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EMPIRICAL RESEARCH

Linking Family Economic Pressure and Supportive Parenting to Adolescent Health Behaviors: Two Developmental Pathways Leading to Health Promoting and Health Risk Behaviors

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Abstract Adolescent health behaviors, especially health risk behaviors, have previously been linked to distal (i.e., family economic pressure) and proximal (i.e., parental support) contributors. However, few studies have examined both types of contributors along with considering health promoting and health risk behaviors separately. The present study investigated the influences of family economic hardship, supportive parenting as conceptualized by self-determination theory, and individual psychosocial and behavioral characteristics (i.e., mastery and delinquency, respectively) on adolescents' health promoting and health risk behaviors. We used structural equation modeling to analyze longitudinal data from a sample of Caucasian adolescent children and their mothers and fathers (N = 407, 54 % female) to examine direct and indirect effects, as well as gender symmetry and asymmetry. Findings suggest that family economic pressure contributed to adolescent mastery and delinquency through supportive parenting. Further, supportive parenting indirectly affected adolescent health risk behaviors only through delinquency, whereas supportive parenting indirectly influenced health promoting behaviors only through mastery, suggesting different developmental pathways for adolescent health risk and health promoting behaviors. Testing for gender symmetry of the full model showed that maternal and paternal parenting contributed to females' health risk behaviors directly, while maternal and paternal parenting contributed to males' health risk behaviors through delinquency. Gender symmetry was largely unsupported. The study highlights key direct and indirect pathways to adolescent health risk and health promoting behaviors within a family stress model and self-determination theory framework, and also highlights important gender differences in these developmental pathways.

Keywords Adolescent health behaviors · Supportive parenting · Family stress model · Mastery · Delinquency · Gender symmetry

Introduction

Health behaviors developing in adolescence have been consistently linked to the same behaviors in later life (i.e., smoking, alcohol consumption) (Latendresse et al. 2008; Paavola et al. 2004), suggesting that the behaviors learned in adolescence set a precedence for health habits that extend throughout the life course (Lohaus et al. 2009; Maggs et al. 1997). In understanding the processes by which health behaviors are acquired, extant research has shown several factors to be consistently linked to adolescent health behaviors; distal factors, like family socioeconomic characteristics (Hanson and Chen 2007), as well as proximal factors, such as parenting (Lohaus et al. 2009; Wickrama et al. 1997), delinquency (McLeod et al. 2012), and mastery (Backman et al. 2002), have been linked to adolescent health behaviors. However, the direct and indirect processes of these relevant factors have not been adequately examined within the same analytical framework. Drawing from the family stress model (Conger and Elder Jr. 1994), the present study tested a comprehensive model that incorporates the influences of the

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aforementioned distal (i.e., economic stress) and proximal (i.e., parenting, mastery, delinquency) factors on adolescent health behaviors.

Health Behaviors in Adolescence

Adolescence is an important period to examine health behaviors, as the behaviors developed in adolescence are likely to be maintained throughout the life course. Adolescent health behaviors are health risk or health promotion oriented (Lohaus et al. 2009; Umberson et al. 2010). Health promoting behaviors are those that promote one's health such as healthy eating habits and regular physical activity, whereas health-risk behaviors are those that undermine one's health, such as smoking, drug use, and risky sexual behaviors (Umberson et al. 2010). However, health promoting behaviors are not the opposite or absence of health risk behaviors; we contend that those are two different behavioral constructs. Thus, it would be optimal to examine both health risk and health promoting behaviors to wholly understand the development of health behaviors in adolescence.

While extant research has identified specific distal and proximal factors that influence the development of health behaviors in adolescence (Umberson et al. 2010; Viner et al. 2012), there is a need for theoretical application and empirical evidence clarifying through what mechanisms these social factors systemically impact health behaviors (Dmitrieva 2013). For example, both low socioeconomic status (Hanson and Chen 2007; Melotti et al. 2011) and lower levels of parental monitoring (Borawski et al. 2003) have been linked to maladaptive health behaviors in adolescence (i.e., increased tobacco use, early onset of alcohol use); however, it is unclear through which mediating pathways this association may unfold (Dmitrieva 2013). According to the family stress model, a low socioeconomic status (i.e., socioeconomic disadvantage) may foster increased feelings of economic pressure, which would disrupt any supportive parenting behaviors (i.e., involved parenting) that could have prevented the development of maladaptive health behaviors (Conger et al. 1992). Further, the family stress model asserts that the impact of family relationships (i.e., parenting) and economic stress may be particularly salient in adolescence (Conger et al. 2000).

Supportive Parenting and Adolescent Health Behaviors

Parenting, specifically, parental monitoring, parental warmth, and parental autonomy support, has been consistently linked to a variety of health behaviors in the literature (i.e., alcohol use) (Ryan et al. 2010), have been examined in the literature. Framing parenting as domain specific (Grusec and Davidov 2010) provides that different parenting dimensions may influence health behaviors through differing mechanisms. That is, parental monitoring, autonomy support, and warmth may all be linked to adolescent health behaviors, but the specific mechanisms by which they operate may differ, and as such it is pertinent to consider all three dimensions. For example, parental monitoring behaviors, which have been linked to healthy eating behaviors, lower rates of alcohol use, and lower rates of smoking in adolescence (Borawski et al. 2003; Graves et al. 2005; Li et al. 2000; Peters et al. 2009; Ryan et al. 2010), are characterized by enforced and appropriate parental rules and an awareness of adolescents' day to day activities. Such behaviors may guard against potential exposure to deviant peer association and may prevent risky unsupervised interactions that could lead to health risk behaviors (i.e., smoking) (Borawski et al. 2003; Windle et al. 2008).

Parental warmth, which is characterized by how loving, nurturing, and affectionate the parent is, has been linked to adolescent health risk behaviors, such as lower rates of alcohol use (Mogro-Wilson 2007) and a delayed onset of drinking (Ryan et al. 2010), as well as fewer physical health complaints in adolescence (Wickrama et al. 1997). Parental warmth may act as a buffer against psychological or emotional stressors (i.e., depressive symptoms; Ge et al. 1994) that could, in turn, influence the adolescent to engage in health risk behaviors. Parental autonomy support, which is conceptualized as support, encouragement, and acceptance in adolescence (Ryan et al. 2010), has been associated with lower rates of alcohol use and a lower probability of initiating sexual intercourse (Latendresse et al. 2008; Mogro-Wilson 2007; Turner et al. 1993). Parental autonomy support also promotes adolescent mastery (Finkenauer et al. 2005), which may, in turn, promote the adolescents' individual ability to disengage in health risk behaviors and/or engage in health promoting behaviors. Clearly, parental monitoring, autonomy support, and warmth represent key parenting dimensions that are salient to health behaviors in adolescence, though the mechanisms by which they influence health behaviors may differ.

