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Adolescent Intentions and Willingness to Smoke Cigarettes: Evaluation of a
Dual Process Model with Black, Latino, and White Youth

A dissertation submitted in partial satisfaction of the requirements
for the degree Doctor of Philosophy

in

Psychological Sciences

by

Anna E. Epperson

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2016

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This dissertation is dedicated to my wonderful father, Randall Epperson. Thank you for all your support, love, and patience to help me make this dream a reality.

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Abstract of the Dissertation

Objective: The aim of the current study was to test a modified dual-process model examining how willingness and intentions to smoke predicted initiation of cigarette smoking from early to mid-adolescence, and to assess if this model applied across gender and three racial/ethnic groups.

Methods: Data were from 4,073 adolescents (Grade 7; ages 12-13) in the Healthy Passages study, a longitudinal cohort study examining youth from urban areas of Alabama, California, and Texas. Participants completed a revised version of the Tanner scale, the Self-Perception Profile – Global Self-Worth scale, the Social Skills Rating System Self-Control Subscale, and questions regarding parental monitoring, perceived peer smoking, availability of cigarettes, and future smoking intentions and willingness; participants were assessed three years later (Grade 10, *M* age = 15.59) and reported on cigarette smoking initiation.

Results: Both intentions and willingness to smoke reported at Grade 7 predicted cigarette smoking initiation by Grade 10. Parent smoking, cigarette availability, and peer smoking were associated with smoking intentions and willingness and predicted initiation. Multiple group analyses by gender and race/ethnicity showed model differences by race/ethnicity, where both intentions and willingness were predictive of smoking initiation for only Black and male adolescents.

Conclusions: Intentions and willingness appear to play an important role in whether an adolescent will try cigarettes, but this does not apply universally across gender and race/ethnicity. These findings demonstrate the utility of dual-process models in examining influences on cigarette smoking initiation among diverse adolescent samples. Results from this study may have implications for interventions designed to prevent tobacco use, especially cigarette smoking, among diverse youth.

Adolescent intentions and willingness to smoke cigarettes: Evaluation of a dual process model with Black, Latino, and White Youth

Introduction

An estimated 40 million (~17%) adults in the U.S. were classified as current cigarette smokers in 2014 (Jamal et al., 2015). Most cigarette smoking begins during adolescence, with almost 90% of current adult smokers having already tried smoking by age 18 (USDHHS, 2012), and national data indicate that approximately 3% of middle (12-13 years old) and 9% of high school youth (14-18 years old) are classified as current cigarette smokers (Arrazola et al., 2015). Cigarette smoking continues to be the largest preventable cause of death and illness in the U.S., and is associated with numerous negative health outcomes, including respiratory problems, lung cancer, and cardiovascular disease (USDHHS, 2012). Despite significant declines in cigarette smoking over the last few decades, a clear understanding of factors associated with smoking during adolescence is still needed and key to reducing smoking prevalence and for preventing smoking initiation (USDHHS, 2012).

Numerous biological, psychological, and sociodemographic factors are associated with smoking during adolescence, including gender (Evans-Polce, Vasilenko, & Lanza, 2015), pubertal status (Walls & Whitbeck, 2011), race/ethnicity (Chen & Jacobson, 2012), self-control (Wills et al., 2013), self-esteem (Wills et al., 2007), parent smoking (Chuang, Ennett, Bauman, & Foshee, 2005), parental monitoring (Gerrard, Gibbons, Stock, Lune, & Cleveland, 2005), peer smoking (Guilamo-Ramos, Dittus, Holloway, Bouris, & Crossett, 2011), and availability of cigarettes (Stock et al., 2013). The current study examined all of these factors together in the context of a modified dual-process model, largely based on the Prototype-Willingness Model (PWM), to predict cigarette smoking. The PWM was examined because recent research has indicated that dual process theories may be more effective at predicting risk behavior among adolescents compared to other single-process health theories, such as the Health Belief Model (Becker, 1974; Rosenstock, 1974), Theory of Reasoned Action (Fishbein, 1979), and the Theory of Planned Behavior (Ajzen, 1991), and may be particularly effective for prediction of substance use during adolescence.

The PWM posits that two processes control health risk behavior: a reasoned or planned path (behavioral intention) and a reactive or unplanned path (behavioral willingness; Gerrard et al., 2005; Gibbons, Gerrard, Blanton, and Russell, 1998; Wills et al., 2013). The PWM specifically incorporates two new concepts: *willingness* to engage in a behavior and *risk images* based on perceptions of others who engage in the behavior (Gibbons et al., 1998). It has been found to be predictive across several adolescent health risk behaviors, including alcohol abuse (Dal Cin et al., 2009) and substance abuse (Gerrard et al., 2005). A meta-analysis found support for the PWM and models based on the PWM across 81 studies examining various health behaviors (Todd, Kothe, Mullan, & Monds, 2016).

Both intentions and willingness to smoke have been linked to adolescent cigarette smoking (Andrews et al., 2008; Gibbons et al., 1998; van den Eijnden et al., 2006). However, findings about which process is a stronger predictor of adolescent cigarette smoking have been mixed (Andrews et al., 2008; Gibbons et al., 1998; Hukkelberg &

Dykstra, 2009). Results from one longitudinal study indicated that although both childhood intentions and willingness to smoke predicted cigarette smoking seven years later in high school, intentions were the stronger predictor (Andrews et al., 2008). In contrast, other studies have found that willingness is more strongly associated with smoking compared to intentions (Gibbons et al., 1998) or that only willingness is predictive of smoking initiation (Hukkelberg & Dykstra, 2009). Previous research also indicates that biological (i.e., pubertal status), psychological (i.e., self-control), and environmental-level (i.e., parental monitoring and peer tobacco use) factors may influence adolescent tobacco-related cognitions and behaviors. Yet, thus far, only a small number of studies have been conducted examining these factors in the context of a dual-process model. Specifically, earlier pubertal development (Walls & Whitbeck, 2011), decreased self-control (Wills et al., 2013), and having friends who smoke cigarettes (Gerrard et al., 2005; Guilamo-Ramos et al., 2011) have all been found to be associated with increased smoking intentions, willingness, and future initiation. In addition, being closely monitored by a parent has also been found to be related to decreased willingness and initiation of smoking (Gerrard et al., 2005).

Even less is known about the usefulness and effectiveness of dual-process models, such as the PWM, across gender and racial/ethnic groups (Andrews et al., 2008; Wills et al., 2013). Only one study assessing gender differences for cigarette smoking initiation using a model based on the PWM could be located. Results indicated that the relationship between smoking intentions and initiation seven years later was stronger for females, but no differences between genders were present for smoking willingness (Andrews et al., 2008). To our knowledge no study has examined the ability of the PWM to predict cigarette smoking across racial/ethnic groups. Indeed only one study has collected data examining substance use (a composite variable of alcohol, drug use and smoking) from two diverse samples (Wills et al., 2013). However, sample differences were assessed using simple comparisons of estimates of association and no assessment of differences by race/ethnicity was made.

Prior research has been further limited by the use of mainly cross-sectional designs, with fewer studies having examined how factors during pre-adolescence predict smoking in later adolescence using longitudinal designs. Finally, despite research indicating a significant relationship of smoking initiation with pubertal status, self control, self-esteem, parental monitoring, parent smoking, and peer smoking, no study has examined all these potentially important factors jointly to examine their role in the tobacco-related intentions and willingness and smoking initiation. Examination of these factors and their associations with adolescent smoking within the context of a dual process health behavior theory has the potential to enhance prediction of smoking initiation and may further assist in prevention and cessation efforts.

Current Study

The aims of the current study were to (1) test a modified dual-process model based on previous research and the PWM, examining how intentions and willingness to smoke predict initiation of cigarette smoking, and (2) assess if this model applied across male and female, and non-Latino African American/Black (Black), Hispanic/Latino (Latino), and non-Latino White (White) adolescents. As depicted in Figure 1, we

hypothesized that (1) pubertal status, self-esteem, self-control, parental monitoring, parent and peer smoking, perceived availability of cigarettes, smoking intentions, and willingness to smoke measured at Grade 7 would predict initiation of cigarette smoking by Grade 10; (2) intentions to smoke cigarettes at Grade 7 would be a stronger predictor of cigarette smoking initiation by Grade 10 compared to willingness; (3) intentions and willingness to smoke would mediate the association between pubertal status, parent and peer smoking, and tobacco availability with initiation of cigarette smoking ; and (4) the relationships in Hypotheses 1-3 would differ among males and females and among Black, Latino, and White adolescents.

Methods

Data for this project came from the second and third waves of the Healthy Passages™ (HP) study, a longitudinal, multi-site study of health and health behaviors in youth (Windle et al., 2004; Schuster et al., 2012).

Participants

The sample includes youth initially recruited and enrolled during the first wave of data collection at 10-11 years old (*M* age 11.12 years old). Participants were recruited from public schools with ≥ 25 students in regular academic classrooms in metropolitan areas of Birmingham, Alabama, Los Angeles, California, and Houston, Texas. Schools and students were selected by using a two-stage probability sampling procedure where stratified sampling was used to ensure adequate sample sizes of the three largest racial/ethnic groups: Black, Latino, and White youth (Schuster et al., 2012). Of the 11,532 fifth-graders eligible for the study, 58% of parents agreed to be contacted and receive information about the study, and of these, 77% completed the assessment during the first wave ($N = 5,147$). The sample closely resembled the sampled population and all eligible students on basic demographic characteristics and sampling weights adjusted for any selection bias due to differential nonresponse. Overall exclusion criteria included not attending a regular academic classroom or having a caregiver (parent or legal guardian) who could not complete interviews in English or Spanish.

