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## Parental Smoking Cessation and Child Daily Smoking: A Nine-Year Longitudinal Study of Mediation by Child Cognitions About Smoking

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### Abstract

**Objective**—This study investigated to what extent the prospective relationship between parental smoking cessation and child daily smoking is mediated by child cognitions about smoking.

**Design**—The study drew its sample from the 40 Washington State School districts involved in the Hutchinson Smoking Prevention Project. The predictor variable of parental smoking cessation was measured during third grade. The mediator measures, consistent with the Theory of Planned Behavior and Social Cognitive Theory, were measured during ninth grade and the smoking status outcome was measured during twelfth grade.

**Main Outcome Measures**—Smoking status at twelfth grade.

**Results**—Negative general attitudes toward smoking, attitude that cigarette smoke is bothersome, and tobacco refusal self-efficacy together significantly mediated 49% of the prospective relationship between parental smoking cessation and child daily smoking.

**Conclusion**—Parental smoking cessation before children reach third grade may lead children to develop more negative cognitions about smoking which, in turn, reduce their risk of smoking.

### Keywords

smoking; mediation; cognitions; children; parents

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Declaration of Interest

Authors have no conflicts of interest.

## Introduction

Within the past decade, research has identified an important factor that may contribute to the prevention of child daily smoking: parental smoking cessation (Bricker et al., 2003; Chassin, Presson, Rose, Sherman, & Prost, 2002; Farkas, Distefan, Choi, Gilpin, & Pierce, 1999; Jackson & Henriksen, 1997). For example, in a nine-year longitudinal study of 3,012 families, Bricker et al. (2003) found that, compared to parents who smoked, parents who quit smoking by the time their children were in third grade had children who were less likely to be daily smokers in the twelfth grade. Indeed, an overall summary of these results was that parents who quit smoking may reduce the risk their children will smoke by 30%. In order to understand the theoretical underpinnings of these results and develop more effective child smoking prevention programs, Chassin, Presson, & Sherman (2003) suggested that the “most important direction for future research is to identify mechanisms underlying parental smoking cessation effects.” To directly address this need, the purpose of this study is to examine several child cognitions about smoking that serve as mechanisms underlying the Bricker et al. finding of a prospective relationship between parent smoking cessation and their children’s smoking.

There is a substantial body of empirical literature suggesting that children’s negative attitudes toward smoking prospectively predict lower odds of smoking (Flay, Petraitis, Hu, 1999). We posit the mediational hypothesis that parents who quit smoking influence children’s negative attitudes towards smoking and that these negative attitudes will in turn, reduce the risk of children’s smoking. One way that parents who quit smoking may influence children’s attitudes toward smoking is by modeling non-smoking behavior (e.g., avoiding places where people smoke). Specifically, we speculate that parents who quit are especially motivated to engage in non-smoking behaviors both as a way to avoid relapsing and as a way to protect their children from the harm that smoking has caused in their own lives.

Only one study has examined to what extent the relationship between parental smoking cessation and child smoking is mediated by child attitudes. Specifically, Chassin Presson Rose Sherman & Prost (2002) found that a child’s perception of their parents’ intolerance of smoking partially mediated the relationship between parental cessation and child smoking. However, the study found no statistically significant evidence of a mediating role of children’s attitudes towards smoking. Additionally, this study was limited by its cross-sectional design, modest sample size ( $N = 446$ ), and young average age of the study sample ( $M = 12.8$  years).

To our knowledge, only one other study has examined the potential underlying mechanisms of the relationship between parental smoking cessation and child smoking. Bricker, Leroux, Andersen, Rajan, & Peterson (2005) investigated the mediational role of several parent anti-smoking actions. For example, they found that parents’ tendencies to sit in non-smoking sections of public establishments (reported when the child was in eleventh grade) was a significant mediator of the relationship between parental cessation (reported when the child was in third grade) and child daily smoking (reported when the child was in twelfth grade). While valuable, the study did not examine any potential *child* mediators of parental cessation.