Importantly, the aforementioned parental dimensions (autonomy support, warmth, monitoring) are key characteristics of an authoritative parenting style (Lohaus et al. 2009), which has been linked to higher rates of health promoting behaviors (i.e., better nutrition, exercise, hygiene) and to lower rates of health risk behaviors (i.e., smoking, drinking) (Lohaus et al. 2009; Pearson et al. 2009). These similarities across the literature suggest that both the specific dimensions of parenting as well as an underlying style of parenting are involved the development of health behaviors in adolescence.

Studies have thus far examined these parenting dimensions either in isolation as they relate to a single health behavior (e.g., only alcohol use; Mogro-Wilson 2007), or

have assessed parenting more holistically (i.e., style; Lohaus et al. 2009; Pearson et al. 2009). This study examined these three dimensions of parenting behaviors as an underlying higher level factor reflective of supportive parenting. We hypothesized that supportive parenting would positively influence health promoting behaviors while negatively influencing health risk behaviors.

Mastery and Delinquency as Important Mediators of Parenting

The impact of parenting on adolescent health behaviors may operate through specific individual psychosocial and behavioral mechanisms. According to the family stress model, supportive parenting that is disrupted by economic pressures (i.e., ineffective parenting) negatively affects adolescent adjustment, such as mastery (Conger et al. 2000). Mastery is the personal control that an individual can exert to engage in appropriate behaviors that would lead to desirable outcomes, as well as inhibit socially less accepted behaviors that lead to undesirable outcomes (i.e., self-regulation). For example, an adolescent with high mastery may be better equipped to steer away from substance use, particularly if the adolescent's individual development is embedded within a supportive familial environment. Theoretically, mastery represents an important psychosocial mediator that is both influenced by parental behaviors and predictive of individual health behaviors.

Empirically, the salience of mastery in adolescence has been documented in prior literature. Whitbeck et al. (1997) examined adolescent mastery in relation to family economic strain and parenting behaviors, and found increased economic strain associated with decreased parental structure (e.g., using reasoning and rationales in discipline), which, in turn, associated with decreased adolescent mastery. Further, Finkenauer et al. (2005) found adolescent mastery to be both positively predicted by parental acceptance and to act as a mediator for the influence of parenting behaviors on adolescent adjustment outcomes (i.e., depression, self-esteem). Mastery itself has been shown to positively influence health behaviors, such as good nutrition and lower rates of smoking in adolescence (Backman et al. 2002; Carvajal et al. 2000); this suggests that adolescents with high mastery show the ability to engage in health promoting behaviors and to avoid health risk behaviors. Thus, we expected supportive parenting to indirectly buffer against health risk behaviors and foster health promoting behaviors through adolescent mastery.

Similarly, a lack of regulation, or the consequence of disrupted parenting, can result in a general lack of control or a lack of competence that can manifest as delinquency (Baumeister and Heatherton 1996; Krueger et al. 1996). Delinquency is an indicator of behavioral maladjustment that has been consistently predicted by parental support and monitoring (Hoeve et al. 2009), which is in accordance with the family stress model. The relationship between delinquency and health behaviors, and more specifically substance use behaviors, is more complex.

The strong association between delinquency and substance use behaviors is established (i.e., Elliott et al. 1989; McLeod et al. 2012; Wickrama and Wickrama 2010), but this relationship is not a unidirectional causal link. While studies have shown increases over time in adolescent delinquency significantly predicted substance use behaviors in adulthood (Mason et al. 2010), another study specific to the adolescent period (Mason and Windle 2002) showed delinquency and substance use to have a reciprocal or reinforcing relationship over 2 years. It is important to note that the latter study found the influence of delinquency on substance use to be relatively consistent over time (i.e., small and significant influences across all time points), whereas the influence of substance use on delinquency was specifically influential at the initial time point (Mason and Windle 2002). Further, delinquency peaks in mid-adolescence (Farrington 1986), whereas substance use behaviors increase over adolescence and early adulthood (Tucker et al. 2005). Thus, it appears that while delinquency and substance related health risk behaviors are interrelated, the influence of delinquency on substance use behaviors may be more salient in mid-adolescence. While we do not deny the potential reciprocity between delinquency and substance use, the aim of the current study was to understand the mechanism underlying the development of adolescent health risk behaviors. Therefore, we hypothesized that increased delinquency would associate with increased health risk behaviors. We also expected delinquency to mediate the influence of supportive parenting on health risk behaviors.

The Influence of Family Economic Pressure

Following the family stress model, increased stresses from economic pressure can indirectly impact adolescent health behaviors via ineffective parenting. Extant research has shown that increased economic pressure has been linked to decreased supportive parenting (i.e., low supportive parenting, ineffective communication, low involvement) (Conger and Elder Jr. 1994; Conger et al. 1994; Lee et al. 2011, 2013). Further, such disturbances in supportive parental behaviors have been linked to health risk behaviors (e.g., smoking, drinking) (Lohaus et al. 2009). Further, disruptions of supportive parenting likely disrupt any positive subsequent mechanisms of influences on adolescent outcomes; for example, adolescents who perceived their parents to be less accepting and less autonomy

supportive reported decreased mastery and increased delinquency, though this association was cross-sectional (Finkenauer et al. 2005). Thus, the current study hypothesized that increased family economic pressure would associate with decreased supportive parenting, which, in turn, would negatively impact adolescent health behaviors.

Economic pressure can also have a direct negative impact on adolescent adjustment. Hard economic conditions influence individual well-being by increasing the strains or stresses experienced in daily living through reduced economic resources (i.e., inability to purchase necessary goods, having to make significant cutbacks) (Conger et al. 2002). For example, Hanson and Chen (2007) noted that a low socioeconomic status (i.e., lack of economic resources) was linked to poor diets, less exercise, and more cigarette smoking in adolescents, emphasizing the impact of economic pressure on individual health behaviors. Thus, we hypothesized that increased family economic pressure would also directly decrease adolescent health promoting and increase adolescent health risk behaviors.