After two years, 4,773 families (93% retention) completed the second wave (T1 in this analysis) and of those families, 4,521 families (95% retention from Wave 2 to 3) completed the third (T2) wave five years later, corresponding to when participants were enrolled in the Grade 7 and 10. Of the 4,741 youth who provided information at T1, only those participants who identified as being members of one of the three major racial/ethnic groups, Black, Latino, and White, were included in the analysis ($n = 4,459$). Because the current study focuses on cigarette smoking initiation between T1 and T2, only participants who had never tried cigarette smoking by T1 (Grade 7) were analyzed resulting in the analysis sample ($n = 4,073$).

Procedure

Following standard procedures approved by the Institutional Review Boards at each of the three data collection sites and the Centers for Disease Control and Prevention, two trained interviewers completed the full HP™ assessment protocol with the adolescent and one parent/caregiver (biological mother, 87%, father, 6%; other, 6%) at their home or another agreed upon location. Informed consent was provided by the primary caregiver and the adolescent provided assent. The interviews were conducted using both computer-assisted personal and self-interview procedures with the adolescent and parent separated in private spaces (Windle et al. 2004). Both adolescent and parent were given a choice of completing the interviews in English or Spanish (prepared using standard back translation), with 82% of adolescents and 83% of parents completing the interview in English.

Measures

Pubertal status (T1) was measured using a revised version of the Tanner scale where adolescents were asked two gender specific questions referencing depictions of five pubertal physical development stages (Taylor et al., 2001). Each question has five depictions corresponding to five stages, where stage 1 indicates no pubertal development and stage 5 indicates full pubertal development. The two questions were combined for each adolescent to create an average score ranging from 1 to 5, where higher scores indicate more advanced pubertal development.

Self-esteem (T1) was measured using the Global Self-Worth subscale from the Self Perception Profile for Adolescents (SPPA-SW) consisting of six items answered by the adolescent (Harter, 2012). Items from the SPPA-SW asks the participants to identify which contrasting description fit them best (e.g., “Some teenagers like the kind of person they are, other teenagers often wish they were someone else”) and how true it was for them (“sort of true” or “really true”). Each item is scored from 1 to 4 and certain item scores are reversed, such that the total score for the SPPA-SW ranges from 6 to 24, with higher scores indicating more positive physical appearance satisfaction ($\alpha = .62$ in this sample).

Self-control (T1) was measured with seven items from the Social Skills Rating System Self-Control subscale (SRS - SC) reported by the parent (Gresham & Elliott, 1990; Gresham, Elliott, Cook, Vance, & Kettler, 2010). Items assessed how often (“never”, “sometimes”, or “very often”) the adolescent exhibited self-control in certain situations (e.g., “How often does your child control his or her temper when arguing with other children?”). The seven items were used as indicators of the latent construct “Self-control” ($\alpha = .81$; see Appendix).

Parental monitoring (T1) was measured using five questions from a previous study (Brown, Mounts, Lamborn, & Steinberg, 1993) where adolescents were asked to indicate on a four-point scale (1 = *do not know much*, 4 = *know a lot*) how much their parent knew about what they did with their free time (e.g., “How much do your parents know about where you are most afternoons after school?”) and who their friends were (e.g., “How much do your parents know about who your friends really are?”). The five items were used as indicators of the latent construct “Parental Monitoring” ($\alpha = .80$; see Appendix).

Parent tobacco use (T1) was measured with two questions posed to the parent, “During the past 12 months, how many cigarettes did you smoke per day?” (0=*none*; 7=*more than 30 per day*) and, “During the past 12 months, did you use chewing tobacco, snuff, or dip, or smoke cigars or a pipe? (1=*Yes*; 2=*No*). These were combined to create a dichotomized variable, where “None” [0] or “No” [2] on both questions was recoded as a “No” [0] and all other response combinations were coded as “Yes” [1].

Perceived peer smoking (T1) was measured with one question, “How many of your closest friends do you think have smoked cigarettes?” (1=*none*; 3=*many*). This was converted into a dichotomized score with 0=*no peer use* or 1=*peer use*.

Perceived cigarette availability (T1) was assessed with one question, “Has anyone ever offered you a cigarette?” (0 = *no* or 1 = *yes*).

Intentions to smoke (T1) were measured by asking “Do you think you will smoke cigarettes at any time during the next year?” with responses ranging from 0 = *no*,

1 = *maybe*, or 2 = *yes*. This was recoded into a dichotomized variable with 0 = *no* and 1 = *maybe/yes*.

Willingness to smoke (T1) was assessed with the question “If one of your closest friends offered you a cigarette, would you smoke it?”, with responses ranging from 0 = *no*, 1 = *maybe*, or 2 = *yes*. This was recoded into a dichotomized variable with 0 = *no* and 1 = *maybe/yes*.

Cigarette smoking initiation (T2) was measured with the question, “Have you ever tried cigarette smoking, even one or two puffs?” (0 = *no*; 1 = *yes*).

Control Variables (T0). Because education is considered a more stable indicator of socioeconomic status (SES) and best for use with members of racial/ethnic minority groups (Kaufman, Cooper, & McGee, 1997; Williams & Collins, 1995), highest level of education reported for either parent was classified into four categories ranging from less than high school graduation to completion of a college degree or higher. In addition, total household income was transformed as a percent of federal poverty level based on concurrent norms and only used for descriptive analyses. Both gender and race/ethnicity of the adolescent was based on the adolescent’s response. For race/ethnicity, adolescents were asked which of seven racial/ethnic categories described them, and were classified as Latino if indicated regardless of whether other categories had also been chosen.

Data Analysis

All analyses were conducted with design weights to account for differential probabilities of selection of students according to their school and a cluster variable to account for clustering of students within schools using IBM SPSS Statistics™ Complex Sampling module and *Mplus* version 7.4 (Muthén & Muthén, 2012). Weighting accounted for non-participation (by school, race/ethnicity, gender, and combinations thereof) initially and then for dropout, producing unbiased estimates among respondents if the characteristics used in the weights account for all nonresponse bias.

Descriptive statistics and tests for group differences (one-way ANOVA and chi-square tests) by gender and race/ethnicity were first conducted. To address the first research aim, a structural equation model (SEM) was tested (see Figure 1). Prior to testing the entire SEM, confirmatory factor analyses (CFA) were conducted to verify that all measured items would constitute the latent factors *self-control* (7 items) and *parental monitoring* (5 items; see Appendix). Because all items were categorical, models were estimated with weighted least squares means and variance adjusted (WLSMV) and theta parameterization. The overall SEM was tested with SES included as a covariate to obtain associations among all latent factors and the observed variables of intentions, willingness, and cigarette smoking initiation and to examine the direct and indirect effects. Mediation in this SEM was determined by the strength and significance of indirect versus direct effects (Cheong & MacKinnon, 2012). Model fit was assessed using the comparative fit index (CFI), Tucker-Lewis Index (TLI), and root mean square error of approximation (RMSEA) indexes. Based on work by Browne and Cudeck (1992) and Hu and Bentler (1999) we take RMSEA values of < .05 to indicate close fit, .05-.08 fair fit, and >.10 poor fit. Likewise for CFI and TLI, > .90 indicates good model fit, .80 -.90 acceptable fit, and <.80 as poor fit (Browne & Cudeck, 1992).

We started by testing measurement invariance (MI) for the measurement models

of the latent variables *self-control* and *parental monitoring* across gender and racial/ethnic groups, which are detailed in the appendix. A multiple group SEM was then conducted to address the specific aims and examine whether direct and indirect effects according to Figure 2 were equivalent across racial/ethnic groups and gender. Two models were tested and compared using fit indices: (1) an overall baseline model where associations between variables or factors were allowed to be freely estimated across groups and (2) a constrained model where associations were constrained in turn to be equal across gender and racial/ethnic groups. Model fit was assessed using the CFI, change in CFI (Δ CFI), Bayesian Information Criterion (BIC), and the Sample Size Adjusted Bayesian Information Criterion (SSABIC; Schwarz, 1978). For Δ CFI, values that are smaller than or equal to -0.01 indicate invariance of the current model compared to the previous model (as recommended by Cheung & Rensvold, 2002), and for the BIC and SSABIC, the model with the lowest comparative index is considered to be the best fitting model. Model fit assessment for the multigroup analysis using the chi-square difference test was not available because model estimation was conducted using data imputation procedures.

Multiple imputation, where 50 copies of the data set were created containing unique and plausible replacement scores that are averaged to produce estimates, was used to estimate missing values that were missing at random. One T1 predictor variable, pubertal status (5%), the T2 outcome variable, smoking initiation (9%), and one covariate, education (2%), had missing data and were imputed.