To examine the potentially important role of child attitudes, and build on the paucity of evidence to date, this paper examines the prospective mediational role of a specific kind of attitude, namely, child cognitions about smoking, on the relationship between parental smoking cessation and child daily smoking. We draw from several major health psychology theories to focus on child cognitions reflecting thoughts, beliefs, and attitudes children have

toward smoking and the smoking behavior of others. Specifically, we posit that parental smoking cessation may influence a child to develop cognitions about smoking consistent with the Theory of Planned Behavior (TPB; Ajzen, 1991) and Social Cognitive Theory (SCT; Bandura, 1986). Specifically, the mediators consistent with TBP were: general attitudes toward smoking, intentions to smoke, and normative beliefs about smoking. Each of these mediators represents more general cognitions about the child's own daily smoking and the smoking behavior of others. Consistent with SCT, the cognitive mediators were: tobacco refusal self-efficacy and negative expectations about smoking. Each of these mediators presents a more specific cognition about smoking behavior. By implementing measures that reflect both TBP and SCT, we were able to investigate a more comprehensive mediational model that examines both general and specific cognitions about smoking. Examining these child cognitions about smoking is aimed at deepening our understanding of the relationship between parental smoking cessation and child daily smoking.

To test these mediational hypotheses, the current paper presents the *first* prospective study examining the extent to which child *cognitions about smoking* consistent with the TPB (Ajzen, 1991) and SCT (Bandura, 1986) mediate the relationship between parental smoking cessation and child daily smoking. Identifying these mediators will help show why parental smoking cessation is prospectively associated with lower levels of child smoking (Bricker et al., 2003; Chassin et al., 2002; Farkas et al., 1999; Jackson & Henriksen, 1997). This evidence may lead to the development of intervention programs designed to specifically target child cognitions about smoking and thereby reduce the risk of child smoking.

## Methods

### Participants

Study participants were drawn from the students in the 40 Washington State school districts of the Hutchinson Smoking Prevention Project (HSPP)—a landmark 15-year randomized trial of school-based tobacco prevention in which 20 participating school districts were randomized to the intervention group and 20 districts were randomized to the control group (Peterson, Kealey, Mann, Marek, & Sarason, 2000). Participants were eligible for this study if (1) one or more of their parents were either a current smoker, or if one or more parents quit smoking (with no parents currently smoking) by the time the child was in third grade (4,074 participants) and (2) if these children were eligible to receive the mediator measures (2,656 participants). [Note that to reduce child participant response burden, only certain versions of surveys were designed to include measures for particular scientific questions (e.g., mediator measures)]. Eighty-six percent (2,293/2,656) of those children offered the opportunity to complete the ninth grade survey actually completed the child smoking mediator measures. Of those child participants, ninety-seven percent (2,230/2,293) self-reported their smoking status during the twelfth grade survey. Thus, the total sample size for this study was 2,230 participants. Of the 2,230 participants, 91% were Caucasian and 48% were female. The races and ethnicities of the study population were representative of students in the 40 school districts.

### Procedures

Parental smoking status was obtained via a mailed or telephone survey when the child was in the third grade. Mediators were measured while the child was in ninth grade and the child smoking outcome was measured when the child was in the twelfth grade. All child measures were obtained via in-class, mailed-home, or telephone survey. To maximize retention, a comprehensive tracking system and follow-up procedure was applied to all members of the HSPP cohort. Standard tracking strategies and methods were applied meticulously (Call,

Otto, & Spenner, 1982; Peterson, Kealey et al., 2000; Peterson, Mann, Kealey, & Marek, 2000; Pirie et al., 1989).

