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Maternal personality traits associated with patterns of prenatal smoking and exposure: Implications for etiologic and prevention research

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Abstract

Background—Little is known about the characteristics of women who smoke during pregnancy beyond demographic factors. We examined the relationship between novelty seeking, harm avoidance, and self-directedness and (a) abstinence from smoking during pregnancy and (b) average daily cigarette consumption during pregnancy.

Methods—Participants were 826 birth mothers who made adoption placements in the Early Growth and Development Study and completed the Temperament and Character Inventory – Short Form, and interview-based smoking assessments 3 - 6 months postpartum. Never smokers ($n = 199$), pregnancy abstainers ($n = 277$), pregnancy light smokers ($n = 184$), and pregnancy heavy smokers ($n = 166$) were compared on personality dimensions and smoking-related processes.

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Using regression analyses we examined relationships between personality and (a) abstinence versus smoking during pregnancy; and (b) average daily cigarette consumption among lifetime smokers, controlling for nicotine dependence, birth father substance dependence, maternal antisocial behavior, and depressive symptoms during pregnancy.

Results—Smokers with higher self-directedness and lower harm avoidance were more likely to abstain during pregnancy [O.R. 1.380; 95% C.I. (1.065 – 1.787); B(SE) = .322(.132); $p = .015$] and [O.R. .713; 95% C.I. (.543 - .935); B(SE) = -.339(.138); $p = .014$], respectively. Novelty seeking differentiated never smokers from lifetime smokers ($t = -3.487$; $p = .001$), but was not significant in multivariate models. Lifetime smokers who abstained during pregnancy reported fewer depressive symptoms relative to never smokers.

Conclusions—Personality dimensions associated with abstinence from smoking and cigarettes per day during pregnancy may be important to consider in etiologic and intervention research.

Keywords

Pregnancy smoking; smoking cessation; personality; temperament; externalizing problems

1. Introduction

1.1 Scope of the problem

Maternal smoking during pregnancy (MSDP) remains a common modifiable risk factor for adverse pregnancy and birth outcomes (Cnattingius 2004) and externalizing problem behaviors in offspring (Gaysina et al. 2013, Huizink & Mulder 2006, Wakschlag et al. 2006). While the characteristics of children exposed to MSDP have received substantial attention (Knopik 2009), less is known about characteristics of their mothers beyond demographic factors (Massey & Compton 2012). Moreover, although patterns of smoking are known to vary widely during pregnancy (Pickett et al. 2005), most studies characterize pregnancy smokers dichotomously (women who smoked and those who did not), and combine smokers who quit during pregnancy with women who never smoked (Massey & Compton 2012). Understanding the characteristics of mothers who engage in different smoking behaviors during pregnancy is important for several reasons. First, prenatal smoking cessation interventions show varying degrees of effectiveness in different smokers, yet it is unclear why (Lumley et al. 2009). For example, the use of ultrasound visualization of the fetus followed by motivational interviewing about smoking cessation seems effective for some smokers, yet counterproductive for others (Stotts et al. 2009). Second, it is still unclear whether MSDP has a direct teratologic effect on offspring behavior problems, or whether it is a marker for genetic and environmental factors that adversely affect child development (U.S. Department of Health and Human Services 2014, Estabrook et al. in press).

1.2 Why maternal personality is important

Reducing or stopping smoking during pregnancy likely constitutes a deliberate attempt to protect the baby rather than a long-term intention to quit (Massey et al. 2015)—close to half of smokers suspend smoking over the many months of gestation without treatment, then

resume smoking postpartum (DiClemente et al. 2000). This capacity to change smoking behavior could reflect maternal personality characteristics related to the ability to adapt to circumstances and to delay gratification in favor of long term goals (Pickett et al. 2008). Moreover, as personality is an important determinant of parenting behavior (McCabe 2014), and is partially heritable (Bratko & Vukasovic 2015), understanding the relationship between maternal personality and smoking behavior during pregnancy is also critical to elucidating pathways by which MSDP and offspring behavior are linked (Knopik 2009, Pickett et al. 2008).