Results

Preliminary Analysis and Descriptive Findings

Descriptive information and correlations appear in Tables 1 and 2. More males (29.8%) had initiated cigarette smoking by Grade 10 compared to females (26.2%; $\chi^2 [1, n=3,709]=5.81, p < .05$), but there were no significant differences in intentions and willingness to smoke. On average, males had lower self-control scores ($t [1, 4069] = 2.01, p < .05$) and less mature pubertal development ($t [1, 3858] = 3.48, p < .05$) compared to females.

More Latino adolescents reported having intentions ($\chi^2 [4, n=4,073]=40.54, p < .05$) and being willing ($\chi^2 [4, n=4,073]=30.23, p < .05$) to smoke compared to Black and White adolescents. On average, Black adolescents had more advanced pubertal development compared to Latino and White adolescents ($F [2, 3857] = 46.63, p < .05$). White adolescents on average had higher levels of self-control ($F [2, 3, 4070] = 169.43, p < .05$) and reported higher levels of monitoring by their parents ($F [2, 4070] = 144.95, p < .05$) compared to Black and Latino adolescents. A higher percentage of Black and Latino adolescents reported that they believed their friends smoked ($\chi^2 [2, n=4,073]=69.71, p < .05$) and that cigarettes were available to them ($\chi^2 [2, n=4,073]=32.36, p < .05$) to them compared to White adolescents. A higher percentage of parents of Black adolescents (22.4%) reported smoking cigarettes compared to parents of Latino (12.1%) and White (16.2%) adolescents ($\chi^2 [2, n=4,073]=58.13, p < .05$). Finally, SES was significantly associated with intentions, willingness, and smoking initiation for the overall sample. Significantly more White adolescents had parents who had attained a four-year college degree and on average a higher household income compared to Black and Latino adolescents ($\chi^2 [6, n=4,073]=1754.08, p < .05; F [2, 3765] = 994.28, p < .05$, respectively).

Structural Model

Associations. CFA analyses revealed that all observed variables significantly loaded onto their respective latent factors *self-control* and *parental monitoring*, both for the overall sample and for the multiple group CFAs for race/ethnicity and gender (details are available from the author; see Appendix). The hypothesized model (Figure 2), with racial/ethnic groups and genders combined, was an adequate fit for the data: RMSEA=.05, CFI=.74, and TLI=.70. With all variables (including SES) in the overall model approximately 7% of the variance in cigarette smoking initiation was explained ($R^2 = .07$). Seventh grade smoking intentions and willingness to smoke significantly predicted cigarette smoking initiation by Grade 10 ($ps < .05$). Cigarette smoking initiation was also predicted by having parents that smoked, believing cigarettes to be available, having friends that smoked, and having a more mature pubertal development in Grade 7 ($ps < .05$). Increased parental monitoring was associated with both decreased smoking intentions and willingness to smoke in Grade 7, and higher self-esteem was associated with decreased willingness to smoke ($p < .05$). Finally, reporting that friends smoked and perceiving cigarettes to be available was associated with increased intentions and willingness to smoke ($ps < .05$).

Mediation. The hypothesized mediational model, where intentions and willingness to smoke mediated the association between pubertal status, parent and peer smoking, and tobacco availability with initiation of cigarette smoking, was partially supported. Intentions partially mediated the relationship between peer smoking and smoking initiation for the overall sample ($\beta = 0.01, p < .05$), females ($\beta = 0.02, p < .05$), and Latino ($\beta = 0.02, p < .05$) adolescents in the multiple group SEM, but not for male, Black, and White adolescents. Intentions also partially mediated the relationship between the perception that cigarettes were available and smoking initiation for the overall sample ($\beta = 0.02, p < .05$) and for Black ($\beta = 0.02, p < .05$) and Latino ($\beta = 0.01, p < .05$) adolescents in the multiple group SEM, but not for White adolescents. Willingness partially mediated the association between peer smoking and smoking initiation for the overall sample ($\beta = 0.01, p < .05$) and for males ($\beta = 0.01, p < .05$) in the multiple group SEM, but not for females.

Gender Differences. Although the multigroup model, testing for equivalence across gender, fit the data adequately (RMSEA = .05, CFI = .76, TLI = .75) and fit indices indicated invariance ($\Delta\text{CFI} = .01$; $\Delta\text{BIC} = -91.51$; $\Delta\text{SSABIC} = -12.06$), further examination of the path coefficients for females and males revealed some significant differences. As shown in Figure 3, intentions to smoke in the seventh-grade positively predicted smoking initiation for both males and females, but willingness to smoke only positively predicted smoking initiation for males. Having a more mature pubertal development was associated with increased smoking intentions and predicted smoking initiation for males, but not for females, and high self-control was associated with decreased smoking intentions for females, but not for males. Higher levels of parental monitoring were associated with fewer intentions and less willingness to smoke for males, but not for females. Higher levels of self-esteem were associated with decreased willingness to smoke for males only, and having friends who smoked was associated with smoking intentions for only females. The perception that cigarettes were available was associated with increased willingness to smoke for females, but not for males. Approximately 8% of the variance in cigarette smoking initiation was explained by variables for the male model ($R^2 = .08$), and 6% in the female model ($R^2 = .06$).

Racial/Ethnic Group Differences. Results from the multiple group SEM to assess differences by racial/ethnic group indicated poor fit for the multigroup model (RMSEA = .05, CFI = .65, TLI = .64), with fit indices indicating lack of invariance across groups ($\Delta\text{CFI} = .05$; $\Delta\text{BIC} = -208.40$; $\Delta\text{SSABIC} = -367.28$). As shown in Figure 4, intentions to smoke in Grade 7 predicted smoking initiation for Black and Latino adolescents, but not for White adolescents, and willingness to smoke only predicted smoking for Black adolescents. Having more pubertal development and friends who smoked predicted smoking initiation for Latino and White, but not Black adolescents.

Self-esteem was negatively associated with smoking intentions for Latino adolescents, and also negatively associated with willingness to smoke for Black adolescents. Increased self-control was associated with increased willingness to smoke for Latino adolescents, but not for Blacks or White adolescents. Having parents that smoked and believing cigarettes to be available were both associated with increased willingness to smoke for Black, but not Latino or White adolescents. Having friends who smoked was associated with increased willingness to smoke for Black and Latino

adolescents, but was associated with increased smoking intentions for Latino and White adolescents. Approximately 10% of the variance in cigarette smoking initiation was explained by variables in the model for White adolescents ($R^2 = .10$), which was reduced to 8% and 6% for the Latino and Black models, respectively (R^2 s = .08 and .06).

Discussion

Overall findings are first discussed followed by discussions focused on gender and racial/ethnic findings, respectively. Our examination of the modified dual-process model developed revealed that for the overall sample the dual pathways of smoking intention and willingness reported at the seventh-grade predicted cigarette smoking initiation by the tenth-grade. As hypothesized, findings also indicated that intentions were the stronger predictor of smoking initiation compared to willingness, which confirmed previous findings (Andrews et al., 2008). Parental, peer, and community factors were more influential on these smoking-related cognitions in the overall sample compared to biological and psychological factors. Contrary to expectations, for the most part, pubertal status, self-control and self-esteem were not associated with smoking intentions and willingness, which may reflect our use of single measures for these constructs (Wills, Pokhrel, Morehouse, & Fenster, 2011; Wills et al., 2013). Our study did find that smoking initiation was predicted by increased parental monitoring, having parents or friends that smoked, and the perception that cigarettes were available. Consistent with previous research (Andrews et al., 2008; Gerrard et al., 2005; Hukkelberg & Dykstra, 2009), these were also associated with intentions and willingness to smoke.

An important focus of this study was to examine gender and racial/ethnic differences in the proposed dual-process model of associations between smoking and smoking-related variables. Findings indicated that the model was not equivalent across racial/ethnic and gender groups. In fact, pathways of intentions and willingness were only predictive of cigarette smoking initiation three years later for male and Black adolescents. These findings are inconsistent with previous work by Andrews and colleagues (2008) where no gender differences among the associations of smoking intentions, willingness and initiation were found. Inconsistent gender findings may be due to differing study samples, as the prior study sample was racially/ethnically homogeneous (predominately White) and drawn from one region in the Northern U.S. Because no previous studies have examined racial/ethnic differences in a dual-process model of smoking initiation, our finding that these dual cognitions were predictive of smoking initiation among only Black adolescents is novel. This finding may reflect racial/ethnic differences in how health cognitions influence health behavior. For some groups, risk behaviors, like smoking cigarettes, may be initiated after plans are made to try that behavior, while for other groups these behaviors may be both planned and reactive given a motivating situation.

Gender differences in the associations between the biological, psychological and social variables with smoking cognitions and behaviors revealed a similar pattern to the findings for the overall sample. Only parent and peer factors were associated with smoking intentions, willingness and initiation. However, the exact associations did vary for males and females. For females, only peer smoking appeared to be associated with smoking intentions and willingness, but for males, parental monitoring emerged as more influential. This is partially supported by previous work that has found that peer smoking is associated with smoking willingness and initiation for females but not males (Andrews, et al., 2008; Mason et al., 2014), and that parental monitoring has a stronger association with substance use among male compared to female adolescents (Steinberg, Fletcher, &

Darling, 1994).