## Measures

**Parental smoking status when child was in the third grade**—Parents were asked the question “Do you use cigarettes?” Those who responded with either “Yes, often” or “Yes, occasionally” were classified as current smokers while those who responded with “No, not anymore” were classified as those who quit smoking. The response option “No, Never” was also available. However, because this study focuses on the mediational role of child cognitions about smoking on parental smoking cessation, parents who were never smokers are not included in the study population. For each family who completed the survey, one parent self-reported his or her own smoking status and then gave a proxy report of the other parent’s smoking status. In our prior research (Bricker et al., 2003; Bricker et al., 2005), we found that the third grade measure of parent smoking status is reliable and that parental smoking status remains stable from third to eleventh grade. Additionally, previous investigations have demonstrated high concordance (86%–98%) rates between a parent’s self-report and their biochemically reported smoking status (Attebring, Herlitz, Berndt, Karlsson, & Hjalmarsen, 2001; Murray, Connett, Lauger, & Voelker, 1993; Shaffer, Eber, Hall, & Vander Bilt, 2000). Proxy reports given by adults have also shown high concordance rates (86%–96%) with the household member’s self-report. (Hyland, Cummings, Lynn, Corle, & Gifeen, 1997; Nelson, Longstretch, Koepsell, Checkoway, & van Belle, 1994; Schnitzler, Olshan, Savitz, & Erikson, 1995). The parent study population was all those who were either a current smoker or who had quit smoking (with none currently smoking) by the time the child was in third grade. To be consistent with Bricker et al. (2005), we created a binary predictor variable of parental smoking cessation. Specifically, a “0” was assigned to families with at least one parent currently smoking while the child was in third grade and a “1” was assigned to families with at least one parent who quit smoking, and no parent currently smoking, while the child was in third grade. In our sample, 51.0% ( $n = 1,283$ ) of the parents were former or current smokers when their child was in third grade.

**Child cognitions about smoking at ninth grade**—In order to maximize the retention rate of study participants, we kept our surveys brief with one or two item measures of child cognitions about smoking at ninth grade. The retention benefit of this approach brought with it the important limitation that the items had incalculable (in the case of one-item smoking cognition scales) or low alpha internal reliabilities (i.e. in the case of two-item smoking cognition scales). Nonetheless, we chose to utilize these cognitions about smoking items in order to conduct this important and novel study, and we are aware of no other data set that would make it possible to longitudinally examine child cognitions about smoking as mediators of parental smoking cessation.

To examine the prospective mediational role cognitions about smoking play in the relationship between parental smoking cessation and child daily smoking, we utilized constructs from both The Theory of Planned Behavior (TPB; Ajzen, 1991) and Social Cognitive Theory (SCT; Bandura, 1986). The first TPB mediator, *global attitudes towards smoking*, was measured with two-items “What is your overall feeling towards smoking?” and “Do you think cigarette smoking is bothersome?” The five response options ranged from “very negative” to “very positive” (*Cronbach alpha* = .49). The second TPB mediator, *intentions to smoke*, was measured with the item: “Do you think you will smoke cigarettes in the future?” The four response choices ranged from “no, definitely not” to “yes, definitely.” The third TPB mediator, *normative beliefs*, was measured with two items. A sample item

was: “Most high-school students smoke.” Responses were “true” or “false” (*Cronbach alpha* = .60).

The first SCT mediator, *self-efficacy to refuse tobacco*, was measured with the item “I know how to get out of situations where others might want me to use tobacco.” The four response options ranged from “not like me at all” to “just like me.” The second SCT mediator, *negative expectations about smoking*, was measured with two-items. A sample item was: “Smoking hurts the way a person looks” (*Cronbach alpha* = .55). Due to the low alphas of two-item scales, we chose to utilize each item separately in the analyses. As shown in Table 1, the correlations between the mediators ranged from .04 to .45, with a mean coefficient of .18.