1.3 Personality and smoking behavior during pregnancy

Cloninger's psychobiological model of personality is of particular relevance in this regard as it was derived from neurobiological studies of brain networks that regulate behavior in rodents, and from genetic studies in humans (Cloninger et al. 1993). The model includes the genetically-influenced temperament dimensions novelty seeking, harm avoidance, reward dependence, and persistence (Ando et al. 2004), and dimensions of character (self-directedness, cooperativeness, and self-transcendence) that demonstrate strong environmental influences (Gillespie et al. 2003). While Cloninger's Temperament and Character Inventory (TCI) was originally designed to study personality traits associated with the development of alcoholism, two temperament dimensions, novelty seeking and harm avoidance, and the character dimension, self-directedness, have also demonstrated applicability to other forms of addictive behavior such as cigarette smoking (Etter 2010, Leventhal et al. 2007).

Novelty seeking describes a tendency toward exploratory behavior in response to new environmental cues, impulsive decision making, and avoidance of frustration (Cloninger et al. 1993). High-novelty seeking individuals may be characterized as quick-tempered, curious, easily bored, and impulsive. These attributes are hypothesized to be linked to reduced dopaminergic receptor availability in the ventral midbrain, leading to heightened responses to novelty (Zald et al. 2008). Studies in non-pregnant adults have demonstrated associations between novelty seeking and smoking initiation (Perkins et al. 2008), and severity of nicotine withdrawal symptoms (Leventhal et al. 2007). We have previously shown that women with lower novelty seeking are more likely to abstain from the use of all addictive substances during pregnancy (Massey et al. 2011). However, the relationship between novelty seeking and different levels of smoking during pregnancy has not directly been examined to our knowledge.

Another dimension of personality, harm avoidance, describes the tendency to worry in anticipation of future problems. Persons with high harm avoidance are cautious, tense, fearful, inhibited, and shy. Harm avoidance has been associated with serotonergic activity and brain systems involving behavioral inhibition (Paulus et al. 2003). Like novelty seeking, greater harm avoidance has also been directly linked to smoking initiation (Etter 2010) and intensity of nicotine withdrawal symptoms among habitual smokers (Leventhal et al. 2007). Moreover, harm avoidance has been correlated with a greater availability of $\alpha 4\beta 2$ nicotinic acetylcholine receptors, leading to heightened cholinergic transmission associated with

smoking (Storage et al. 2013). Thus, harm avoidance may differentiate smokers who abstain during pregnancy from those who do not, and relate to cigarettes per day across pregnancy.

Finally, self-directedness, a character dimension inversely linked to smoking initiation among non-pregnant adults (Etter, 2010), describes an individual's ability to adapt to one's environment and delay immediate gratification in favor of long-term goals (Cloninger et al. 1993). Low self-directedness is thought to be conceptually related to an external locus of control, or feeling as though one's experience is the product of the environment, rather than the product of one's own actions (De Fruyt 2000). Thus, to the degree that abstaining from smoking during pregnancy involves the delay of immediate gratification in favor of long term health, maternal self-directedness may be related to patterns of smoking during pregnancy.

In this study, to better understand how personality relates to the tendency/ability to abstain from smoking during pregnancy, we examined the relationship between novelty seeking, harm avoidance, and self-directedness and abstinence from smoking during pregnancy among lifetime smokers. Additionally, to elucidate maternal personality traits associated with different levels of prenatal exposure to smoking, we examined the relationship between personality dimensions and average daily cigarette consumption during pregnancy.

2. Materials and methods

2.1 Study design and participants

Participants were birth mothers who made adoption placements in the Early Growth and Development Study, a prospective adoption study of birth parents, adoptive parents, and adopted children aimed at examining how family, peer, and contextual processes, and their interplay with genetic influences, affect child adjustment (Leve et al. 2013). Women were recruited from a wide variety of adoption agencies across the Northwest, Southwest, and Mid-Atlantic United States. All data in the current study were ascertained during the first in-person interview at an average of 5 months postpartum (range = 3 – 6 months), with the exception of the Social Behavior Questionnaire, which was mailed out to participants immediately prior to this interview.