Gender Comparisons in the Development of Health Behaviors

Several factors provide rationales for examining differences in gender in the associations between supportive parenting and adolescent health behaviors. Firstly, research indicates that males engage in more delinquent behaviors than females (Griffin et al. 2000; Mason and Windle 2002), though the contextual risk factors for delinquency (i.e., SES, poor parenting) influence both genders (Simourd and Andrews 1994). Further, extant research notes gender differences in the link between parenting and adolescent health behaviors (Windle et al. 2010). These gender differences have been noted both by the gender of the parent, as well as the gender of the focal adolescent. For example, fathers' autonomy support was associated with lower adolescent drinking, but mothers' autonomy support was not similarly related to adolescent drinking (Ryan et al. 2010). For adolescent gender differences, Borawski et al. (2003) found that high parental monitoring was linked to lower alcohol use for males, but not for females. Finally, Wickrama et al. (1999) found support for gender symmetric transmission of health risk behaviors such that mothers' health risk behaviors transmitted to daughters only, while fathers' health risk behaviors transmitted to sons only. Thus, in this study, we considered gender differences by gender of the parent, gender of the adolescent, as well as gender symmetric associations. Specifically, we hypothesized that direct gender symmetric associations would be significant; that is, mother's supportive parenting would foster daughter's adolescent health behaviors only, whereas, father's supportive parenting would foster son's adolescent health behaviors only.

Current Study

Adolescence is a key life stage in which health behaviors develop and establish; as such, understanding the processes by which social factors influence these health behaviors is pertinent. Previous research has identified supportive parenting and economic pressure as relevant proximal and distal factors, respectively. However, it is still unclear how these social factors together influence adolescent health behaviors. Drawing from the family stress model, the present study sought to identify the direct and indirect processes of these relevant factors within a single analytical framework (Fig. 1). Specifically, we used structural equation modeling (SEM) to analyze a longitudinal sample of parents and their adolescents ($N = 407$).

Following the family stress model and extant research highlighting the beneficial influence of supportive parenting, we made several hypotheses. We hypothesized that supportive parenting, as conceptualized as monitoring, warmth, and autonomy support, would positively associate with health promoting behaviors and negatively influence health risk behaviors. Further, we hypothesized that adolescent mastery and delinquency would operate as individual psychosocial and behavioral mediators of the influence of supportive parenting on adolescent health behaviors such that mastery would promote health promoting behaviors and prevent health risk behaviors, whereas delinquency would promote health risk behaviors. Importantly, we acknowledge that parenting and adolescent individual psychosocial and behavioral variables, such as delinquency, may potentially have reciprocal relationships (i.e., Laird et al. 2003). However, in the current study, we proposed supportive parenting to predict mastery and delinquency; to ensure this temporal order and to mitigate the potential for any reverse associations, we assessed supportive parenting only at wave 2 (1990) and assessed adolescent individual variables (mastery, delinquency, health behaviors) only at wave 3 (1991). We hypothesized that increased family economic pressure, as assessed by parental reports of economic needs and financial attributes, would associate with decreased supportive parenting, and that supportive parenting would operate as a mediator for the detrimental influence of family economic pressure on adolescent health behaviors. Finally, we hypothesized that the proposed model shown in Fig. 1 would show meaningful gender-symmetric associations (i.e., mother-daughter, father-son).

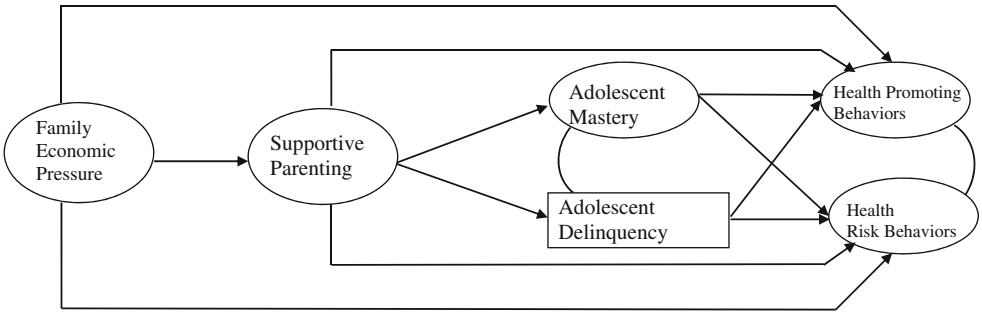


Fig. 1 Proposed model

Method

Sample

This study used data from the Iowa Youth and Families Project (IYFP), which is a larger longitudinal study that focused on the effects of a regional economic crisis on family functioning and relationships (Conger and Elder Jr. 1994). Data for this study came from Wave 1 (i.e., baseline; 1989), Wave 2 (1990), and Wave 3 (1991). The sample consisted of 407 parents' and their adolescents (at baseline, $M_{age} = 12.6$ years, range = 12–14 years; 54 % female)(Wave 3 $M_{age} = 14.59$; range = 14–16 years). The sample was Caucasian, from rural Iowa, and had a median family income of $33,000 in 1988, which was comparable to the national median family income in 1988 ($32, 400) (U. S. Department of Housing and Urban Development 2013). The median age was 39 years for fathers and 37 years for mothers at baseline (Conger et al. 1992). The median years of education was 13 years for mothers and fathers at baseline, which was average for Caucasians between the ages of 35-44 in 1989 (U.S. Census Bureau 1991).

Procedure

The IYFP began in 1989 with 451 families across eight counties in Iowa. Families were initially recruited through 34 public and private schools in 1989. Inclusion criteria were that the families had two parents, a target child in 7th grade, and a sibling within 4 years of the target child's age. Families fitting the inclusion criteria were invited to participate through letters and telephone calls. Approximately 78 % of the families contacted agreed to participate. Sample attrition from 1989 to 1994 was 6 %. Drop-out families were slightly less educated than continuing families, but did not differ in family income level.

Data from only the target child and the parents in each family were used. Two home visits were conducted at each wave of data (Conger et al. 1992). As part of the home visits, each family member was individually asked to complete an extensive questionnaire on family life, finances, friends, and mental and physical health. Families were financially compensated for their participation at each home visit.

