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The role of parental engagement in the inter-generational transmission of smoking behavior and identity

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Abstract

Purpose—Prior research has found that the protective effect of parental engagement on adolescent smoking behaviors may be weaker if parents smoke. We examine parental influence on adolescent smoking using a Social Learning Theory framework. We hypothesize that adolescents are more likely to mimic parental smoking behavior if they perceive parents as being more engaged, and if the parent is the same gender of the adolescent.

Methods—Hypotheses were tested using a diverse sample of 6,998 adolescents who were followed for seven waves (grades 6-12). Adolescent gender, time-stable and time-varying effects of parental engagement, adolescent perceptions of parental smoking, and interactions amongst the effects of these variables are tested using multilevel mediation models. We use a traditional measure of past three month adolescent smoking and a novel measure of smoking identity.

Results—Parental smoking was associated with a developmental increase in adolescent smoking; time-stable and time-varying parental engagement protected against adolescent smoking. Whereas maternal engagement and smoking exerted independent and opposite effects with no moderation, time-stable paternal engagement moderated the effects of perceived paternal smoking on adolescent smoking outcomes. Parental smoking was more strongly associated with adolescent smoking outcomes when adolescent gender was congruent with parent gender.

Conclusions—Even when parents smoke, parental engagement confers protection. Protective effects of engagement may be enhanced amongst parents who smoke through increased anti-smoking communication, particularly as adolescents reach the legal smoking age.

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Keywords

smoking identity; parental engagement; social learning theory; adolescent smoking

Heritability estimates for adolescent smoking initiation range from 31-39%, indicating that inter-generational transmission of smoking behavior is largely environmentally-mediated [1-4]. Engaged parenting and parental smoking each affect adolescent smoking, conferring a safeguard and a risk, respectively [5-7]. Earlier studies have found that parental smoking has even stronger negative effects when parents are more engaged [8-11]. These findings suggest a social modeling process by which parental smoking increases risk for adolescent smoking as parental engagement increases. However, much remains to be understood about the context in which parental engagement moderates the intergenerational transmission of smoking behaviors. In this study, we build upon prior research to further assess the nature of the interaction between parental engagement and parental smoking on adolescent smoking outcomes.

As other family process researchers have done, we adopt the term “engaged parenting” when referring to a parenting style that is high on two fundamental and highly correlated parenting dimensions: warmth and monitoring [12-17]. Engaged parenting provides support and structure in directing adolescent decision-making, and is thus protective against adolescent substance use [6, 18-20]. However, the protective role of engaged parenting may vary depending on the health behaviors modeled by parents. Social Learning Theory (SLT) suggests that modeling helps to account for a portion of the association between parent and adolescent smoking [20-22]. Parental modeling occurs when adolescents identify with their parents and are thus motivated to imitate their behavior [23]. For this reason, engaged parenting may place adolescents at *higher* risk for smoking if parents smoke.

Although some studies have found evidence of an interaction between parenting and parent smoking behavior [8-11], no study has compared time-varying and time-stable effect of engaged parenting on adolescent outcomes in this context. Consistently engaged parenting may serve a different function than time-varying, episodic spikes in engagement that may arise in reaction to adolescent behavior or other situational factors. The nature of parental influence on adolescent smoking outcomes may change over the course of adolescent development: the benefits of consistent, engaged parenting might not come to fruition immediately, but might only be observed in later adolescence when smoking behavior becomes more socially normative. Similarly, time-varying spikes in parental engagement might be beneficial in preventing deviant behavior in younger adolescents, but it might represent a reaction to deviant behavior in older adolescents.

Previous gender-dependent findings [8,10] underscore the importance of the interaction between the gender of the parent and that of the adolescent. Consistent with SLT, we hypothesized that adolescents are more likely to imitate smoking behavior of their same-gender parent [24], particularly in the presence of engaged parenting.

Study Overview

In this study, we use longitudinal data from 6,998 adolescents to address the following research questions. First, do the associations between adolescent reports of mother or father smoking and adolescent smoking outcomes depend upon average (time-stable) parental engagement observed over time? Second, over and above the influence of stable parental engagement across adolescence, do time-varying spikes in parental engagement predict spikes in adolescent smoking outcomes, and do these time-varying effects differ for those with smoking versus non-smoking parents? Third, does parent-adolescent gender congruency predict stronger links between parent behavior and adolescent smoking outcomes?