Demographic information for the full EGDS birth mother sample are as follows: mean age was 25.1 years (standard deviation (SD) = 6.2 years), mean annual household income was \$25,000 (SD = \$16,000), and mean educational attainment was a high school degree. Racial and ethnic distribution was: 69.2% non-Hispanic Caucasian, 13.7% African American, 6.5% Hispanic, 4.3% more than one race or ethnicity, 2.3% American Indian or Alaskan Native, 1.8% Asian, and 2.2% unknown or not reported. Marital status was: 55.5% single, never married; 18.9% living with a partner in a committed relationship; 11.1% married; 10.5% divorced, not remarried; 3.7% separated; 0.5% remarried; 0.3% single, widowed. The analytic sample used in this study (n = 826 with data on smoking) did not differ in demographic factors from the full EGDS sample (N = 913).

2.2. Personality measures

Novelty seeking, harm avoidance, and self-directedness were assessed using respective subscales from the 125-item TCI – Short Form (Cloninger et al. 1994). Participants rated whether each item was true or false about themselves. Cronbach's α for the novelty seeking, harm avoidance, and self-directedness subscales were .72, .87, and .84, respectively. Domains within each subscale and sample items are described below.

2.2.1 Novelty Seeking—The 17-item Novelty Seeking subscale of the TCI taps into four domains: Exploratory Excitability (When nothing new is happening, I usually start looking for something that is thrilling or exciting); Impulsiveness (I often do things based on how I feel at the moment without thinking about how they were done in the past); Extravagance (I often spend money until I run out of cash or get into debt from using too much credit), and Disorderliness (I like it when people can do whatever they want without strict rules and regulations).

2.2.2 Harm Avoidance—The 19-item Harm Avoidance scale includes Anticipatory Worry (Usually I am more worried than most people that something will go wrong in the future); Fear of Uncertainty (I usually feel tense and worried when I have to do something new and unfamiliar); Shyness (I often avoid meeting strangers because I lack confidence with people I don't know); and Fatigability (I have less energy and get tired more quickly than most people).

2.2.3 Self Directedness—The 24-item self-directedness subscale includes five domains: Responsibility vs. Blaming (Circumstances often force me to do things against my will), Purposefulness vs. Lack of Goal Direction (Often I feel that my life has little purpose or meaning), Resourcefulness vs. Inertia (I prefer to wait for someone else to take the lead in getting things done), Self-Acceptance vs. Self-Striving (I often wish I was smarter than everyone else), and Congruent Second Nature vs. Incongruent Habits (Many of my habits make it hard for me to accomplish worthwhile goals).

2.3 Smoking

2.3.1 Categorical measure of smoking—Lifetime tobacco use was derived from the Composite International Diagnostic Interview – Short Form (CIDI-SF) (Kessler et al. 1998), modified to include tobacco use, and lifetime use rather than past 12-month use. Data on smoking during pregnancy was obtained using the Pregnancy History Calendar (PHC) based on the Life History Calendar method of retrospective reporting (Caspi et al. 1996). Interviewers helped participants to create a timeline of memorable events (birthdays, holidays, etc.) including, but not limited to the pregnancy. Utilizing this timeline to assist in recall, birth mothers were asked, “For these nine months, [corresponding to the pregnancy] did you smoke cigarettes?” Based on these lifetime and pregnancy smoking data, women were grouped by: (a) women who never smoked = *never smokers*; (b) lifetime smokers who did not smoke during pregnancy = *pregnancy abstainers*; (c) women who smoked < 10 cigarettes/day in any trimester of pregnancy = *pregnancy light smokers*; and (d) women who smoked ≥ 10 cigarettes/day in one or more trimesters = *pregnancy heavy smokers*.

2.3.2 Continuous measure of smoking – cigarettes per day during pregnancy

—In addition to the presence or absence of smoking during the nine months that corresponded to the pregnancy, within the PHC, lifetime smokers were asked to estimate the average number of cigarettes they smoked per day during each trimester of pregnancy. To provide an estimate of total exposure across the pregnancy, these data were coded to reflect a continuous measure of average daily cigarette consumption during pregnancy.