Measures

Family Economic Pressure

Family economic pressure was operationalized as a higher latent factor of parent reports of familial economic need and baseline financial attributes. 12 items (6 paternal report and 6 maternal report) assessed *familial economic needs* on a scale of 1-strongly agree to 5-strongly disagree (i.e., "we have enough money to afford the kind of food we need") ($\alpha > .88$ at baseline). Economic needs from all three waves were used. Higher scores indicated greater economic pressure.

Two baseline financial characteristics were also included as empirically supported temporally prior indicators of potential financial stress (Conger et al. 1992): a debts-to-assets ratio and family per capita income. A debts-to-assets ratio was computed from the parent reports of concurrent total estimated monetary value of debts (i.e., mortgages, vehicle loans, tuitions, outstanding personal or medical bills) divided by the concurrent total estimated monetary value of assets (i.e., current homes, savings, annuities, material assets such as works of art and jewelry). This ratio was transformed with a natural log to account for skewness. The family's per capita income from 1989 included total income from all sources (i.e., wages, interest, business) divided by number of family members to account for differing family sizes.

Supportive Parenting

Supportive parenting was assessed as a latent factor of six composite scores of parenting dimensions as reported by the adolescent (autonomy support, warmth, monitoring for mothers and fathers) in 1990 (Wave 2). Autonomy supportive parenting (17 items; mothers' $\alpha = .76$; fathers' $\alpha = .75$) was measured with items related to how much the mother/father supported or validated the adolescent in the

past month on a 7 point scale from 1-always to 7-never (e.g., "how often did your mom/dad ask for your opinion?" "how often did your mom/dad help you do something that was important to you?"). Monitoring was measured on a 5 point scale from 1-always to 5-never on behaviors that reflected clear and consistent parental guidelines, appropriate parental involvement, or consistency of parenting in the past month ("how often does your mom/dad give you a set time to be home or in bed on weekend nights," "how often does your mom/dad punish you for something at one time, and then at other times not punish you for the same thing," "how often does your mom/dad know where you are") (7 items; mothers' $\alpha = .74$, fathers' $\alpha = .71$). Warmth was reported on a 7 point scale from 1-always to 7-never regarding behaviors that reflected the warmth or hostility expressed by the parent in the past month ("how often did your mom/dad get angry at you when spending time with you," "how often did your mom/dad let you know s/he really cares about you") (10 items; mothers' $\alpha = .89$, fathers' $\alpha = .89$). Items were reverse coded if necessary such that higher scores reflected higher autonomy support, structure, or warmth.

Adolescent Mastery

Mastery was measured with the personal mastery scale in 1991 (Wave 3) (Pearlin et al. 1981). Respondents were asked to answer 7 items on a 5 point scale from 1-strongly agree to 5-strongly disagree, to statements such as "sometimes I feel that I'm being pushed around in life," "I have little control over things that happen in my life," and "what happens to me in the future mostly depends on me." Responses were coded and composited such that higher scores reflected higher mastery. All 7 items were loaded onto a latent factor reflecting adolescent mastery. The scale had adequate internal consistency ($\alpha = .78$).

Adolescent Delinquency

Delinquency was measured in 1991 (Wave 3) by asking the target adolescent how often in the past 12 months had they engaged in a variety of delinquent acts on a 5 point scale: 1 (never), 2 (once), 3 (2–3 times), 4 (4–5 times), and 5 (6 or more times). This measure was adapted from the National Youth Survey (Elliott et al. 1989), and assessed 20 different delinquent behaviors related to laws and rules (e.g., running away from home, damaging property, using weapons or force, being in juvenile detention, stealing, speeding, driving without a license, etc.). The items for delinquency showed adequate internal consistency ($\alpha = .78$). The 20 items were averaged to create a composite manifest variable of delinquency.

Adolescent Health Promoting Behaviors

Health promoting behaviors were assessed from two items on eating behavior and physical activity in 1991 (Wave 3). *Eating behavior* was measured with a single item on a 5 point scale from 1-strongly agree to 5-strongly disagree ("I take care of myself by eating the right foods and watching my weight"). *Physical activity* was measured with a single item on a 5 point scale from 1-strongly agree to 5-strongly disagree ("I exercise several times each week to stay physically fit"). Both items were reverse coded such that higher scores reflected higher health promoting behaviors. The two items were significantly correlated ($r = .41$, $p < .01$), and had adequate internal consistency ($\alpha = .57$). These two items were loaded onto the health promoting behaviors factor.

Adolescent Health Risk Behaviors

Health risk behaviors were assessed in 1991 (Wave 3) by measuring use of alcohol and nicotine in the past year. Alcohol use and nicotine use was measured with 5 items ($\alpha = .84$) asking about alcohol use and smoking in the past 12 months (i.e., "how often have you smoked cigarettes, cigars, or a pipe," "…drunk beer,"…"drunk hard liquor"). The items were assessed on a 7 point scale where higher scores reflected greater frequency in health risk behaviors (1–Never, 2–1 or 2 times, 3–3 to 11 times, 4–about 1-3 times per month, 5–about 1–2 times per week, 6–about 3 or more times per week). These 5 items were loaded onto the health risk behaviors factor.

Analytical Technique

The current study used SEM to examine the proposed model using AMOS, which is a statistical software package of IBM's SPSS (Version 18). Missing data were analyzed using the default missing data imputation method for AMOS, which is the Full Information Maximum Likelihood method (FIML). FIML allows cases with missing data to be analyzed based on parameter estimates of all available information, and has been shown to provide more consistent and less biased parameter estimates as well as improved model goodness of fit statistics (Enders and Bandalos 2001). The proposed model was tested with age and mean parental education levels as covariates; this was to account for the collinearity between education levels and income, as parental education has often been used as an indicator for socioeconomic status (e.g., Hanson and Chen 2007).

We tested the significance of the hypothesized indirect effects using the Sobel test (Sobel 1982). We used equality constraint tests to determine the significance of gender

symmetric associations (Wickrama et al. 1999). In an equality constraint test, the hypothesized path is constrained across the two comparison groups to be equal. The resulting changes in model fit (i.e., Chi squared) are used to infer whether the path is significantly different across the two groups. In this study, a model with only maternal parenting indicators and a model with only paternal parenting indicators was tested with equality constraints to examine how gender specific parenting characteristics influence gender specific health behaviors (i.e., gender symmetry).