**Child smoking status at twelfth grade**—The primary endpoint for this study was whether or not the child was a daily smoker during twelfth grade. This endpoint is a generally accepted smoking measure for children in twelfth grade (Johnston, O’Malley, & Bachman, 1999; Peterson, Kealey et al., 2000) and child daily smokers are considerably more at risk for health problems and to continue to smoke throughout adulthood than children who smoke less than daily (Holmen, Barrett-Connor, Holmen, & Bjermer, 2000; Johnston et al., 1999). This paper used this endpoint because child daily smoking can lead to (1) tobacco dependence, (2) serious health consequences, and (3) is a stronger predictor of smoking dependence in adulthood than lower levels of child smoking (Chassin, Presson, Pitts, & Sherman, 2000; Patton, Coffey, Sawyer, Wakefield, 2006). Child smoking status was self-reported on an in-class survey. The question “How often do you currently smoke cigarettes?” was asked with answers being coded as “0” for the responses “I have never smoked cigarettes” to “More than once a week, but less than once a day” and classified as a “1” for the responses “One to three cigarettes per day” to “More than 20 cigarettes per day.” For those children who were unable to complete the in-class survey, a telephone questionnaire was conducted in which the question “Do you smoke one or more cigarettes per day?” was asked. If the participant answered “Yes,” then he or she was coded as a “1” (daily smoker). Since there is the possibility that the child will misrepresent their smoking status, twelfth grade participants were required to provide a saliva sample for cotinine analysis. An analysis of a random sample of 12.6% of the saliva samples provided evidence that self-reports were accurate. Only 1.2% of reported non-smokers had evidence of cotinine and only 1.5% of reported smokers showed no evidence of cotinine. In our sample, 30.6% ( $n = 683$ ) children were daily smokers at twelfth grade.

### Mediational Analysis

To examine the extent to which child smoking outcomes were mediated by the hypothesized child cognitions, a mediation analysis consisting of three regression models was conducted (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). The first regression model examined the impact of the predictor variable of parental quitting ( $X$ ) on child smoking status during twelfth grade ( $Y$ ) [Model 1:  $E(Y) = \gamma_1 + \tau X$ ]. A second set of regression models, [Model 2i:  $E(M_i) = \gamma_2 + \alpha_i X$ ], examined the impact of the predictor variable  $X$  on each mediator  $M_i$  for mediators  $i=1, \dots, 8$ . The third regression model examined the simultaneous impact of the predictor variable  $X$  and mediators  $M$  on the smoking cessation endpoint  $Y$  [Model 3:  $E(Y) = \gamma_3 + \tau'X + \beta'M$ ]. Finally, the statistical mediation effect is described as the change in the magnitude of the impact of the predictor variable on the outcome effect after the mediators are added into the model ( $\tau - \tau'$ ). The Sobel method (Sobel, 1982; 1986) was used to calculate the standard error of the mediation effect and the total effect size for all mediators. The percentage of the total statistical effect of the predictor variable  $X$  on the smoking cessation endpoint  $Y$  explained by mediators  $M$  was calculated as  $[(\tau - \tau')/\tau]$  (Kenny, Kashy, & Bolger, 1998).

The mediation analysis adjusted for an indicator of the condition (intervention or control) to which each adolescent was randomized. We used the INDIRECT SPSS macro, developed by Preacher and Hayes (2008), for all mediation analyses and to calculate the total amount of variance explained by all combined significant mediators (Kenny et al., 1988).

## Results

The third to last row of Table 2 indicates an overall summary of the Bricker et al. (2003) results showing that children of parents who quit smoking (by the time they were in third grade) had a 30% lower odds of daily smoking at twelfth grade ( $\tau$  path;  $OR=.700$ ; 95%  $CI = .580-.840$ ). As shown in the  $\hat{\alpha}$  column of Table 2, parental smoking cessation by the time their children were in third grade had a significant prospective relationship with nearly all of the ninth grade cognitions: (1) overall negative feeling about smoking ( $\hat{\alpha} = .175, p < .001$ ), (2) stronger attitude that cigarette smoke is bothersome ( $\hat{\alpha} = .223, p < .0001$ ), (3) lower intentions to smoke ( $\hat{\alpha} = .105, p < .001$ ), (4) reduced normative belief that most adults smoke ( $\hat{\alpha} = -.168, p < .0001$ ), (5) reduced normative belief that most high school students smoke ( $\hat{\alpha} = -.049, p < .05$ ), (6) higher self-efficacy to refuse tobacco ( $\hat{\alpha} = .145, p < .0001$ ), and (7) higher negative expectation that smoking hurts the way a person looks: ( $\hat{\alpha} = .052, p < .01$ ).