In contrast to the findings by gender, the same pattern did not emerge when comparing racial/ethnic groups. Both psychological (i.e., self-control and self-esteem) and social factors, including parental monitoring, parent and peer use, and cigarette availability, emerged as important correlates of smoking intentions, willingness and initiation, but as with gender, the specific relationships varied by race/ethnicity. Previous research has indicated that for Latino and White youth being more physically mature is a risk factor for cigarette smoking (Walls & Whitbeck, 2011), consistent with findings in this study. Our findings that both self-esteem and self-control were associated with smoking-related cognitions for Latino adolescents, but that only self-esteem was associated for Blacks is in line with prior work indicating that “self-attitudes” (i.e., self control and self-esteem) are in general less relevant for Black compared to White and Latino adolescents (Wills, 1994). Parental influence appeared to play a significant role for Latino adolescents in the current study, where consistent with the literature, parental monitoring was found to be important for Latinos (Mahabee-Gittens, Xiao, Gordon, & Khoury, 2012). As in previous research, our study found that for White adolescents, peer influence was strongly related to both smoking processes and initiation while parental smoking was important for Black adolescents (Headen et al., 1991).

This study is one of the first to examine the association of biological, psychological, and social factors with cigarette smoking intentions, willingness and initiation in a racially/ethnically diverse sample of adolescents using a prospective longitudinal design. The findings have implications for future dual-process theory and tobacco-related research as well as tobacco policy. That both the dual-process pathways of intentions and willingness predicted cigarette smoking initiation three years later, but only certain racial/ethnic and gender groups may call into question how we use health behavior theory to predict risk behaviors, such as smoking, among diverse youth. Our results underscore the need to examine whether national campaigns, especially those disseminated in schools, aimed at smoking prevention among youth are effective long term and whether they are addressing relevant risk factors for today’s increasingly diverse youth. The shift toward addressing cigarette smoking on a population level through smoke free laws and public bans has been effective, but has not completely eliminated this dangerous health behavior. It may be that general population level policies will not fully work and instead we may need to consider turning toward more group tailored approaches to enhance prevention of tobacco use. Future research should further examine the effectiveness of commonly used health behavior theories and related prevention approaches they engender, across time and different youth groups to further assess differences.

Among the limitations of this study are that data were drawn from a sample of youth in three specific urban regions of the U.S., which is not representative of the national adolescent population. Latinos in the current study were mainly recruited from two southern regions, representing a heritage mainly from Mexico, further limiting generalizability to the overall national Latino population. All measures were obtained by self-report, including cigarette smoking, and future studies may benefit from verifying cigarette smoking through biological measures (i.e., cotinine). A specific measure of smoker prototypes, which is often included in PWM research, was not available to us.

Previous research has indicated that prototypes are predictive of willingness to smoke (Gerrard et al., 2005) and exclusion in this study may potentially hinder overall predictability of initiation of cigarette smoking by the current model. Finally, only report of cigarette smoking initiation was included as the outcome. Other key tobacco-related outcomes, such as number of cigarettes smoked per day or time to smoke upon waking up in the morning, if included, could inform about becoming a current smoker.

In conclusion, our research has showed that, whereas both intentions and willingness appear to play important roles in whether an adolescent will try cigarettes, this does not apply universally across gender and race/ethnicity. Given that there is a growing body of research highlighting drastic differences in health risk behavior by racial/ethnic groups (Adler & Rehkopf, 2008; Barr, 2008; Fagan, Moolchan, Lawrence, Fernander, & Ponder, 2007; Leischow, Ranger-Moore, & Lawrence, 2000), that racial/ethnic minority groups will be the majority among youth by 2040 (Wallander et al., 2012), and that the societal costs of smoking are too high (Jamal et al., 2015), we need to ensure effective health behavior theory and subsequent efforts to curb this preventable behavior.

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Table 1
Sample Characteristics by Gender and Race/Ethnicity

Categorical Variables	Overall (<i>N</i> = 4,073)		Female	Male	Black	Latino	White
	Raw <i>n</i>	Wtd%	<i>n</i> = 2,072	<i>n</i> = 1,999	<i>n</i> = 1,477 36.3% Wtd %	<i>n</i> = 1,499 36.8% Wtd %	<i>n</i> = 1,097 23.9% Wtd %
Gender – Female	2,072	49.2	-	-	49.0	50.8	46.2
Highest education in household							
Less than high school graduate	741	23.6	24.9	22.3	9.4 ^a	43.9 ^b	1.8 ^c
High school graduate	803	21.6	22.4	20.8	29.1 ^a	24.2 ^a	7.3 ^b
Some college or 2 year degree	1098	25.5	25.0	25.9	37.2 ^a	22.0 ^b	17.6 ^c
Four year degree or higher	1376	29.4	27.7	31.0	24.4 ^a	9.9 ^b	73.2 ^c
Parental tobacco use (Grade 7)	682	16.2	16.4	15.9	22.4 ^a	12.1 ^b	16.2 ^b
Believe friends smoke (Grade 7)	1087	27.7	26.7	28.7	31.3 ^a	30.6 ^a	17.7 ^b
Cigarettes available (Grade 7)	452	11.7	11.4	12.0	13.1 ^a	13.5 ^a	6.6 ^b
Willingness to smoke (Grade 7)	159	4.5	4.7	3.5	3.2 ^a	5.8 ^b	2.0 ^a
Intentions to smoke (Grade 7)	183	4.1	4.8	4.3	4.8 ^a	5.8 ^a	1.8 ^b
Smoking initiation (Grade 10)	1036	28.1	26.2 ^a	29.8 ^b	28.5	27.8	28.0
Continuous Variables							
	<i>M</i> (<i>SD</i>)		<i>M</i> (<i>SE</i>)	<i>M</i> (<i>SE</i>)	<i>M</i> (<i>SE</i>)	<i>M</i> (<i>SE</i>)	<i>M</i> (<i>SE</i>)
Household income as a % of FPL	277.04 (298.25)		238.49 (17.75)	252.72 (19.84)	164.15 (10.09) ^a	149.14 (10.36) ^a	516.40 (24.60) ^b
Pubertal development	3.48 (0.93)		3.52 (0.03) ^a	3.43 (0.03) ^b	3.69 (0.03) ^a	3.40 (0.04) ^b	3.35 (0.04) ^c
Self-control	16.15 (2.63)		16.05 (0.11) ^a	15.95 (0.13) ^b	16.03 (0.09) ^a	15.32 (0.11) ^b	17.27 (0.14) ^c
Parental monitoring	17.55 (2.48)		17.75 (0.10) ^a	17.78 (0.11) ^b	17.35 (0.11) ^a	16.94 (0.10) ^b	18.60 (0.08) ^c

Note. % is calculated with weights to reflect sampling. Wtd = weighted; FPL = federal poverty level.

^{a,b,c} Different superscripts within gender and race/ethnicity subgroups for row variable indicates statistically significant difference between groups as per χ^2 tests (gender $p < .025$ and race/ethnicity $p < .017$ per Bonferroni correction) or ANOVA test ($p < .05$).

Table 2
Correlations of Study Variables

Variable	1	2	3	4	5	6	7	8	9	10
1. Gender	-									
2. SES ^a	0.02	-								
3. Pubertal Status ^b	-0.06*	-0.03*	-							
4. Self-control ^b	-0.03*	0.35*	-0.05*	-						
5. Parent Tobacco Use ^b	-0.02	-0.09*	0.02	-0.06*	-					
6. Parent Monitoring ^b	-0.12*	0.24*	-0.06*	0.19*	-0.04*	-				
7. Peer Smoking ^b	0.04*	-0.13*	0.11*	-0.11*	0.06*	-0.18*	-			
8. Cigarette Availability ^b	0.03	-0.11*	0.12*	-0.10*	0.05*	-0.13*	0.32*	-		
9. Smoking Intentions ^b	0.01	-0.07*	0.05*	-0.07*	0.05*	-0.13*	0.18*	0.19*	-	
10. Smoking Willingness ^b	-0.02	-0.05*	0.05*	-0.06*	0.02	-0.09*	0.15*	0.12*	0.34*	-
11. Smoking Initiation ^c	0.04*	-0.07*	0.11*	-0.10*	0.11*	-0.13*	0.17*	0.17*	0.16*	0.09*

Note. ^aSES= the highest level of education in household. ^b Variable measured at Grade 7. ^cVariable measured at Grade 10.