2.4 Covariates

Nicotine dependence was assessed using questions that assess Diagnostic and Statistical Manual-IV (DSM-IV) criteria for substance dependence (American Psychiatric Association 2000) in the CIDI-SF, but modified to pertain to smoking, for example, “During your lifetime, did you have such a strong urge to smoke that you could not keep from smoking? Have you smoked more than you intended, or for more days in a row than you intended? For example, smoking a half a pack when you were trying to limit yourself to 1 or 2 cigarettes?” To control for non-personality-related genetic factors likely to influence smoking during pregnancy, family history of substance use disorders was controlled. Five items in the CIDI-SF assess whether a specific biological first degree relative “has had problems with drugs or alcohol.” Endorsement of at least one relative was coded as the presence of a first degree biological relative with a substance use disorder. To account for the potential influence of partner smoking and substance abuse on MSDP, birth father substance use was controlled. Birth father report of one or more DSM-IV criteria for alcohol, tobacco, or drug dependence from the CIDI-SF was coded as the presence of substance dependence. Finally, maternal antisocial behavior and depressive symptoms during pregnancy have both been associated with MSDP (Pickett et al. 2009, Zhu & Valbo 2002). The total score from the 38-item Elliot Social Behavior Questionnaire (Elliot & Huizinga 1993), was used as a covariate in analyses ($\alpha = .88$). Depressive symptoms during pregnancy were assessed using 19 items from the Beck Depression Inventory (Beck et al., 1988), utilizing the PHC to assist in recall ($\alpha = .83$).

2.5 Statistical Analyses

Personality traits, demographic factors, and covariates were compared between: (a) never smokers versus lifetime smokers; (b) never smokers versus pregnancy abstainers; (c) pregnancy abstainers versus pregnancy smokers; and (d) pregnancy light smokers versus pregnancy heavy smokers using two-tailed t-tests and χ^2 tests for continuous and dichotomous factors, respectively. Bivariate correlation analysis was performed to detect for the presence of multi-collinearity among personality dimensions. Finally, multivariate regression analysis was used to determine the independent relationship between personality dimensions and (a) abstinence from smoking during pregnancy among lifetime smokers; (b) average daily cigarette consumption during pregnancy among lifetime smokers, controlling for nicotine dependence, first degree biological relative with a substance use disorder, birth father substance dependence, maternal antisocial behavior, and maternal depressive symptoms during pregnancy. All analyses were conducted using IBM SPSS Statistics 22.

3. Results

Relative to women who never smoked, women who smoked at any time in life were more likely to have a first degree biological relative with a substance use disorder, report birth father substance dependence, more antisocial behaviors, and more depressive symptoms during pregnancy. Lifetime smokers also had higher novelty seeking and lower self-directedness scores compared to never smokers (Table 1). Pregnancy abstainers reported fewer depressive symptoms during pregnancy compared to pregnancy smokers, and also never smokers. In bivariate correlation analyses, self-directedness was strongly inversely correlated with harm avoidance ($r = -.549, p < .01$) and novelty seeking ($r = -.398, p < .01$). Harm avoidance was unrelated to novelty seeking ($r = .035, p = .306$). Thus, to avoid multicollinearity in regression models, self-directedness was entered alone with covariates, separate from the other two dimensions. With familial factors and smoking related processes controlled in these models, higher self-directedness and lower harm avoidance were independently associated (a) abstinence versus smoking during pregnancy (excluding never smokers) (Tables 2 and 3); and (b) average daily cigarette consumption during pregnancy (Tables 4 and 5). Novelty seeking did not show direct effects on smoking outcomes measured.

4. Discussion

4.1 Self-directedness and ability to abstain from smoking

In this sample, among lifetime smokers, women with greater self-directedness were more likely to abstain from smoking during pregnancy. The construct of self-directedness, in particular the dimension of resourcefulness versus inertia (example item: I prefer to wait for someone else to take the lead in getting things done) has been linked to self-efficacy (Bandura 1977), known to be predictive of successful smoking cessation during pregnancy (Devries & Backbier 1994). Together with literature on self-efficacy, a relative deficit in self-directedness associated with MSDP may explain in part why currently-recommended approaches to prenatal smoking cessation, such as the 5 A's (Ask, Assess, Advise, Assist and Arrange) (Melvin et al. 2000) have led to minimal gains despite decades of research (Lumley 2009). Women may desire to quit, but struggle to utilize the specific behavioral strategies recommended (distraction, talking to a friend), as these techniques require the delaying of short term gratification in favor of long-term goals. These smokers may need interventions that are able to provide adequate and consistent reinforcement for abstinence throughout gestation, or alternatives rewarding enough to compete with the drive to smoke.