Results

Using a sample of 407 adolescents and their mothers and fathers, this study examined direct and indirect (i.e., mediated) pathways of family economic pressure and supportive parenting to adolescent health behaviors, considering supportive parenting, mastery, and delinquency as potential mediators. Further, we examined gender symmetry of the developmental pathways. To address these research objectives, we tested the full hypothesized model using SEM and used the Sobel's test to analyze the significance of the indirect effects. To examine the gender symmetry and potential asymmetry of the model, we first tested two separate SEMs with either maternal supportive parenting or paternal supportive parenting to assess the model fit of the full model using only maternal or paternal parenting indicators. Then, we used equality constraints to examine whether the pathways differed for adolescent males and females for each model (maternal or paternal). The findings partially supported the hypotheses.

Preliminary Analyses

The descriptive statistics and correlations of the study variable are presented in Table 1. For the most part, the correlations between the variables of the hypotheses were significant and in the expected directions, and correlations among manifest variables loading onto the same latent factor were high and significant. Table 2 shows the standardized factor loadings of the study variables; the initial measurement model for all latent factors showed adequate model fit: CFI = .94; TLI = .93; RMSEA: .04; χ^2 (285) = 567.71. The standardized factor loadings of the study variables were all statistically significant and had moderate to high magnitudes with the exception of the alternative forms of nicotine use (e.g., pipe tobacco) item having a low to moderate factor loading for the health risk behaviors latent factor ($\beta = .31$, $p < .001$). This is likely due to the infrequency of cigar and pipe tobacco use in the sample (median and mode of cigar or pipe tobacco use was 1-"Never" in past 12 months). Factor loadings for family economic pressure, supportive parenting, adolescent mastery, and adolescent health promoting behaviors were adequate and statistically significant, indicating adequate measurement fit of study variables. We then tested the proposed model using SEM; Fig. 2 presents the standardized path coefficients of this model. The following results are organized according to the presentation of the aforementioned hypothesized associations.

Supportive Parenting and Adolescent Health Behaviors

SEM analysis showed the influence of supportive parenting on health behaviors was largely mediated through individual mastery and delinquency. However, supportive parenting was negatively predictive of adolescent health risk behaviors ($\beta = -.10$, $p < .05$), suggesting that while adolescent health risk behaviors were significantly linked to adolescent delinquency, supportive parenting itself directly deters the alcohol and nicotine use of an adolescent. Supportive parenting was not directly associated with adolescent health promoting behaviors.

Mastery and Delinquency as Mediators

The influence of supportive parenting on adolescent health behaviors was mediated by mastery and delinquency, and these indirect associations showed two significant pathways. Supportive parenting positively predicted adolescent mastery ($\beta = .43$, $p < .0001$), and adolescent mastery positively predicted adolescent health promoting behaviors ($\beta = .46$, $p < .0001$), but not health risk behaviors ($\beta = .05$, $p > .05$). Further, supportive parenting indirectly influenced adolescent health promoting behaviors only via mastery ($\beta = .19$, $p < .001$).

Supportive parenting was negatively associated with adolescent delinquency ($\beta = -.15$, $p < .001$), and adolescent delinquency was positively associated with health risk behaviors ($\beta = .55$, $p < .0001$), but not health promoting behaviors ($\beta = .03$, $p > .05$). Further, delinquency mediated the influence of supportive parenting on adolescent health risk behaviors only ($\beta = -.06$, $p < .001$). The indirect pathways from supportive parenting to adolescent health behaviors showed two separate pathways to health risk behaviors and health promoting behaviors via delinquency (a behavioral maladjustment) and mastery (a psychosocial resource), respectively.

The Influence of Family Economic Pressure

The results indicated that family economic pressure was not directly associated with adolescent health behaviors, but was negatively associated with supportive parenting

Table 1 Descriptive statistics and correlations of study variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Debts/assets ratio W1	1																			
2. INCOME W1[a]	−.22**	1																		
3. FEP W1	.28**	−.45**	1																	
4. FEP W2	.34**	−.42**	.77**	1																
5. FEP W3	.35**	−.40**	.70**	.80**	1															
6. M A-support[b]	−.06	.02	−.05	−.03	−.06	1														
7. F A-support[b]	−.12*	.06	−.15**	−.12*	−.13**	.70**	1													
8. M structure	−.03	.02	−.04	−.02	−.03	.74**	.61**	1												
9. F structure	−.14**	.09†	−.16**	−.16**	−.12*	.51**	.71**	.66**	1											
10 M warmth	−.06	.01	−.01	−.002	−.03	.83**	.62**	.76**	.55**	1										
11. F warmth	−.09*	.08†	−.09†	−.10*	−.12*	.63**	.81**	.62**	.76**	.69**	1									
12. Mastery	−.07	−.03	−.11*	−.13**	−.12*	.31**	.34**	.31**	.37**	.33**	.35**	1								
13. Delinquency	.02	−.03	.02	.06	.17**	−.22**	−.12*	−.14**	−.07	−.18**	−.15**	−.10*	1							
14. Eating	.02	.04	−.08†	−.05	−.09†	.15**	.12*	.07	.12*	.16**	.11*	.30**	−.09†	1						
15. Phys. Act.[c]	−.05	.05	−.11*	−.07	−.06	.08	.18**	.06	.17**	.08†	.15**	.24**	.06	.40**	1					
16. Cigarette use	.06	−.05	.11*	.09†	.19**	−.24**	−.19**	−.17**	−.15**	−.15**	−.18**	−.04	.52**	−.07	−.08†	1				
17. Alt. Nic. use[d]	.10*	−.03	.05	.09	.11*	−.01	−.04	.03	−.01	−.01	−.07	−.05	.20**	.01	−.00	.27**	1			
18. Beer use	.11*	−.01	.03	.08	.16**	−.14**	−.14**	−.10*	−.11*	−.10*	−.16**	−.06	.52**	−.14**	−.08	.65**	.29**	1		
19. Wine use	.11*	−.03	.02	.02	.14**	−.09†	−.08	−.05	−.05	−.08†	−.12*	−.004	.46**	−.14**	−.06	.62**	.27**	.79**	1	
20. Liquor use	.02	−.01	−.01	.01	.08	−.10*	−.11*	−.11*	−.07	−.08	−.13**	−.04	.41**	−.14**	−.08†	.55**	.19**	.72**	.71**	1
Mean (SD)	.42 (.28)	–[a]	2.68 (.41)	2.65 (.43)	2.59 (.73)	5.14 (.55)	5.13 (.59)	3.37 (.53)	3.38 (.55)	5.44 (.95)	5.47 (1.0)	3.91 (.60)	1.09 (.17)	3.47 (.90)	3.68 (1.1)	1.58 (1.3)	1.19 (.66)	1.61 (1.1)	1.62 (.99)	1.36 (.79)
Range	0–2		1.7–4.2	1.6–4.2	1.0–4.9	2.4–6.3	2.4–6.1	1.1–4.6	1.3–4.6	1.4–7.0	1.3–7.0	2.1–5.0	1–2.4	1–5	1–5	1–6	1–6	1–6	1–6	1–6