Regarding the relationship between ninth grade child smoking beliefs and lower levels of twelfth grade child daily smoking (shown in  $\hat{\beta}$  column of Table 2), there was a significant prospective relationship in four of the measures: (1) overall negative feeling about smoking ( $\hat{\beta} = -.596, p < .0001$ ) and (2) stronger attitude that cigarette smoke is bothersome ( $\hat{\beta} = -.182, p < .001$ ), (3) normative belief that most high-school students smoke ( $\hat{\beta} = .238, p < .05$ ), and (4) higher self-efficacy to refuse tobacco ( $\hat{\beta} = -.202, p < .01$ ).

Regarding mediation (shown in  $\widehat{\alpha\beta}$  column of Table 2), the ninth grade cognitions of (1) overall negative feeling about smoking ( $\widehat{\alpha\beta} = -.104, SE = 0.029, p < .001$ ), (2) stronger attitude that cigarette smoke is bothersome ( $\widehat{\alpha\beta} = -.041, SE = .015, p < .05$ ), and (3) higher self-efficacy to refuse tobacco ( $\widehat{\alpha\beta} = -.029, SE = .012, p < .05$ ) each significantly mediated the prospective association between third grade parental smoking cessation and twelfth grade child smoking. Together, all three significant smoking cognition mediators accounted for 48.9% of the prospective relationship between parental smoking cessation and child smoking. When all the significant cognition mediators were combined into one statistical model, the observed association between parental smoking cessation and child smoking was attenuated and no longer statistically significant ( $\tau'$  path;  $OR = .833, p = .075$ ).

Finally, to conservatively test for the possibility that ninth grade child cognitions about smoking may be a reflection of, rather than a prediction of, their twelfth grade daily smoking status, we repeated all analyses while adjusting for smoking status at ninth grade. This secondary analysis showed the same pattern of results. Indeed, the prospective relationship between parental smoking cessation and child daily smoking was again non-significant ( $\tau'$  path,  $OR = .880, p = .224$ ) when the significant child cognitions were included in the model.

## Discussion

This paper is the first to examine whether the relationship between parental smoking cessation and child daily smoking was mediated by child cognitions about smoking. The results of the study provide three key findings. First, parental smoking cessation by the time their children were in third grade had a direct prospective relationship with nearly all smoking mediators at ninth grade. Second, ninth grade measures of the overall feelings about smoking, the attitude that smoke is bothersome, and higher tobacco refusal self-

efficacy had a negative relationship with child smoking while the ninth grade measure of the normative belief that most high school students smoke had a positive relationship with daily smoking at twelfth grade. Finally, ninth grade measures of two general attitudes toward smoking and tobacco refusal self-efficacy were significant mediators that accounted for 48.9% of the prospective relationship between parental smoking cessation by third grade and child daily smoking in twelfth grade. When these three significant mediators were included in the statistical model, the relationship between parental smoking cessation and child daily smoking became non-significant.

The finding that TPB-consistent general attitudes toward smoking were significant mediators of parental smoking cessation is generally consistent with our hypotheses. Parents who quit smoking may be especially motivated to engage in a variety of non-smoking behaviors and educate their children on numerous specific consequences of smoking. The amalgamation of these parenting behaviors may lead children to develop general negative attitudes toward smoking. These general attitudes may have a pervasive and enduring impact on children's smoking behavior.

We also found it interesting that one SCT-consistent mediator, tobacco refusal self-efficacy, was a significant mediator. Parents who used to smoke may believe that their children are more susceptible to acquiring smoking. Therefore, they may educate their children about various strategies to refuse tobacco offers. Such strategies could be extrapolated from the Bricker et al. (2005) study where parents who asked others to not smoke around them accounted for 22% of the association between parental smoking cessation and child smoking. Children may also learn such strategies through observation and are able to apply them in situations where they are offered a cigarette. Knowing these different strategies may help the child be more confident in refusing tobacco. Future research should test these possibilities.