4.2 Self-directedness and average daily consumption of cigarettes during pregnancy

Lower self-directedness was associated both with the tendency to smoke during pregnancy and with smoking more cigarettes per day during pregnancy. Furthermore, the presence of a first degree biological relative with a substance use disorder was also significantly associated with average daily cigarette consumption during pregnancy. These findings may be relevant when considering the association of MSDP to neurobehavioral consequences in exposed children, notably impaired cognitive abilities (Paula & Koiranen 1987), attention-deficit/hyperactivity disorder (Thapar et al. 2003), and conduct disorder (Wakschlag et al.

1997). Characteristics of mothers who smoke during pregnancy, and smoke at greater levels, and the characteristics of their biological relatives, may themselves contribute to the development of externalizing behaviors in their children (D'Onofrio et al. 2010). It is plausible then, that the intergenerational transmission of children's externalizing problems may partially reflect maternal traits associated MSDP (Richter et al. 2002).

4.3 Harm avoidance and MSDP

Among lifetime smokers, those with higher harm avoidance were more likely to smoke during pregnancy, and reported smoking more cigarettes per day during pregnancy. With the current study design, it is impossible to discern whether anxiety contributed to cigarette smoking as a coping mechanism, was associated with guilt about smoking, or some combination. Either way, addressing and managing anxiety may be important to help smokers abstain during this critical period of development.

4.4 Possible protective factors in pregnancy abstainers and their implications

Findings about pregnancy non-smokers relative to never smokers were perhaps most intriguing; while they had greater familial and temperamental risks compared to never smokers as expected (biological relatives with substance use disorders, higher novelty seeking), they actually reported *fewer* depressive symptoms compared to never smokers. Relatedly, Pickett and colleagues (2008) have previously shown that the infants of pregnancy quitters have easier temperaments compared to infants of pregnancy smokers, and also compared to the infants of *never* smokers. This suggests that the capacity to suspend smoking during pregnancy may represent more than the absence of risk, but also the presence of adaptive and heritable maternal characteristics. However, it is important to emphasize that data were collected retrospectively—future studies using prospective measures of maternal personality and depressive symptoms could provide additional support for the presence of this “protective pathway.” If substantiated through future work, harnessing these positive maternal characteristics into brief prenatal interventions for smokers could powerfully advance the prenatal smoking cessation field.

4.5 Implications for etiologic research on the MSDP-child externalizing link

Differences found between pregnancy abstainers and never smokers also have implications for etiologic research. In the majority of studies of MSDP and child behavioral outcomes, the offspring of never smokers and pregnancy abstainers are typically grouped together in the “non-exposed” group (Ellingson et al. 2014, D'Onofrio et al. 2008, Kuja-Halkola et al. 2010, Skoglund et al. 2014). If pregnancy abstainers possess some of the heritable risks of pregnancy smokers (biological relatives with substance use disorders and novelty seeking), yet possess certain protective factors (resulting in fewer depressive symptoms) as suggested by our results, the effects of maternal characteristics associated with MSDP on offspring development may have been previously underestimated. Thus, the characterization of women who engage in different patterns of smoking (and other addictive substances) during pregnancy informs both efforts to intervene on pregnancy smoking, and investigations into the mechanisms of risk in exposed children.

4.6 Limitations

The retrospective nature of data and the cross-sectional study design are important methodologic limitations. While interview-based methods of retrospective report of smoking during pregnancy have shown comparable accuracy to prospective biomarker-confirmed data (Brigham et al. 2008, Lewis-Esquire et al. 2005), the ideal study would include assessments of personality prior to pregnancy, and prospective measurements of smoking utilizing a combination of interview-based and biological (cotinine) data (Dukic et al. 2007). Next, as the women in this study made adoption placements following the studied pregnancy, our results may not generalize to all pregnant women. Finally, important contextual factors have been identified as barriers to smoking cessation during pregnancy including social capital and stressful life events (Poland et al. 2006). While the focus of the current study was on personality characteristics, contextual factors are also important to address to help mothers and children achieve the best health outcomes.