Methods

Sample and Procedure

Data are from the UNC IRB-approved Context of Adolescent Substance Use Study. All middle-school students in three public school districts in North Carolina were invited to complete surveys in school every six months, starting in spring 2002, for a total of seven assessments. At Wave 1, 10 middle schools were included; beginning with Wave 2 when eighth graders transitioned to high school, six high schools were included. All three counties were included in Waves 1 through 5, and two of the three counties continued participation into Waves 6 and 7.

At each wave, all enrolled students at the targeted grades, except those with limited English-language reading skills or in self-contained classrooms designated for Exceptional Child, were eligible. Adolescents who provided written assent and whose parents did not refuse their participation were surveyed. Due to new student enrollments, the sample included both continuing and new participants at each wave. The sample sizes for each wave were: 5,122 (1), 4,975 (2), 4,987 (3), 4,949 (4), 4,615 (5), 2,728 (6), and 2,376 (7), with 6,998 unique respondents across all waves.

Models for father effects used data from all adolescents who ever reported about their father ($N=5,969$) and models for mother effects used data from all adolescents ever reported about their mother ($N=6,404$). Adolescents (49% male, 52% White, 37% Black) ranged in age from 10 to 18 ($M = 14.36$ years; $SD = 1.39$). Approximately 87% of adolescents lived in a two-parent household and for 39% the highest education attained by either parent was high school or less.

Measures

Descriptive statistics for time-varying measures are provided in Table 1 as a function of age (which was used to measure time in all analyses). Adolescents were asked to identify “one woman who is a mother, stepmother, or someone else who is like a mother (such as a grandmother or aunt).” If there was more than one such woman, adolescents chose the woman whom they lived with most of the time. Adolescents identified a male parent or guardian in the same manner. Adolescents who did not identify a mother or father, or who reported seeing the parent less than once per year, skipped these questions.

Covariates—Covariates were: high school attended (effects-coded; the largest school was used as the reference group), gender (effects coded; male = 1, female = -1), adolescent-reported household structure measured in wave 1 (effects coded; lives with one parent = 1; lives with two parents = -1), adolescent report of the highest educational level ever obtained by either parent (a six-point scale, centered at the median and modal response, “some college”; assessed at every wave), and race/ethnicity (Black (1) or White/other (-1)).

Adolescent Perceptions of Parental Smoking—In each wave, adolescents reported on mother and father smoking separately with a single item asking “About how many cigarettes do you think (s)he now smokes in a day?”. Reports of parental smoking were stable across waves: 20% and 25% of adolescents consistently reported active maternal and paternal smoking; 71% and 62% consistently reported no maternal and paternal smoking; and 9% and 14% were inconsistent in their reports of maternal and paternal smoking. Parents whose children reported that they ever actively smoked during the study were coded ‘1’ and parents whose adolescents never reported that they were active smokers were coded ‘0.’

We compared youth reports of parent smoking with maternal self-reports from a subset of the sample (N=1642) for whom mothers were interviewed. Mothers in this sub-sample reported on their own, and the adolescent’s father’s smoking behavior. Maternal and youth reports of maternal smoking behavior were highly consistent ($\chi^2(1)=620.47$; $p<.001$) as were maternal and youth reports of paternal smoking behavior ($\chi^2(1)=549.27$; $p<.001$). A total of 486 (45%) mothers reported smoking in the past three months on any occasion; 91% of these active smokers were identified in adolescent reports as well. Similarly, A total of 468 (51%) of mothers reported fathers’ smoking on any occasion; 88% of these active paternal smokers were identified in adolescent reports as well.