The results of this paper help fill the gaps left by the two prior investigations of parental cessation mediators. By addressing key limitations of the Chassin et al. (2002) study (e.g. cross-sectional design), we believe that this paper was able to provide evidence that child cognitions about smoking have a significant role in mediating the relationship between parental cessation and child daily smoking. The results of this study also complement the findings of the Bricker et al. (2005) study, which focused on *parent* anti-smoking actions, by suggesting that *child* general attitudes and refusal self-efficacy also have a mediating role in parental cessation.

Taken together, the significant findings from each of the three mediational studies to date (including this study) provide a hypothetical model of how parental cessation influences child smoking. The significant role of mothers' implicit attitudes found in Chassin et al. (2002) may influence their actions toward smoking. Negative implicit attitudes may lead to the parent anti-smoking actions examined in Bricker et al (2005). These anti-smoking actions may socialize a child to develop more negative attitudes toward smoking thereby reducing their risk of smoking. Such an integration of the three studies' findings could be empirically tested in future research.

### Intervention Implications

The mediational role of the mediators in this study suggests several implications for child smoking prevention interventions. First, parent-targeted cessation programs that include the goal of preventing child smoking could teach parents who quit smoking to socialize their child to have a negative general attitude toward smoking and to develop confidence in their ability to refuse tobacco. Additionally, the results may help motivate parents to discuss the

potential hazards of smoking or to teach their child different strategies to refuse tobacco and thereby build their confidence in using those skills.

### Limitations

Key limitations of this study were the following. First, as we mention in the Methods, the measures of child cognitions were limited to one or two items, thereby reducing their precision. The fact that (1) parental smoking cessation was prospectively associated with nearly all of these child cognitions, (2) four of these cognitions were prospectively associated with child smoking, and that (3) three of the cognitions mediated parental smoking cessation suggests that these measures were nonetheless valuable and the results may have been even stronger with more precise measures. Second, strict causal influences cannot be drawn because the study only presents prospective associations. Third, the results of this study are only generalizable to children whose parents smoked previously. Additionally, caution should be used when generalizing from this study as 90% of the study participants were Caucasian. However, the study population was representative of Washington State.

### Future Directions

The results from this study provide several directions for future investigations. First, future studies should utilize psychometrically-sound measures of cognition mediators. Second, cognition measures could be recorded at multiple time points to investigate when child cognitions most strongly mediate the impact of parental smoking cessation on child smoking. Third, future investigations could examine other cognitions, including: perceived behavioral control and subjective norms. Finally, future work could collect smoking cognition data from a more diverse study population.

### Conclusion

This is the first prospective study to examine the extent to which children's cognitions about smoking mediate the relationship between parental smoking cessation and child daily smoking. Two general smoking attitudes and tobacco refusal self-efficacy, measured during ninth grade, were important mediators that accounted for 48.9% of the prospective relationship between parental smoking cessation, measured during third grade, and child daily smoking, measured during twelfth grade.

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Table 1

Correlations between and individual means (standard deviations) of cognition mediators.<sup>†</sup>

Cognitive Mediator	1.	2.	3.	4.	5.	6.	7.	8.
1. Feeling about smoking <sup>a</sup>	3.26 (1.02)							
2. Smoke bothersome <sup>b</sup>	0.41 <sup>****</sup>	1.73 (1.08)						
3. Smoking intentions <sup>c</sup>	0.28 <sup>****</sup>	0.45 <sup>****</sup>	2.75 (0.64)					
4. Self-efficacy to refuse tobacco <sup>d</sup>	0.33 <sup>****</sup>	0.29 <sup>****</sup>	0.33 <sup>****</sup>	2.59 (0.82)				
5. Hurts looks <sup>e</sup>	0.29 <sup>****</sup>	0.22 <sup>****</sup>	0.17 <sup>****</sup>	0.19 <sup>****</sup>	0.80 (0.40)			
6. Causes wrinkles <sup>f</sup>	0.12 <sup>****</sup>	0.08 <sup>***</sup>	0.04	0.06 <sup>**</sup>	0.36 <sup>****</sup>	0.66 (0.48)		
7. Most adults smoke <sup>g</sup>	-0.13 <sup>****</sup>	-0.11 <sup>****</sup>	-0.08 <sup>***</sup>	-0.09 <sup>****</sup>	-0.09 <sup>****</sup>	-0.05 <sup>*</sup>	0.29 (0.45)	
8. Most HS students smoke <sup>h</sup>	-0.18 <sup>****</sup>	-0.06 <sup>**</sup>	-0.04	-0.07 <sup>**</sup>	-0.07 <sup>**</sup>	0.36 <sup>****</sup>	0.36 <sup>****</sup>	0.36 (0.48)