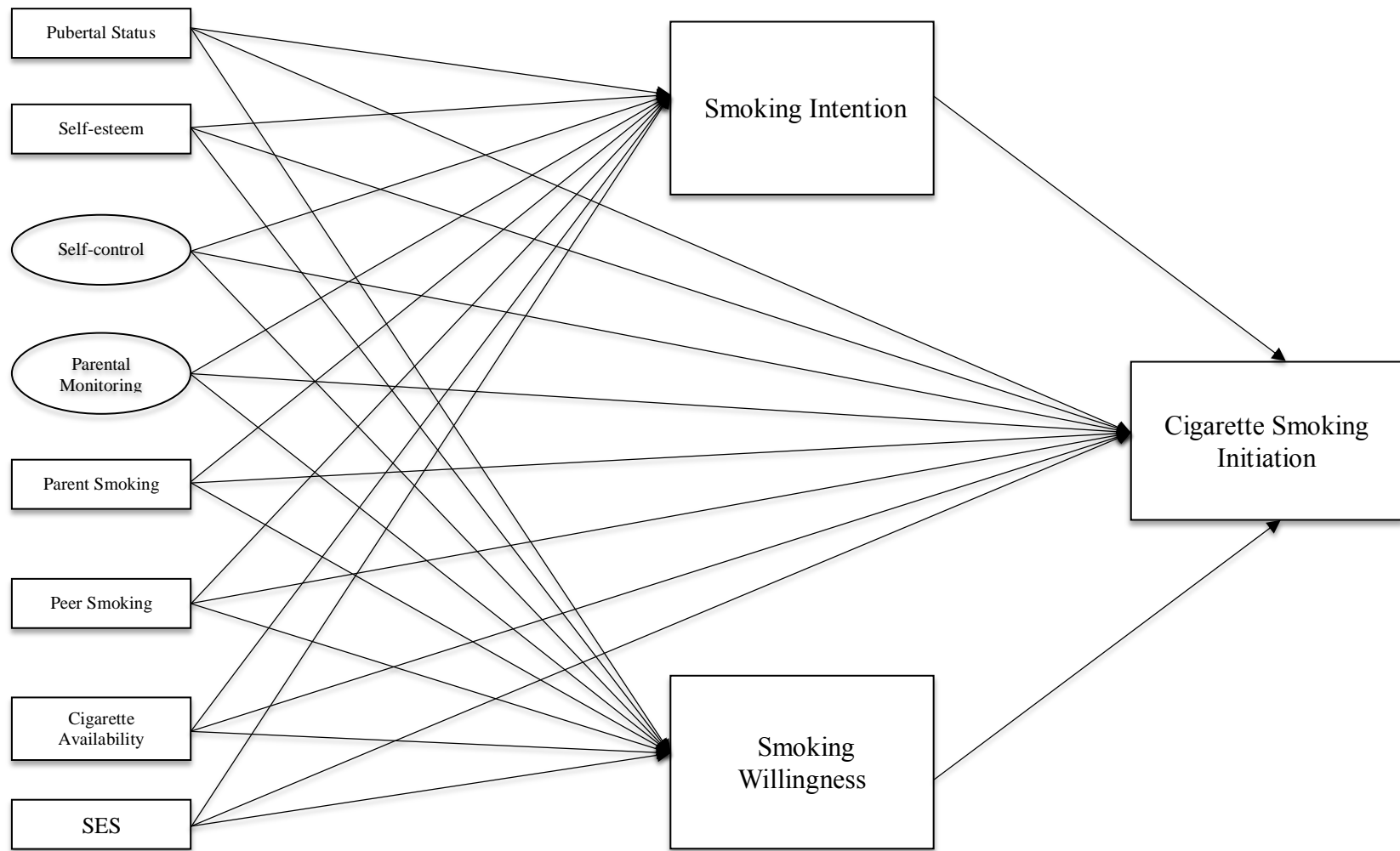


Figure 1. Hypothesized dual-process model to predict initiation of cigarette smoking. SES = Socioeconomic status (Parent education).

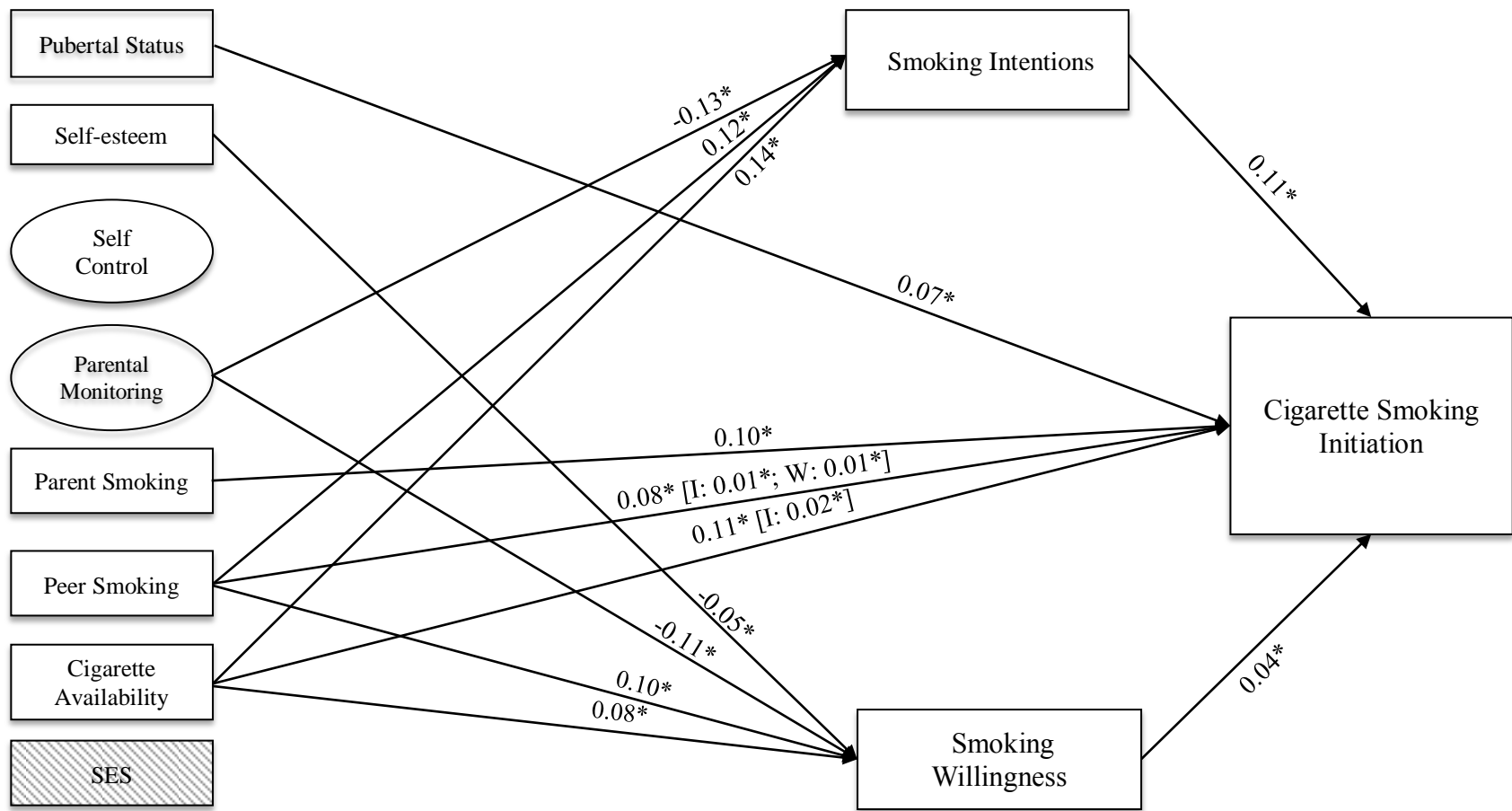


Figure 2. Overall dual-process model with significant paths to predict initiation of cigarette smoking (controlling for SES). SES = socioeconomic status (parent education); I = intentions; W = willingness. All variables except initiation were measured Grade 7. Brackets indicate indirect effects. $*p < .05$.