Parental Engagement—A subset of items were taken from “responsiveness” (e.g., “(S)he wants to hear my problems”) and “demandingness” (e.g., “(S)he tells me times when I must come home”) sub-dimensions on the *Authoritative Parenting Index* [25] (Appendix). These items were administered to adolescents in each wave. We tested and found support for the hypothesized two-factor structure. Factor score estimates were calculated for both dimensions, separately for mothers and fathers. We constrained the measurement models for maternal and paternal responsiveness and demandingness to be configurally invariant, indicating that these models had the same meaning, but we allowed factor loadings and item thresholds to vary by parent.¹

Factor score estimates for demandingness and responsiveness were averaged to create a single measure of engagement for mothers ($\alpha = .87$) and fathers ($\alpha = .92$). The intra-class correlation (ICC; a measure of stability of adolescent-reported parental engagement over time) was .45 for maternal engagement and .49 for paternal engagement. Parental engagement measures were averaged across all waves to create time-stable maternal and

¹Factor loading values for “makes me feel better” and “wants to hear problems” were statistically equivalent, but all other factor loadings were stronger for fathers.

paternal engagement and they were grand mean centered. Time-varying engagement measures were person mean centered [30].

Adolescent Smoking Outcomes

Past Three Month Smoking—For each wave, adolescents reported on how many days, during the past 3 months, they had smoked. Because the response distribution was strongly zero-inflated, this item was dichotomized to reflect no smoking (0) or any smoking (1) in the past 3 months. The ICC for past three month smoking was .45.

Smoking Identity—Adolescents who smoke tend to do so less frequently than adults, reflecting an earlier stage of smoking development [26]. Smoking development begins before adolescents smoke their first cigarette. A challenge in measuring adolescent smoking is that adolescents who experiment with smoking show erratic patterns of use and many will not become regular smokers [27]. We thus considered a novel smoking outcome which may be more sensitive to adolescent smoking development than smoking behavior, and which is compatible with SLT: smoking identity [27-29].

All adolescents, regardless of their smoking history, were asked in each wave to report the degree to which they agree with the statement: “I see myself as a smoker.” Response options ranged from “strongly agree” to “strongly disagree.” Because the modal response to this item was strong disagreement, we coded people who disagreed strongly as identifying as a non-smoker (0) and people who did not disagree strongly as exhibiting at least somewhat of a smoking identity (1). The ICC for smoking identity was .43. Of note, more adolescents failed to reject a smoking identity than reported smoking in the past three months (Table 1). Phi correlations between past three month smoking and smoking identity ranged from a low of $r = .37$ in the spring of 6th grade to a high of $r = .54$ in the fall of 12th grade.

Data Analysis

Missing time-invariant covariates were imputed using multiple imputation to avoid listwise deletion of these cases. All covariates had rates of missingness between 1 - 4%. Response rates for Waves 1–7 considering eligibility at each wave were 88%, 81%, 81%, 79%, 76%, 75%, and 73%. We used a generalized linear model to predict the total number of missing waves for which a participant was eligible to participate. Those with more missing data were more likely to be male, from families with less educational attainment, have parents who smoked, and report having a smoker identity and more frequent smoking. Missing data on outcomes were assumed to be missing at random conditional on observed or imputed measures and were handled using direct maximum likelihood.

We used the multilevel modeling facilities within *Mplus* to address our research questions with separate analyses for mothers and fathers. A path diagram representing the full model is shown in Figure 1 for one smoking outcome (covariate effects not shown). The multilevel path model diagramming method shown in the figure maps one-to-one with model equations [31], except that we included a logit link function to account for the binary nature of the response variables. All models included a random intercept and a random slope for age. Age was mean centered for all analyses.

Model building proceeded as follows. We first established the functional form of the growth models for each smoking outcome and tested the influence of control variables on the random intercept and random slope of each smoking outcome. With the exception of adolescent gender, which we did not trim from the models, covariate effects were trimmed at $p > .10$. Next, we evaluated main effects of perceived parental smoking, time-stable parental engagement, and time-varying spikes in parental engagement on the smoking outcomes (Model 1). The time-invariant measures predicted the random intercept and slope; time-varying measures predicted the repeated outcomes directly. We tested our first and second research questions, which concerned the time-stable and time-varying effects of parental engagement, respectively, by including interactions between perceived parental smoking and time-stable parental engagement, and between perceived parental smoking and time-varying parental engagement (Model 2). We evaluated our third research question by testing gender interactions with time-stable and time-varying parental engagement and perceived parental smoking (Model 3). We used the MODEL CONSTRAINTS option in Mplus to probe significant interaction effects by obtaining simple slopes within the range of the data, along with standard errors.

Results

Standardized parameter estimates from maternal models are shown in Table 2 and paternal models are shown in Table 3.