<sup>†</sup> Pearson correlation coefficients reported on the off-diagonal, mean (SD) along the diagonal.<sup>a</sup> "What is your overall feeling toward smoking?" Responses "Very Negative" to "Very Positive"<sup>b</sup> "Does cigarette smoke bother you?" Responses "No, not at all" to "Yes, very much"<sup>c</sup> "Do you think you will smoke cigarettes in the future?" Responses "No, Definitely not" to "Yes, definitely"<sup>d</sup> "I know how to get out of situations where others might want me to use tobacco" Responses "Not like me at all" to "Just like me"<sup>e</sup> "Smoking hurts the way a person looks"<sup>f</sup> "Smoking causes premature wrinkles on the face"<sup>g</sup> "Most adults smoke"<sup>h</sup> "Most high school students smoke"<sup>i</sup> Responses were "True" or "False"\*  $p < 0.05$ ,\*\*  $p < 0.01$ ,\*\*\*  $p < 0.001$ ,\*\*\*\*  $p < 0.0001$

**Table 2**

Effects of parental cessation on child cognitions, association between child cognitions and child smoking, and the mediational role of child cognitions about smoking

Cognitive Mediator	Mediation path		Mediation effect ( $\widehat{\alpha\beta c}$ )	
	$\hat{\alpha}^a$	$\beta^b$	Estimate	Standard error <sup>d</sup>
Mediators from Theory of Planned Behavior				
General Attitudes Toward smoking				
Overall feeling about smoking	0.175 <sup>***</sup>	-0.596 <sup>****</sup>	-0.104 <sup>***</sup>	0.029
Cigarette smoke bothersome	0.223 <sup>****</sup>	-0.182 <sup>***</sup>	-0.041 <sup>*</sup>	0.015
Intentions to smoke in future	0.105 <sup>***</sup>	-0.106	-0.011	0.010
Normative Beliefs				
Most adults smoke	-0.168 <sup>****</sup>	0.066	-0.011	0.020
Most high-school students smoke	-0.049 <sup>*</sup>	0.238 <sup>*</sup>	-0.012	0.008
Mediators from Social Cognitive Theory				
Self-efficacy to refuse tobacco	0.145 <sup>****</sup>	-0.202 <sup>**</sup>	-0.029 <sup>*</sup>	0.012
Negative Expectations				
Smoking hurts the way a person looks	0.052 <sup>**</sup>	0.007	0.000	0.008
Smoking causes premature face wrinkles	0.019	-0.015	-0.000	0.003
Effect of Parent's Quitting on Smoking at 12 <sup>th</sup> grade		Odds Ratio	95% CI	p-value
Total Effect ( $\tau$ path)		0.700	0.584, 0.840	<0.001
Direct Effect ( $\tau'$ path)		0.833	0.682, 1.019	0.075
Total effect of all mediators				48.9%

<sup>a</sup> Standardized regression coefficient for intervention effect on mediator.

<sup>b</sup> Standardized coefficient for association between mediator and cessation outcome controlling for HS intervention.

<sup>c</sup> Product of standardized  $\alpha$  and  $\beta$  coefficients.

<sup>d</sup> Standard error of the mediation effect.

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$ .

\*\*\*\*  $p < .0001$ .