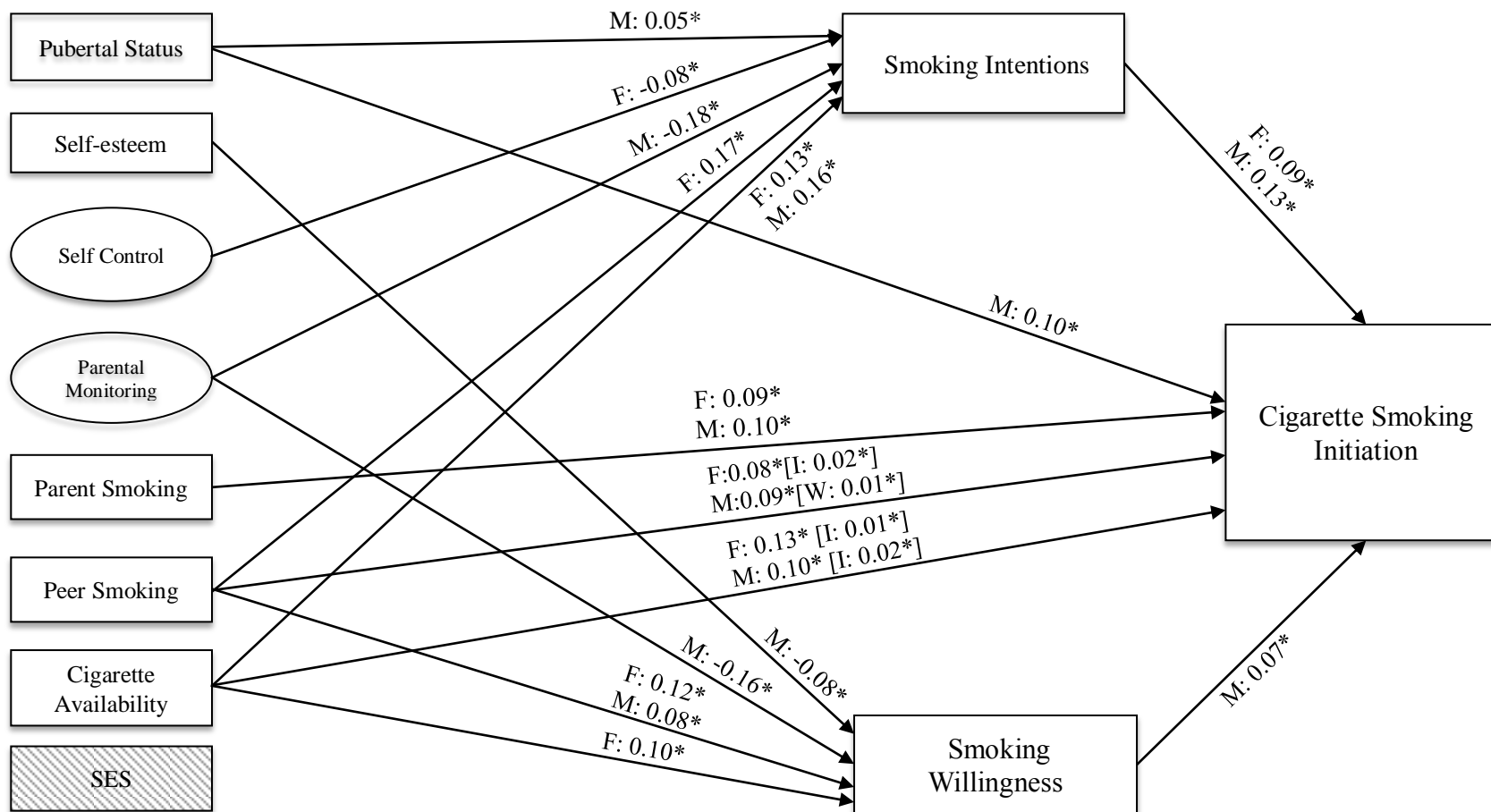


Figure 3. Dual-process model with significant paths to predict initiation of cigarette smoking across gender (controlling for SES). F=Female; I = intentions; M=Male; SES = socioeconomic status (parent education); W = willingness. All variables except initiation were measured Grade 7. Brackets indicate indirect effects. * $p < .05$.

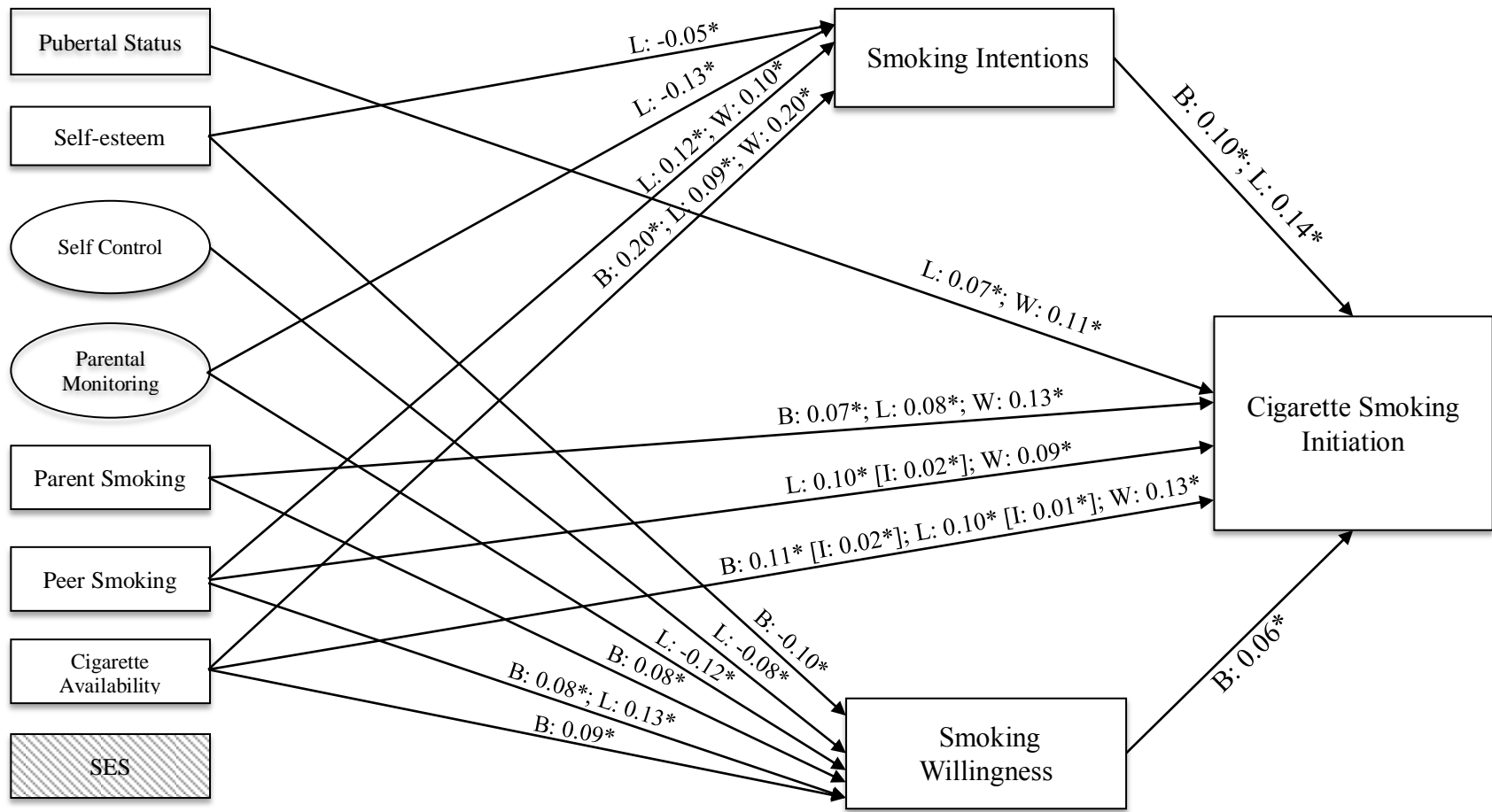


Figure 4. Dual-process model with significant paths to predict initiation of cigarette smoking across race/ethnicity (controlling for SES). B = Black; L = Latino; I = intentions; SES = socioeconomic status (parent education); W = White. All variables except initiation were measured Grade 7. Brackets indicate indirect effects. * $p < .05$.

Appendix Measurement Invariance Testing

Approach

To examine racial/ethnic and gender differences, measurement invariance tests for the measurement models of *self-control* and *parental monitoring* were conducted across the three racial/ethnic groups (Black, Hispanic, and White) and gender (female and male; see Appendix Table 1 for specific items). Invariances tests were conducted using multiple steps (Millsap & Olivera-Aguilar, 2012) as follows: (1) configural or baseline invariance model, where factor loadings were allowed to be freely estimated across each group; (2) metric invariance model, where factor loadings are held equal across groups, also referred to as weak factorial invariance; (3) scalar invariance model, where intercepts or thresholds are constrained to be equal across group, referred to as strong factorial invariance; (4) residual variances are constrained to be equal across groups, referred to as strict factorial invariance; (5) invariant factor variances, where factor variances are constrained to be equal across groups; and (6) equal factor means, where the factor means were constrained to be equal (Van de Schoot, Lugtig, & Hox, 2012). At each step in the process, model fit is tested using the chi-square difference test and Δ CFI as recommended by Cheung and Rensvold (2002) comparing the current step model to the previous step model. For the Δ CFI, values that are smaller than or equal to -0.01 indicate invariance of the current model (Cheung & Rensvold, 2002). For the chi-square difference test, if invariance is rejected (i.e., if the chi-square test is significant), then an attempt is made to locate the violation of invariance (loadings, intercepts or thresholds, residual invariances, or factor variance) using Lagrangian multipliers (modification indexes) to search for sources of model misfit (Apsarouhov & Muthén, 2009). If located, this parameter can be “freed” across the groups and the model retested for potential achievement of partial invariance (Millsap & Olivera-Aguilar, 2012). This process will ultimately uncover whether the model is invariant across groups (race/ethnicity and gender). Rejection of invariance (or lack of equivalence), however, may indicate that responses on measured and latent variables may (in part) be a reflection of membership in a particular group.

Results for Gender

All invariance testing results for gender are reported in Appendix Tables 2 and 3, indicating first that fit for the configural model (Step 1) was acceptable for both the factors *self-control* and *parental monitoring*. For the latent factor *self-control* full metric invariance, where all factor loadings are constrained to be equal across females and males, the χ^2 difference test indicated that invariance was rejected ($p < .05$), but the Δ CFI test indicated that invariance would not be rejected (Δ CFI = 0.01). Following the χ^2 difference test results, MIs for the model pointed to strong non-invariance for item 1 (*does your child respond appropriately when hit*) and item 6 (*does your child control temper in conflict situations*), indicating that content for these items varied for females and males. To achieve partial metric invariance and proceed with the invariance testing, loadings for these items were allowed freely to be estimated across the groups ($p > .05$). Both the χ^2 difference test and Δ CFI indicated that full scalar invariance, where the goal is to constrain all thresholds to be equal across groups, was

achieved. This indicates that the endorsement of all seven items were similar for males and females in the sample. For comparison of factor means, there appeared to not be a significant difference when comparing mean factor scores for females and males. Finally, for the overall factor variance, the χ^2 difference test and the Δ CFI test indicated that invariance of factor variance should be rejected, indicating that males had significantly less variance in the latent factor of self control compared to females.