Characterizing Trajectories—As is suggested by the leveling-off trends shown in Table 1, the growth processes underlying both of the adolescent smoking outcomes have a positive linear component and a negative quadratic component. Representative of unexplained individual differences in smoking outcomes at age 14 (the location of the intercept for age due to centering), there was significant random variation in the intercepts. The linear effect of age (but not the quadratic effect) also had significant individual variation for both outcomes, which represents individual differences in rate of change in smoking outcomes over time.

Covariate Effects—Living in a household with only one parent or guardian² had a small, consistently significant, positive association with smoking in the past three months and with smoking identity, but was not associated with rate of change in either smoking outcome (non-significant age-by-covariate interactions were trimmed from the model). Likewise, parental education and Black identity had consistently significant small, negative effects on both smoking outcome intercepts, but not on slopes. Gender was not significantly associated with smoking in the past three months, but males had significantly higher rates of smoking identity than females. Smoking identity appeared to grow at a faster rate for males in the maternal model, but this effect was not statistically significant in the paternal model.

²Because adolescents reported on maternal and paternal behaviors even if they did not live with that parent primarily, a child living with only one parent may still report about the other parent.

Model 1 (Main Effects of Perceived Parenting Behaviors on Smoking Outcome Trajectories)

Time-Stable Main Effects—The time-stable effects of maternal and paternal engagement (denoted TIC Engage in Tables 2 and 3) were protective for both smoking outcomes. As expected, mother and father smoking each had a positive association with both adolescent smoking outcomes. Paternal smoking was associated with a smaller positive effect on linear rate of change in smoking identity (represented by Age * Parent Smoking) but not on change in smoking behavior. Maternal smoking was not significantly associated with change in either smoking outcome.

Simple slopes indicated that the effect of paternal smoking on adolescent smoking identity was not statistically significant in the fall of 6th grade, but the magnitude of the influence grew over time and was significant from the spring of 6th grade on. While the effect of paternal smoking increased with age, the protective influence of time stable paternal engagement appeared to decrease with age in Model 1. We did not probe or interpret this effect because it did not remain significant in subsequent models.

Time-Varying Main Effects—Time-varying maternal and paternal engagement (denoted TVC Engage in the tables) were both significantly protective against adolescent smoking behavior and identity.

Model 2 (Moderation of Perceived Parental Smoking Effect by Parental Engagement)

Time-Stable Moderation Effects—There was no evidence of two-way interactions between time invariant maternal engagement with maternal smoking on the intercept or slope of either adolescent smoking outcome. However, time-stable paternal engagement significantly moderated the effect of paternal smoking on the adolescent smoking identity intercept (but not the slope) such that paternal smoking had a stronger deleterious effect when fathers were more engaged, as hypothesized. At 25th percentile levels of perceived paternal engagement, adolescents who reported paternal smoking were 2.83 times more likely to have a smoking identity than adolescents who did not report paternal smoking. At 75th percentile levels of paternal engagement, the odds of smoking identity were 3.42 times higher if adolescents reported paternal smoking. Thus, although the effect of paternal smoking was always statistically significant, the effect was larger when fathers were more engaged. The same moderating effect was not found for the smoking behavior outcome.

Time-Varying Moderation Effects—There was no evidence of two-way interactions between time-varying parental engagement with perceived parental smoking for any adolescent outcomes.

Model 3 (Gender Congruency)

Perceived maternal smoking influenced all adolescents; however, compared with males, females' smoking behavior and smoking identity were more strongly influenced by their perceptions of their mothers' smoking behavior. Specifically, perceptions of maternal smoking increased the odds of smoking by 5.77 for females and 3.98 for males; perceived maternal smoking increased the odds of smoking identity by 4.44 for females and 2.56 for males. Perceived paternal smoking equally influenced males and females: holding age at its

mean, perceived paternal smoking increased the odds of smoking behavior by 4.63 and increased the odds of smoking identity by 3.09 for both males and females.

Compared to females, smoking behavior (but not identity) of male adolescents was more strongly affected by time-stable maternal and paternal engagement; however, there was a significant three-way interaction between age, gender, and time-stable maternal engagement that suggested opposite age trends for males and females. Analysis of simple slopes showed that maternal engagement was significantly protective for females from the spring of 6th grade (the earliest observation) until the fall of 11th grade (and not in the fall of 12th grade), and that maternal engagement was not protective for males until the fall of 8th grade, but that the protective effect increased in magnitude with grade, remaining significant through the fall of 12th grade. There were no gender differences in the effects of time varying deviations in parental engagement on either smoking outcome, nor was there evidence of gender differences in the moderation of the effect of parental smoking on adolescent smoking outcomes by parental engagement.