FEP family economic pressure; *F* father, *M* mother. *W* wave of data. All parenting variables were measured at Wave 2. All adolescent variables were measured at Wave 3

† $p < .10$; * $p < .05$; ** $p < .01$

[a] Per capita income: per capita mean: $7,938.92; Per capital SD: $5,648.02; Per capita minimum–maximum: −$10,246 to $51,800. [b] Autonomy support. [c] Physical activity. [d] Alternative nicotine use (i.e., cigars)

($\beta = -.15$, $p < .001$). Further, supportive parenting was a significant mediator for the influence of family economic pressure on adolescent mastery ($\beta = -.05$, $p < .05$) and marginally significant for delinquency ($\beta = .02$, $p = .06$). These findings suggest that the detrimental influence of family economic pressure on supportive parenting carried over as a reduced beneficial impact of supportive parenting on adolescent mastery and delinquency. These results provide support for the family stress model in that economic stress influenced adolescent adjustment via disruptions in supportive parenting.

Gender Comparisons and Gender Symmetry

To test the gender symmetry hypothesis in this study, two separate models were run using only maternal parenting variables and only the paternal parenting variables. Further, both models analyzed group comparisons between adolescent males and females. The parameter coefficients and model fit statistics for both models are presented in Table 3. Both models showed adequate model fit. With each model, equality constraints were set across adolescent males and adolescent females to examine gender symmetry of pathways stemming from supportive parenting. With each individual equality constrained path, we compared Chi square differences based on 1 *df*. With a difference of 1 *df*, a $\Delta\chi^2$ of 3.83 or greater would indicate that the constrained pathway differed significantly between adolescent males and females in this sample. A significant increase in the χ^2 indicated that constraining the paths to be equal across both genders significantly reduced model fit (i.e., poor fit with sample data). Each pathway was constrained individually.

The equality constraints tested and subsequent model comparisons are presented in Table 4. The hypothesis of gender symmetric developmental pathways (i.e., mother to daughter and father to son) was largely unsupported. However, the results did show that supportive parenting differently influenced adolescent health behaviors depending on adolescent gender. Supportive parenting directly and indirectly associated with adolescent females' health risk behaviors, but only indirectly associated with males' health risk behaviors via delinquency.

Maternal Supportive Parenting and Adolescent Health Behaviors

In this model, the equality constraint test yielded four significant results. Maternal supportive parenting negatively influenced adolescent males' delinquency, but not adolescent females' delinquency. Further, maternal supportive parenting had no direct bearing on males' health risk behaviors, but was negatively associated with females' health risk behaviors. Unexpectedly, adolescent females' mastery was positively linked to females' health risk behaviors, but the same relationship was not observed for adolescent males. Finally, the delinquency of both adolescent females and males was linked to health risk behaviors, but with differing magnitudes.

Table 2 Factor loadings in final model

Latent factor	
Items	Loading
Family economic pressure	
Debts to assets ratio 1989	.40
Per capita income 1989	−.47
Economic pressure 1989	.82
Economic pressure 1990	.94
Economic pressure 1991	.85
Supportive parenting	
Mothers' autonomy support	.71
Fathers' autonomy support	.88
Mothers' structure	.70
Fathers' structure	.82
Mothers' warmth	.72
Fathers' warmth	.92
Adolescent mastery	
Mastery 1	.61
Mastery 2	.66
Mastery 3	.62
Mastery 4	.48
Mastery 5	.69
Mastery 6	.36
Mastery 7	.60
Adolescent health promoting behaviors	
Healthy eating	.67
Physical exercise	.60
Adolescent health risk behaviors	
Cigarette use	.72
Other nicotine use	.31
Drinking beer	.91
Drinking wine	.86
Drinking other hard liquors	.79

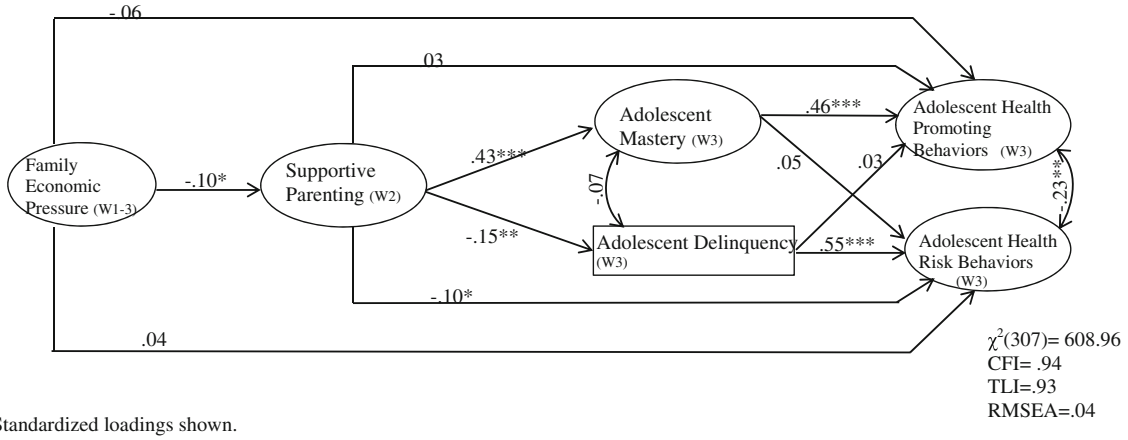
Model fit is as follows: CFI = .94; TLI = .93; RMSEA: .04; χ^2 (285) = 567.71

Standardized loadings shown

All factor loadings were significant at $p < .001$

Paternal Supportive Parenting and Adolescent Health Behaviors

In this model, the equality constraint test yielded three significant results. Fathers' supportive parenting directly promoted adolescent females' health promoting behaviors, but had no direct impact on adolescent males' health promoting behaviors. Fathers' supportive parenting was



Standardized loadings shown.
Factor loadings and covariates (age and parental education) not shown for clarity.
* p <.05; ** p <.01; *** p<.001

Fig. 2 SEM analysis of direct influences on adolescent health behaviors

negatively linked to delinquency for males, but not for females. Finally, the association between delinquency and health risk behaviors was again significantly different in magnitude between adolescent males and females.