4.7 Conclusions

MSDP may reflect differences in maternal self-directedness, harm avoidance and heritable risks associated with addiction. These factors are important for understanding pathways from MSDP to emotional and behavioral problems in children, and should be considered in the design of targeted prenatal smoking cessation interventions.

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Highlights

- Birth mothers in an adoption study reported on smoking patterns and personality.
- In lifetime smokers, harm avoidance directly related to smoking during pregnancy.
- Pregnancy abstainers had higher self-directedness than pregnancy smokers.
- Having a biological relative with addiction predicted cigarettes/day in pregnancy.
- Abstaining from smoking during pregnancy may reflect positive characteristics.

Table 1

Maternal characteristics by smoking patterns (N = 826)

	Ever smokers							
	Never smokers (<i>n</i> = 199)	Pregnancy abstainers (<i>n</i> = 277)	Pregnancy smokers		Never smokers vs. ever smokers	Never smokers vs. pregnancy abstainers	Pregnancy abstainers vs. pregnancy smokers	Pregnancy light smokers vs. pregnancy heavy smokers
			Pregnancy light smokers (<i>n</i> = 184)	Pregnancy heavy smokers (<i>n</i> = 166)				
	Mean (SD) or percentage				<i>p</i>			
Age, mean (SD)	25.1 (7.0)	24.2 (6.3)	23.9 (6.1)	25.3 (6.2)	.257	.197	.375	.043
Household income, in thousand	21.2 (31.7)	16.5 (19.4)	15.0 (11.5)	17.6 (18.2)	.162	.211	.758	.305
USD Educational attainment ^{<i>a</i>}	4.9 (3.3)	4.6 (2.9)	5.3 (3.2)	4.7 (3.0)	.837	.430	.252	.142
Non-Hispanic Caucasian	69.6%	73.7%	73.6%	75.9%	.216	.389	.773	.707
Nicotine dependence ^{<i>b</i>}	0 %	48.8%	56.8%	63.8%	< .001	< .001	.009	.222
First degree biological relative with substance use disorder ^{<i>b</i>}	44.7%	59.9%	72.3%	75.3%	< .001	.001	< .001	.545
Birth father substance dependence ^{<i>b</i>}	46.5%	61.0%	63.0%	71.1%	.035	.163	.487	.505
Antisocial behavior ^{<i>c</i>}	40.4 (3.4)	41.4 (4.1)	43.1 (6.9)	44.2 (7.9)	<.001	.013	< .001	.151
Depressive symptoms in pregnancy ^{<i>d</i>}	10.9 (9.7)	10.0 (8.8)	12.8 (10.2)	12.8 (10.8)	< .001	.028	< .001	.996
Average cigarettes/day in pregnancy	----	0.1 (1.8)	2.3 (2.5)	10.4 (7.3)	----	----	----	< .001
Novelty seeking ^{<i>e</i>}	9.5 (3.8)	10.4 (3.9)	10.5 (3.5)	11.0 (4.2)	< .001	.011	.438	.263
Harm avoidance ^{<i>e</i>}	9.1 (5.1)	8.9 (5.2)	9.4 (5.1)	10.0 (5.5)	.597	.665	.088	.339
Self-directedness ^{<i>e</i>}	17.9 (5.2)	17.4 (5.1)	17.1 (5.0)	16.1 (5.4)	.033	.288	.125	.097

^a 1 (< HS degree), 2 (GED), 3 (HS degree), 4 (Trade school), 5 (2 year college), 6 (4 year college), 7 (Graduate program).^b Modified Composite International Diagnostic Interview – Short Form^c Elliot Social Behavior Questionnaire^d Items from the Beck Depression Inventory assessed using the Pregnancy History Calendar to assist in recall^e Respective subscales from the Temperament and Character Inventory—Short Form

Table 2

Logistic regression model of self-directedness and abstinence from smoking during pregnancy among lifetime smokers^{*} (n = 627)