Discussion

Our first and second research questions centered on whether intergenerational transmission of smoking is more severe when adolescents report that the parent is consistently engaged (time-stable engagement) and when the adolescent reports that the parent is more engaged than normal (time-varying engagement). Our finding provide some support for this idea: To summarize, perceived parental smoking exerted a moderately large, positive effect on adolescent smoking and a moderate effect on adolescent smoking identity. These effects were strongest in later adolescence. Time-stable levels of parental engagement exerted an opposite, moderately large protective effect on adolescent smoking outcomes, and time-varying spikes in parental engagement were associated with small-to-moderate decreases in adolescent smoking outcomes. For the most part, parent engagement and parent smoking exerted independent and opposite effects; however, time-stable paternal engagement buffered the effect of perceived paternal smoking on adolescent smoking identity.

Despite some support for an interactive effect, by and large, we found that parental engagement confers an independent, protective effect even when the effect is countered by parental smoking. Benefits conferred by parental engagement arise both from sustained engagement and, to a lesser extent, from time-varying spikes in engagement. These two types of effects may reflect different mechanisms; for example, sustained effects may reflect the benefits of stable home environments characterized by authoritative parenting styles and time-varying effects may reflect the benefits of parental responsiveness.

With regard to gender congruence, we found that the influence of paternal smoking was stronger for male adolescents and that the influence of maternal smoking was stronger for female adolescent. This finding suggests that adolescents may draw stronger conclusions about normative behavior from their gender-congruent parent.

The observed pattern of results was somewhat different for the two smoking outcomes: perceptions of parental smoking behavior were more predictive of adolescent smoking

behavior than of adolescent smoking identity, whereas perceived parental engagement was more predictive of smoking identity than of behavior. This finding suggests that protective effects may have a greater impact early in the development of smoking behaviors, even prior to smoking initiation. Frequencies show that some adolescents who had not smoked during the past three months did not fully reject a smoking identity. Thus, based on higher endorsement rates in younger adolescents, smoking identity has the potential to identify meaningful risk in younger populations than smoking behaviors. Whereas many adolescents experiment with smoking, smoking identity is potentially more serious and long lasting [26]. This measure has the benefit of being easy to administer, and it does not suffer from recall bias.

The conclusions of the study are bolstered by a large, diverse sample and thoughtful application of statistical methodology. However, we also acknowledge limitations including repeating testing that may result in Type I error given our use of $p < .05$ to determine statistical significance. We had clear *a priori* hypotheses that reduce this threat and we took a conservative approach in interpreting significant effects that were not robust or meaningful. Further limitations of the study include the potential for inflated associations due to shared method variance (given that all variables were based on adolescent self-report and were taken from the same survey), reliance on adolescent reports of parental smoking behavior (though these reports were highly associated with maternal reports, and adolescent perceptions rather than actual parent smoking behavior may be more relevant in this analysis. Partial non-overlap in samples for mother and father models reduces our ability to draw direct comparisons about maternal and paternal effects. Finally, particularly when studying time-varying effects, we cannot disentangle parent-initiated spikes in engagement from spikes in engagement that are a reaction to adolescent behavior. Nonetheless, the current study demonstrates that parental engagement is generally a protective factor for adolescent smoking.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Implications and Contribution

Parental engagement protects against adolescent smoking, but this effect is counteracted somewhat if parents smoke, especially in later adolescence. Adolescents whose fathers are more engaged are even more likely to exhibit smoking behavior and smoking identity in response to paternal smoking. Adolescents are more likely to mimic smoking of their same-, rather than opposite-, gender parent.

Figure 1.

Path diagram of multilevel structural equation model estimated for full model (Model 3) for one smoking outcome follows structure laid out by Curran and Bauer [31]. Time-invariant variables are denoted with i subscript and time-varying variables are denoted with it subscript. Large circles represent the random intercept and random effect of age. Dots connecting lines represent interaction effects. Covariate effects are not shown.