For the latent factor *parental monitoring*, full metric invariance, where all factor loadings are constrained to be equal across females and males, the χ^2 difference test and the Δ CFI test indicated that invariance was achieved ($p > .05$; Δ CFI $< .01$). However, scalar invariance, both full and partial, was not achieved. All thresholds had to be freely estimated for model convergence. This can be taken to mean that the endorsement of all five items were not similar for females and males in the sample. Factor means were compared, and results indicated that compared to males, females appeared to have significantly higher mean factor score ($\Delta M = -0.23$, $p < .05$).

Results for Race/Ethnicity

All invariance testing results for race/ethnicity are reported in Appendix Tables 4 and 5, indicating first that fit for the configural model (Step 1) was acceptable for both the factors *self-control* and *parental monitoring*. For the latent factor *self-control* full metric invariance was rejected ($p < .05$; Δ CFI = .02). MIs for the model pointed to strong non-invariance for item 1 (*does your child respond appropriately when hit*) indicating that content varied across Black, Latino, and White adolescents. When the loading for this item was allowed to freely be estimated across the groups, partial metric invariance was achieved ($p > .05$; Δ CFI = .01). Both the χ^2 difference test and Δ CFI indicated that full scalar invariance was not achieved ($p < .05$; Δ CFI = .08), however, partial invariance was achieved when almost all except three item thresholds (for items 5 and 6) were allowed to be freely estimated across groups ($p > .05$; Δ CFI $< .01$). For comparison of factor means, results indicated that compared to Whites, Blacks and Latinos appeared to have significantly lower mean factor scores ($\Delta M = -0.38$, $p < .05$; $\Delta M = -0.53$, $p < .05$, respectively).

For the latent factor *parental monitoring*, full metric invariance was achieved ($p > .05$; Δ CFI $< .01$). However, scalar invariance, both full and partial, was not achieved, and all thresholds had to be freely estimated for model convergence. Finally, for comparison of factor means, results indicated that compared to Whites, Blacks and Latinos appeared to have significantly lower mean factor scores ($\Delta M = -0.65$, $p < .05$; $\Delta M = -1.11$, $p < .05$, respectively).

Conclusions

Measurement invariance testing indicated that the constructs of *self-control* and *parental monitoring* were not comparable across gender or race/ethnicity, suggesting that observed mean differences may not reflect true differences in self-control or perceived level of monitoring by parents. Measures that are equivalent across gender and racial/ethnic groups should be developed to ensure more precise measurement and assess true group differences.

Appendix References

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Appendix Table 1
Items on the Social Skills Rating System - Self-Control Subscale and Parental Monitoring Scale

Item	Description
SSRS – Self-Control Subscale	
S1	“How often does your child respond appropriately when hit or pushed by other children?”
S2	“How often does your child politely refuse unreasonable requests from others?”
S3	“How often does your child avoid situations that are likely to result in trouble?”
S4	“How often does your child control his or her temper when arguing with other children?”
S5	“How often does your child end disagreements calmly?”
S6	“How often does your child control temper in conflict situations with you?”
S7	“How often does your child respond appropriately to teasing from friends or relatives of his or her own age?”
Parental Monitoring Scale	
P1	“How much do your parents know about who your friends really are?”
P2	“How much do your parents know about where you are most afternoons after school?”
P3	“How much do your parents really know about how you spend your money?”
P4	“How much do your parents really know about where you go at night?”
P5	“How much do your parents really know about how you spend your free time?”

Appendix Table 2
Goodness of Fit Indexes for Measurement Invariance Testing of Social Skills Rating System - Self-control score Across Gender (Female and Male)

Models	Difference in Fit for Current vs. Previous Models				Fit Indices for Current Model			
	χ^2_{diff}	<i>fp</i>	df	<i>p</i>	RMSEA (90% CI)	TLI	CFI	$ \Delta CFI $
1. Configural model – all parameters freed	-	42	-	-	.07 (.06, .08)	.93	.96	-
2. Metric – all loadings constrained Model 2a vs. Model 1	19.83	35	7	.01	.05 (.04, .06)	.97	.97	.01
3. Partial Metric – some loadings constrained Model 2b vs. Model 1	8.17	37	5	.15	.05 (.05, .06)	.96	.97	.01
4. All thresholds constrained & loadings free Model 3 vs. Model 1	19.28	28	14	.15	.04 (.03, .05)	.98	.98	.02
5. Scalar - thresholds constrained & some loadings constrained Model 4 vs. Model 2b	28.02	23	19	.08	.04 (.03, .05)	.98	.98	.01
6. Full uniqueness – residual variances constrained Model 5 vs. Model 1	10.12	35	7	.18	.05 (.04, .06)	.97	.97	.01
7. Factor mean Model 6 vs. Model 1	18.96	30	12	.09	.05 (.05, .06)	.96	.96	0
8. Factor variance Model 7 vs. Model 1	35.96	24	18	.01	.05 (.04, .05)	.97	.97	.01

Note. Resid. = Residual; Var. = Variance; CFI = Comparative Fit Index; TLI = Tucker Lewis Index; RMSEA = Root Mean Squared Error of Approximation; CI = Confidence Interval; χ^2_{diff} = Chi-square difference test; df = degrees of freedom; fp = free parameters; ΔCFI = Change in Comparative Fit Index.

Appendix Table 3
Goodness of Fit Indexes for Measurement Invariance Testing of Parental Monitoring Across Gender (Female and Male)

Models	Difference in Fit for Current vs. Previous Models				Fit Indices for Current Model			
	χ^2_{diff}	<i>fp</i>	df	<i>p</i>	RMSEA (90% CI)	TLI	CFI	$ \Delta CFI $
1. Configural model – all parameters freed	-	40	-	-	.05 (.04, .07)	.96	.98	-
2. Metric – all loadings constrained Model 2a vs. Model 1	10.23	35	5	.07	.04 (.03, .05)	.98	.98	0
3. All thresholds constrained & loadings free Model 3 vs. Model 1	81.05	25	15	< .01	.05 (.04, .06)	.97	.97	.01
4. Scalar – all thresholds constrained & some loadings constrained Model 4a vs. Model 2b	73.56	20	15	< .01	.04 (.03, .05)	.98	.97	.01
5. Partial Scalar – some thresholds & some loadings constrained Model 4b vs. 2b					ERROR			
6. Full uniqueness – residual variances constrained Model 5 vs. 2b					ERROR			
7. Factor mean Model 6 vs. Model 1	26.34	27	13	.02	.04 (.03, .05)	.98	.98	0
8. Factor variance Model 7 vs. Model 1					ERROR			

Note. Resid. = Residual; Var. = Variance; CFI = Comparative Fit Index; TLI = Tucker Lewis Index; RMSEA = Root Mean Squared Error of Approximation; CI = Confidence Interval; χ^2_{diff} = Chi-square difference test; df = degrees of freedom; fp = free parameters; ΔCFI = Change in Comparative Fit Index.

Appendix Table 4
Goodness of Fit Indexes for Measurement Invariance Testing of Social Skills Rating System - Self-control score Across Race/ethnicity (Black, Latino, and White)

