI**	**n**		
Low (score 0 or 1)	65.9 (26.3)	121		
Medium (score 2)	64.1 (25.7)	90		
High (score ≥3)	64.2 (26.9)	117		

Table 5

Logistic regression results of the relationship of SHSe reactions and summary scores with smoking susceptibility in 8 to 13 year-old never smokers

	% endorsed				
Reactions	**Susceptible (n=86-93)**	**Not Susceptible (n=241-257)**	**Unadjusted OR (95% CI)**	**Adjusted OR (95% CI)**	**Significant Covariates at p<0.10**
Dizzy	20.4	25.0	0.77 (0.43, 1.37)	0.68 (0.37, 1.28)	Oldest age+; NA/Asian/PI+
Wanted to throw up	17.2	23.2	0.69 (0.37, 1.27)	0.76 (0.39, 1.48)	Oldest age+; NA/Asian/PI+
Unpleasant/gross	68.8	79.5	**0.57 (0.33, 0.97)** ‡	**0.60 (0.33, 1.07)** ‡	Oldest age+; NA/Asian/PI+
Heart beat faster	16.3	17.8	0.90 (0.46, 1.73)	0.96 (0.47, 1.96)	Oldest age+
Relaxed/calm	18.3	22.2	0.78 (0.43, 1.43)	0.81 (0.42, 1.58)	Oldest age+; NA/Asian/PI+
Rush/buzz in head	16.1	23.3	0.63 (0.34, 1.18)	0.62 (0.32, 1.21)	Oldest age+; NA/Asian/PI+
Nice/pleasant	0.0	3.5	n/a	n/a	
Liked smell	5.4	1.2	**4.79 (1.12, 20.5)** ‡	**4.68 (0.95, 22.9)** ‡	Oldest age+; NA/Asian/PI+
Coughing/choking	51.6	58.5	0.76 (0.47, 1.22)	0.95 (0.57, 1.59)	Oldest age+; NA/Asian/PI+
Summary Score Categories					
Low (score 0 or 1)	45.4	33.9	1.0	1.0	Oldest age+
Medium (score 2)	26.7	27.6	0.72 (0.39, 1.33)	0.86 (0.44, 1.66)	
High (score ≥3)	27.9	38.5	**0.54 (0.30, 0.98)** ‡	0.60 (0.32, 1.15)	

Covariates include age, sex, race, parent education, family smoking index, school grades, smoking friends, and urine cotinine levels (log transformed)

+ indicates a positive relationship with smoking susceptibility; NA=Native American; PI=Pacific Islander; OR=odds ratio; CI=confidence interval

‡ p<0.10