Table 1

Descriptive statistics for time-varying measures.

Age (Rounded)	N	Smoking Identity	Smoked in Past 3 Months	Maternal Engagement: M (SD) Range: -3.92 to 1.50	Paternal Engagement: M (SD) Range: -3.53 to 1.63
11	174	8%	5%	.44 (.71)	.45 (.78)
12	2374	15%	8%	.36 (.79)	.37 (.84)
13	5505	21%	15%	.25 (.84)	.26 (.88)
14	7511	26%	21%	.17 (.87)	.16 (.90)
15	6271	32%	26%	.10 (.91)	.09 (.93)
16	3790	33%	28%	.08 (.90)	.04 (.94)
17	1352	36%	29%	.07 (.91)	.02 (.94)
18	403	36%	30%	.06 (.95)	-.03 (.98)

Table 2
Standardized parameter estimates from models predicting adolescent smoking outcomes from maternal behavior

	Past 3 Month Smoking			Smoking Identity		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Threshold	.70*** (.15)	.83*** (.22)	.58*** (.05)	.54*** (.06)	.54*** (.06)	.55*** (.06)
Age	.80*** (.19)	.83*** (.22)	.58*** (.05)	.52*** (.05)	.52*** (.05)	.52*** (.05)
Age ²	-.14* (.06)	-.15* (.06)	-.30*** (.03)	-.19*** (.02)	-.19*** (.02)	-.19*** (.02)
Single Parent Household	.11*** (.03)	.11*** (.03)	.06*** (.02)	.05*** (.02)	.05*** (.02)	.06*** (.02)
Parent Education	-.07* (.03)	-.07* (.03)	-.06** (.02)	-.08*** (.02)	-.08*** (.02)	-.08*** (.02)
Black	-.12*** (.03)	-.12*** (.03)	-.13*** (.02)	-.07*** (.02)	-.07*** (.02)	-.07*** (.02)
Male	-.01 (.03)	-.01 (.03)	.02 (.02)	.05*** (.02)	.05*** (.02)	.10*** (.02)
Parent Smoke	.25*** (.03)	.25*** (.04)	.26*** (.02)	.22*** (.02)	.23*** (.02)	.22*** (.02)
TIC Parent Engagement	-.21*** (.03)	-.25*** (.05)	-.22*** (.02)	-.27*** (.02)	-.28*** (.02)	-.29*** (.02)
TVC Parent Engagement	-.15*** (.04)	-.14*** (.05)	-.07*** (.02)	-.10*** (.01)	-.08*** (.02)	-.09*** (.02)
Age * Male	-.04 (.06)	-.04 (.06)	-.03 (.04)	.06* (.03)	.06* (.03)	.02 (.04)
Age * Par Smoke	.08 (.06)	.10 (.07)	.06* (.03)	.04 (.03)	.04 (.03)	.04 (.03)
Age * TIC Engage	-.12 (.06)	-.17 (.10)	-.03 (.05)	.05 (.03)	.00 (.05)	.00 (.05)
TIC Engage * Par Smoke		.04 (.04)	.02 (.02)		.02 (.02)	.03 (.02)
TVC Engage * Par Smoke		.00 (.05)	-.03 (.02)		-.02 (.02)	-.03 (.02)
Age * Par Smoke * TIC Engage		.06 (.09)	.06 (.04)		.06 (.04)	.06 (.04)
Male * Par Smoke			-.04* (.02)			-.06** (.02)
Male * TIC Engage			.08*** (.02)			.03 (.02)
Male * TVC Engage			.01 (.01)			.04 (.02)
Male * Par Smoke * TIC Engage			-.03 (.02)			.00 (.02)
Male * Par Smoke * TVC Engage			.00 (.00)			-.03 (.02)
Age * Male * Par Smoke			.04 (.04)			.07 (.04)
Age * Male * TIC Engage			-.11* (.05)			-.07 (.05)
Age * Male * Par Smoke * TIC Engage			.07 (.04)			.06 (.04)
Intercept Res Variance	.77*** (.04)	.76*** (.05)	.82*** (.01)	.82*** (.01)	.82*** (.01)	.82*** (.01)