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for Exp(B)
Nicotine dependence ^a	−1.237	1.044	1.402	1	.236	.290	.037 – 2.249
First degree biological relative with substance use disorder ^a	−.250	.917	.074	1	.785	.779	.129 – 4.699
Birth father lifetime substance dependence ^a	1.299	1.183	1.205	1	.272	3.664	.360 – 37.252
Antisocial behavior ^b	.126	.077	2.651	1	.104	1.134	.975 – 1.320
Depressive symptoms in pregnancy ^c	.133	.051	6.695	1	.010	1.142	1.033 – 1.263
Self-directedness ^d	.322	.132	5.950	1	.015	1.380	1.065 – 1.787

^{*} Abstained from smoking during pregnancy = 2, smoked at any time during pregnancy = 1

^a Composite International Diagnostic Interview – Short Form

^b Elliot Social Behavior Questionnaire

^c Beck Depression Inventory

^d Temperament and Character Inventory—Short Form

Table 3

Logistic regression model of novelty seeking, harm avoidance, and abstinence from smoking during pregnancy among lifetime smokers^{*} (n = 627)

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for Exp(B)
Nicotine dependence ^a	-.051	.978	.003	1	.959	.951	.037 – 2.249
First degree biological relative with substance use disorder ^a	-.309	1.025	.091	1	.763	.735	.129 – 4.699
Birth father lifetime substance dependence ^a	1.639	1.209	1.836	1	.175	5.149	.360 – 37.252
Antisocial behavior ^b	-.114	.098	1.344	1	.246	.893	.975 – 1.320
Depressive symptoms in pregnancy ^c	.181	.070	6.745	1	.009	1.199	1.033 – 1.263
Novelty seeking ^d	.055	.130	.180	1	.671	1.057	1.9065 – 1.787
Harm avoidance ^d	-.339	.138	5.985	1	.014	.713	.543 – .935

* Abstinence from smoking during pregnancy = 2, smoked at any time during pregnancy = 1

^a Composite International Diagnostic Interview – Short Form

^b Elliot Social Behavior Questionnaire

^c Beck Depression Inventory

^d Temperament and Character Inventory—Short Form

Table 4

Linear regression model of self-directedness and average daily cigarette consumption during pregnancy among lifetime smokers (n = 627)

	B	SE	β	t	Sig.	95% C.I. for B
Nicotine dependence ^a	2.822	.939	.228	3.007	.003	.968 – 4.677
First degree biological relative with substance use disorder ^a	2.848	.977	.219	2.914	.004	.918 – 4.779
Birth father lifetime substance dependence ^a	1.038	.911	.082	1.139	.256	–.762 – 2.839
Antisocial behavior ^b	.160	.089	.143	1.806	.073	–.015 – .336
Depressive symptoms in pregnancy ^c	–.076	.058	–.118	–1.304	.194	–.190 – .039
Self-directedness ^d	–.230	.099	–.209	–2.322	.022	–.426 – –.034

^a Modified Composite International Diagnostic Interview – Short Form

^b Elliot Social Behavior Questionnaire

^c Beck Depression Inventory

^d Temperament and Character Inventory—Short Form

Table 5

Linear regression model of novelty seeking, harm avoidance, and average daily cigarette consumption during pregnancy among lifetime smokers (n = 627)

	B	SE	β	t	Sig.	95% C.I. for B
Nicotine dependence ^a	2.579	.939	.209	2.747	.007	.724 – 4.434
First degree biological relative with substance use disorders ^a	2.822	.986	.217	2.863	.005	.875 – 4.770
Birth father lifetime substance dependence ^a	.675	.914	.054	.739	.461	–1.130 – 2.481
Antisocial behavior ^b	.239	.092	.212	2.596	.010	.057 – .420
Depressive symptoms in pregnancy ^c	–.072	.056	–.113	–1.294	.198	–.183 – .038
Novelty seeking ^d	.039	.131	.024	.297	.767	–.220 – .297
Harm avoidance ^d	.254	.093	.222	2.728	.007	.070 – .437

^aModified Composite International Diagnostic Interview – Short Form

^bElliot Social Behavior Questionnaire

^cBeck Depression Inventory

^dTemperament and Character Inventory—Short Form