These results suggest that gender symmetry is not the integral differentiating characteristic of the developmental pathways to adolescent health behaviors. Rather, adolescent males' health behaviors were indirectly influenced by supportive parenting through both mastery and delinquency, whereas adolescent females' health behaviors were more directly impacted by supportive parenting, though mastery remained an important mediator for adolescent females in both the maternal and paternal parenting models.

Discussion

This study contributes to extant research with several points of clarification salient to understanding the development of health behaviors in adolescence, a crucial transitional period when such learned behaviors become cemented and may manifest as health habits in adulthood (Maggs et al. 1997; Viner et al. 2012). Firstly, this study analyzed health risk behaviors (alcohol and nicotine use) and health promoting behaviors (healthy eating and physical activity) as two separate constructs that were found to have differing developmental pathways. Secondly, this study used a longitudinal sample covering early to mid-adolescence (12–14 years of age at baseline). Thirdly, the proposed model tested relevant distal and proximal factors and their direct and indirect pathways to adolescent health promoting and health risk behaviors within a family stress framework. Finally, the present study identified significant gender differences in the influence of parenting on adolescent health behaviors.

Supportive Parenting and Adolescent Health Behaviors

Supportive parenting seemed to prevent health risk behaviors, but did not directly support adolescent promoting behaviors. This would suggest that the three parental dimensions (autonomy support, monitoring, warmth) buffered against the development of health risk behaviors, but the mechanism by which parenting contributes to health promoting behaviors may involve other parental dimensions not measured in this study. For example, social cognitive theory (i.e., social learning theory, Bandura 1977) would suggest that it is not simply the presence of supportive parenting but also the observations or experiences of their parents engaging in health promoting behaviors that contributes to the development of such behaviors in adolescence. That is, children who observe their exercising regularly are more likely to engage in physical activity themselves (Moore et al. 1991). Importantly, the influence of supportive parenting was significantly mediated through delinquency and mastery, which is consistent with the family stress model.

Adolescent Mastery and Delinquency as Significant Mediators of Supportive Parenting

The indirect pathways from supportive parenting to health risk and health promoting behaviors suggested differential developmental pathways for adolescent health risk and health promoting behaviors. The results suggest that supportive parenting promotes adolescent mastery, which, in turn, promotes health promoting behaviors; by contrast, supportive parenting deters adolescent delinquency, which extends to deter health risk behaviors. The differing pathways for adolescent health risk and health promoting behaviors through delinquency and mastery, respectively, make a strong argument for considering health risk and

Table 3 Gender specified model coefficients

Pathways	Maternal parenting model		Paternal parenting model	
	Female adolescents	Male adolescents	Female adolescents	Male adolescents
FEP→SP	.16 (.11)	−.26 (−.17)*	−.09 (−.06)	−.37 (−.24)**
FEP→HP	−.27 (−.13)†	−.11 (−.05)	−.22 (−.11)†	−.13 (−.08)
FEP→HR	.16 (.05)	.09 (.02)	.09 (.03)	.03 (.01)
SP→Mastery	.46 (.32)***	.47 (.48)***	.56 (.41)***	.43 (.45)***
SP→Delinquency	−.01 (−.03)	−.13 (−.32)***	−.01 (−.05)	−.08 (−.20)**
SP→HP	.13 (.09)	−.06 (−.06)	.22 (.17)†	−.13 (−.13)
SP→HR	−.30 (−.14)*	.09 (.05)	−.33 (−.16)**	−.15 (−.10)
Mastery→HP	.56 (.56)***	.34 (.35)*	.50 (.53)***	.40 (.38)*
Mastery→HR	.20 (.13)*	−.17 (−.10)	.23 (.15)*	−.07 (−.04)
Delinquency→HP	−.27 (.05)	−.05 (−.02)	−.16 (−.03)	−.06 (−.02)
Delinquency→HR	6.04 (.74)***	2.06 (.51)***	6.06 (.74)***	1.96 (.50)***
FEP→SP→Mastery	.07 (.03)	−.12 (−.08)*	−.05 (−.02)	−.16 (−.11)**
FEP→SP→Delinquency	−.001 (−.004)	.03 (.06)*	.001 (.003)	.03 (.05)*
SP→Mastery→HP	.26 (.18)***	.17 (.17)*	.28 (.22)***	.17 (.18)*
SP→Delinquency→HR	.03 (.01)	−.35 (−.22)***	.05 (.02)	−.18 (−.12)*
CFI	.96		.96	
TLI	.95		.95	
RMSEA	.03		.03	
χ^2 (*df*)	589.07 (*434*)		582.71 (*434*)	

N_{BOYS} = 186, N_{GIRLS} = 216; Unstandardized (standardized) coefficients shown

FEP family economic pressure, SP supportive parenting, *HR* health risk behaviors, *HP* health promoting behaviors

† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

health promoting behaviors as separate constructs that develop in tandem. While supportive parenting is important to both types of behaviors, fostering mastery in adolescence is conducive to promoting health promoting behaviors, whereas preventing delinquency extends to prevent health risk behaviors—and these individual factors may be particularly salient for adolescent males.

Family Economic Pressure, Supportive Parenting, and Adolescent Health Behaviors

The findings were supportive of the family stress model in that increased family economic pressure predicted decreases in supportive parenting, which, in turn, influenced adolescent adjustment (i.e., mastery and delinquency). The use of the family stress model framed the understanding of how socioeconomic pressures contribute to the development of health behaviors in adolescence. The results indicated that the disturbances to supportive parenting from economic pressure extend as detriments in adolescent mastery and increased adolescent delinquency. Importantly, family economic pressure did not directly predict adolescent health behaviors; this may be reflective of the need to incorporate multiple distal factors of health behaviors. Viner et al. (2012) argued that structural influences (i.e., income inequality, access to education) present as a powerful determinant of adolescent health outcomes; thus incorporating these levels of influence could not only provide a clearer picture of the development of adolescent health behaviors, but also potentially improve the generalizability of the findings.