	Past 3 Month Smoking			Smoking Identity		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Age Res Variance	.98 *** (.02)	.97 *** (.03)	.99 *** (.01)	.98 *** (.01)	.98 *** (.01)	.98 *** (.01)
Residual Correlation	.14 * (.07)	.16 * (.07)	.17 * (.07)	.35 *** (.06)	.19 *** (.07)	.19 *** (.07)

Note. TIC = Time Invariant Covariate; TVC = Time Varying Covariate;

* $p<.01$;
** $p<.01$;
*** $p<.001$

Table 3
Standardized parameter estimates from models predicting adolescent smoking outcomes from paternal behavior

	Past 3 Month Smoking			Smoking Identity		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Threshold	.67*** (.09)	.67*** (.09)	.68*** (.09)	.58*** (.07)	.64*** (.06)	.64*** (.06)
Age	.49*** (.06)	.48*** (.06)	.49*** (.06)	.54*** (.09)	.44*** (.05)	.44*** (.05)
Age ²	-.30*** (.03)	-.30*** (.03)	-.30*** (.03)	-.22*** (.02)	-.21*** (.02)	-.21*** (.02)
Single Parent Household	.08*** (.02)	.08*** (.02)	.08*** (.02)	.07*** (.02)	.07*** (.02)	.07*** (.02)
Parent Education	-.05** (.02)	-.05** (.02)	-.05** (.02)	-.08*** (.02)	-.08*** (.02)	-.08*** (.02)
Black	-.14*** (.02)	-.14*** (.02)	-.14*** (.02)	-.09*** (.02)	-.09*** (.02)	-.09*** (.02)
Male	-.01 (.02)	-.01 (.02)	-.02 (.03)	.06*** (.02)	.05*** (.02)	.21*** (.02)
Parent Smoke	.25*** (.02)	.25*** (.02)	.25*** (.02)	.20*** (.02)	.21*** (.02)	.21*** (.02)
TIC Parent Engagement	-.23*** (.02)	-.27*** (.03)	-.26*** (.03)	-.26*** (.02)	-.30*** (.03)	-.30*** (.03)
TVC Parent Engagement	-.10*** (.01)	-.08*** (.02)	-.08*** (.02)	-.08*** (.01)	-.09*** (.02)	-.09*** (.02)
Age * Male	-.02 (.03)	-.02 (.03)	-.05 (.05)	.06 (.03)	.06 (.03)	.03 (.05)
Age * Par Smoke	.06 (.03)	.07* (.03)	.07* (.03)	.08*** (.03)	.10*** (.03)	.10*** (.03)
Age * TIC Engage	.02 (.03)	-.06 (.05)	-.06 (.05)	.08* (.03)	.00 (.05)	.01 (.05)
TIC Engage * Par Smoke		.05 (.03)	.05 (.03)		.05* (.02)	.06* (.02)
TVC Engage * Par Smoke		-.02 (.02)	-.02 (.02)		.02 (.02)	.02 (.02)
Age * Par Smoke * TIC Engage		.09 (.05)	.08 (.05)		.09 (.05)	.09 (.05)
Male * Par Smoke			.01 (.02)			-.03 (.02)
Male * TIC Engage			.06* (.03)			.03 (.03)
Male * TVC Engage			.00 (.02)			-.01 (.01)
Male * Par Smoke * TIC Engage			.00 (.03)			-.02 (.02)
Male * Par Smoke * TVC Engage			-.03 (.02)			.02 (.02)
Age * Male * Par Smoke			.04 (.05)			.05 (.04)
Age * Male * TIC Engage			-.08 (.05)			-.05 (.05)
Age * Male * Par Smoke * TIC Engage			.04 (.05)			.14 (.08)
Intercept Res Variance	.82*** (.01)	.81*** (.01)	.81*** (.01)	.84*** (.01)	.84*** (.01)	.84*** (.01)

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	Past 3 Month Smoking			Smoking Identity		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Age Res Variance	.96*** (.01)	.96*** (.01)	.95*** (.02)	.97*** (.01)	.97*** (.01)	.96*** (.01)
Residual Correlation	.19** (.07)	.19** (.07)	.20** (.07)	.12 (.07)	.11 (.07)	.11 (.07)

Note. TIC = Time Invariant Covariate; TVC = Time Varying Covariate;

* $p<.01$;
** $p<.01$;
*** $p<.001$