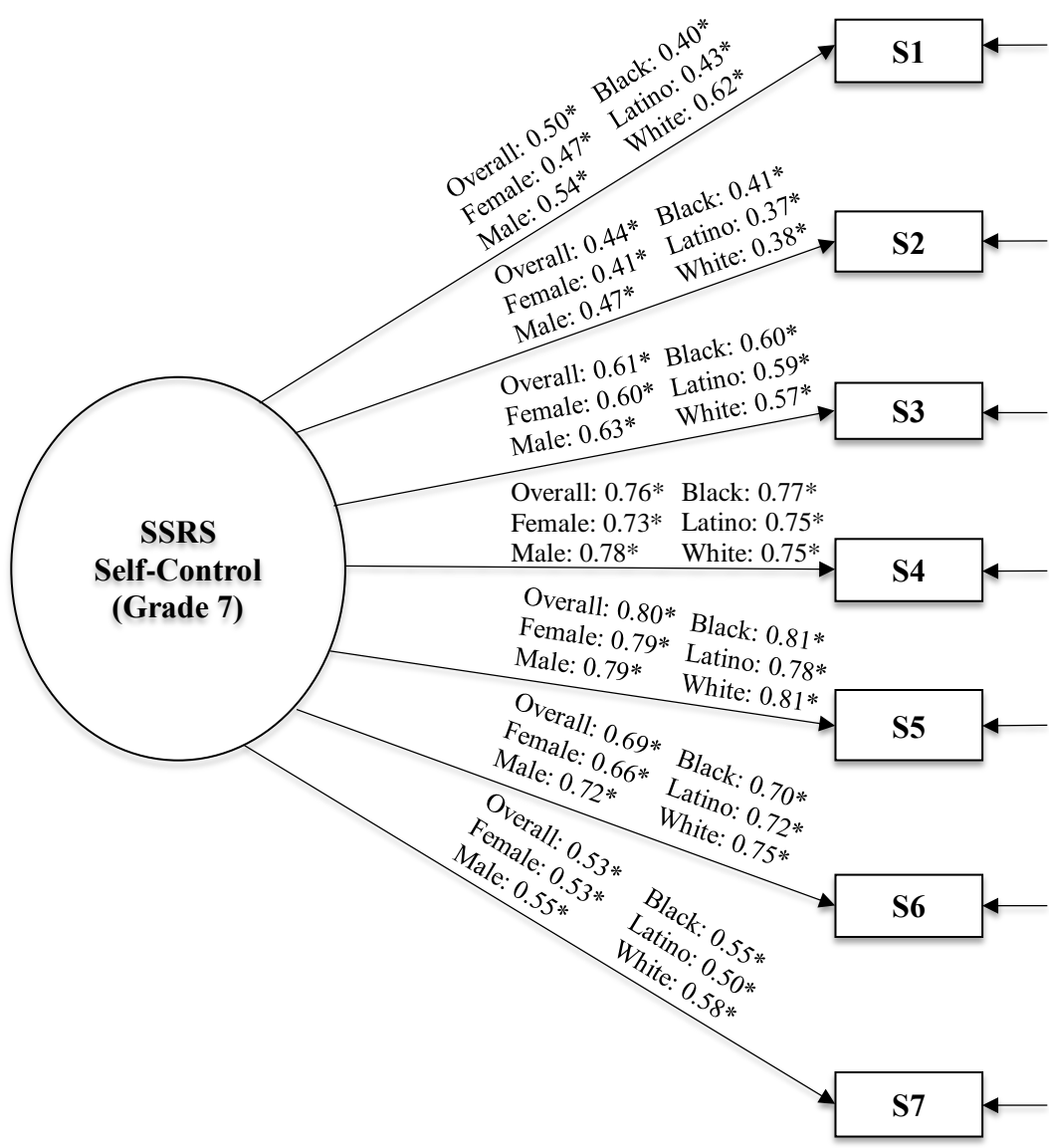
Models	Difference in Fit for Current vs. Previous Models				Fit Indices for Current Model			
	χ^2_{diff}	<i>fp</i>	df	<i>p</i>	RMSEA (90% CI)	TLI	CFI	$ \Delta CFI $
1. Configural model – all parameters freed	-	63	-	-	.06 (.06, .08)	.94	.96	-
2. Metric – all loadings constrained Model 2a vs. Model 1	162.39	48	15	< .01	.07 (.06, .08)	.93	.94	.02
3. Partial Metric – some loadings constrained Model 2b vs. Model 1	11.59	51	12	.48	.05 (.04, .05)	.97	.97	.01
4. All thresholds constrained & loadings free Model 3 vs. Model 1	478.62	21	42	< .01	.08 (.07, .08)	.92	.89	.07
5. Scalar – all thresholds constrained & some loadings constrained Model 4a vs. Model 2b	488.17	23	40	< .01	.08 (.07, .08)	.92	.89	.08
6. Partial Scalar – some thresholds & some loadings constrained Model 4b vs. 2b	22.90	48	15	.09	.05 (.04, .05)	.97	.97	0
7. Full uniqueness – residual variances constrained Model 5 vs. 2b					ERROR			
8. Factor mean Model 6 vs. Model 1	323.47	39	24	< .01	.08 (.07, .08)	.92	.91	.05
9. Factor variance Model 7 vs. Model 1	22.67	49	14	.07	.05 (.04, .05)	.97	.97	.01

Note. Resid. = Residual; Var. = Variance; CFI = Comparative Fit Index; TLI = Tucker Lewis Index; RMSEA = Root Mean Squared Error of Approximation; CI = Confidence Interval; χ^2_{diff} = Chi-square difference test; df = degrees of freedom; fp = free parameters; ΔCFI = Change in Comparative Fit Index.

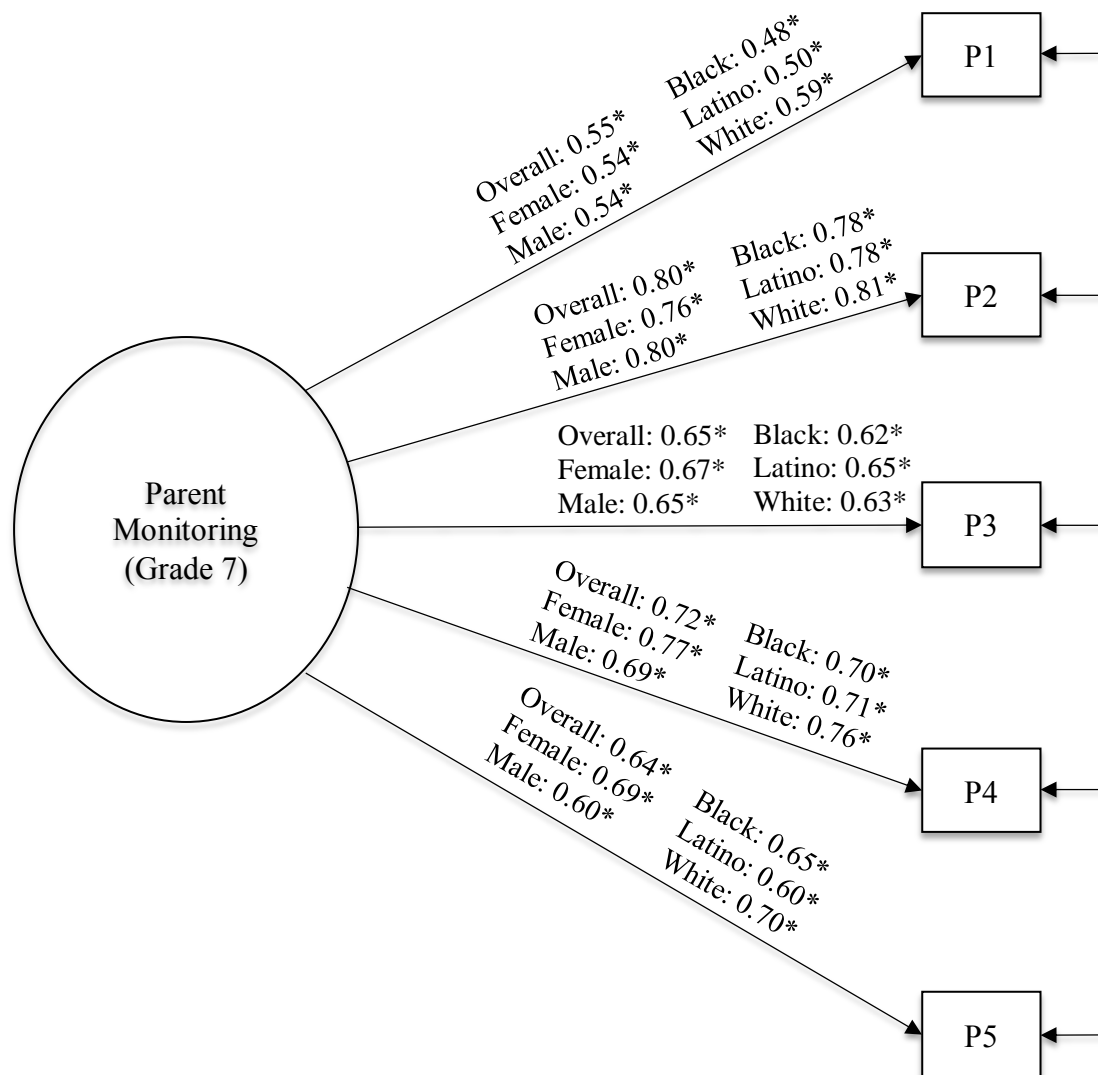
Appendix Table 5
Goodness of Fit Indexes for Measurement Invariance Testing of Parental Monitoring Across Race/ethnicity (Black, Latino, and White)

Models	Difference in Fit for Current vs. Previous Models				Fit Indices for Current Model			
	χ^2_{diff}	<i>fp</i>	df	<i>p</i>	RMSEA (90% CI)	TLI	CFI	$ \Delta CFI $
1. Configural model – all parameters freed	-	60	-	-	.05 (.04, .07)	.96	.98	-
2. Metric – all loadings constrained Model 2a vs. Model 1	15.65	50	10	.11	.04 (.03, .05)	.98	.98	0
3. All thresholds constrained & loadings free Model 3 vs. Model 1	636.00	30	30	< .01	.11 (.10, .11)	.85	.78	.20
4. Scalar – all thresholds constrained & some loadings constrained Model 4a vs. Model 2b	477.67	20	40	< .01	.08 (.08, .09)	.91	.83	.15
5. Partial Scalar – some thresholds & some loadings constrained Model 4b vs. 2b					ERROR			
6. Full uniqueness – only residual variances constrained Model 5 vs. 2b	2.44	55	5	.79	.04 (.02, .05)	.98	.98	0
7. Factor mean Model 6 vs. Model 1	103.05	34	26	< .01	.05 (.04, .06)	.97	.96	.02
8. Factor variance Model 7 vs. Model 1					ERROR			

Note. Resid. = Residual; Var. = Variance; CFI = Comparative Fit Index; TLI = Tucker Lewis Index; RMSEA = Root Mean Squared Error of Approximation; CI = Confidence Interval; χ^2_{diff} = Chi-square difference test; df = degrees of freedom; fp = free parameters; ΔCFI = Change in Comparative Fit Index.



Appendix Figure 1. Confirmatory Factor Analysis for Social Skills Rating System Self-Control (SSRS) Self-Control by Gender and Race/Ethnicity.
* $p < .05$.



Appendix Figure 2. Confirmatory Factor Analysis for Parental Monitoring by Gender and Race/Ethnicity
 * $p < .05$.