The Importance of Gender

Equality constraint testing to analyze gender symmetry in the hypothesized pathways showed that the hypotheses were not fully supported. Both maternal supportive parenting and paternal supportive parenting models showed significant gender differences for the influence of delinquency on health risk behaviors. The pathway from delinquency to health risk behaviors was significant in both models, but the impact of delinquency appeared stronger for adolescent females than for adolescent males. This suggests that even though males engage in delinquent behaviors more than females do (i.e., Mason and Windle 2002), when females do engage in delinquent behaviors, they may more readily engage in health risk behaviors (i.e., substance use).

Table 4 Equality constraint model comparisons with $\Delta\chi^2$ (Δdf)

Model	χ^2 (*df*)	$\Delta\chi^2$ (Δdf)	RMSEA	CFI	TLI
Maternal parenting full model	589.07 (434)	–	.03	.96	.95
Constraining SP→Mastery	589.07 (435)	.003 (1)	.03	.96	.95
Constraining SP→Delinquency	601.19 (435)	12.12 (1)**	.03	.96	.94
Constraining SP→HP	590.24 (435)	1.17 (1)	.03	.96	.95
Constraining SP→HR	593.55 (435)	4.48 (1)*	.03	.96	.95
Constraining Mastery→HP	590.30 (435)	1.23 (1)	.03	.96	.95
Constraining Mastery→HR	593.70 (435)	4.63 (1)*	.03	.96	.95
Constraining Delinquency→HP	589.25 (435)	.20 (1)	.03	.96	.95
Constraining Delinquency→HR	630.03 (435)	40.96 (1)***	.03	.95	.93
Paternal parenting full model	582.71 (434)	–	.03	.96	.95
Constraining SP→Mastery	583.52 (435)	.81 (1)	.03	.96	.95
Constraining SP→Delinquency	586.47 (435)	3.76 (1)*	.03	.96	.95
Constraining SP→HP	586.91 (435)	4.20 (1)*	.03	.96	.95
Constraining SP→HR	583.75 (435)	1.04 (1)	.03	.96	.95
Constraining Mastery→HP	582.98 (435)	.27 (1)	.03	.96	.95
Constraining Mastery→HR	585.73 (435)	3.02 (1)	.03	.96	.95
Constraining Delinquency→HP	582.75 (435)	.04 (1)	.03	.96	.95
Constraining Delinquency→HR	627.55 (435)	44.84 (1)***	.03	.95	.93

SP supportive parenting, *HR* health risk behaviors, *HP* health promoting behaviors

* $p < .05$; ** $p < .01$; *** $p < .001$

Interestingly, while supportive parenting significantly influenced adolescent health behaviors regardless of gender, which is consistent with prior research (i.e., Windle et al. 2008), this influence was manifested differently for adolescent females and males. For males, delinquency was a significant mediator for the influence of supportive parenting on health risk behaviors. For females, increased supportive parenting appeared to directly prevent health risk behaviors and promote health promoting behaviors. These differences may be attributable in part to the gender difference in the manifestation of delinquency; while girls' delinquent behaviors tend to exhibit as less extreme than boys', they may still reflect the same underlying delinquent tendencies (Zahn et al. 2010). It may be that delinquency does act as a partial mediator for supportive parenting on females' health behaviors, but the current study does not account for differential types or rates of delinquency by gender that could capture these associations.

Finally, in the case of adolescent females' mastery, the findings contrast from extant research that highlights the protective influence of mastery on health risk behaviors (i.e., Carvajal et al. 2000); in this sample, higher adolescent mastery for females was positively linked to health risk behaviors. It should be noted that, in general, the adolescents in this sample exhibited relatively low health risk behaviors (i.e., ~2–3 times of smoking/drinking in the past twelve months). The low frequency of actual health risk behaviors suggests that this usage may be reflective of substance use experimentation, which occurs in adolescence as an extension of experimenting with adult behaviors (Chassin et al. 2004; Conner et al. 2010; Petraitis et al. 1995). One possible explanation is that high mastery may encourage exploration of new experiences, which in adolescence includes substance use. Thus, we believe that these findings do not imply that high mastery contributes to increased health risk behaviors; rather, high mastery encourages exploration in adolescence, which may contribute to substance use experimentation. It is important to note that, while experimentation itself differs from consistent substance use, early experimentation can contribute to habits and mental illness in later life (i.e., depressive symptoms) (Conner et al. 2010).

Limitations

The findings of this study should be considered within the following limitations. The sample consisted of data from two parent Caucasian families from a rural area in the US that was collected in 1989–1991. Future research should corroborate these findings with a more representative and current sample; such a study would corroborate if these findings still hold true given the general decline in adolescent alcohol use since the 1990s (Johnston et al. 2011). The health risk behaviors considered only reflect substance use; using a wider variety of health risk behaviors (i.e., sexual risk behaviors) would strengthen the generalizability of these findings. Health risk behaviors were examined as an

extension of delinquency in the current model; however, the relationship between delinquency and health risk behaviors, specifically substance use behaviors, may be more reciprocal in nature and moderated by gender (Mason and Windle 2002). Thus, future research should examine these longitudinal processes more closely. The data used are parent and adolescent self-report measures, which may be subject to social desirability biases (i.e., Davis et al. 2010); future research should attempt to incorporate direct measures of health behaviors. Finally, and perhaps most importantly, peer associations were not considered within this study. Current research on substance use in adolescence highlights peer interactions as a key contributor to substance use (e.g., Larsen et al. 2010; Simons-Morton et al. 2001). Thus, incorporating measures of peer acceptance and rejection would be prudent in future studies.

Conclusions and Implications

This study contributes relevant information to understanding the development of health behaviors in adolescence. Firstly, this study provides support for the family stress model, and extends the detrimental influence of economic stress to health behaviors via indirect proximal processes such as supportive parenting and adolescent mastery and delinquency. Secondly, two developmental pathways were found from supportive parenting to health risk and health promoting behaviors via delinquency and mastery, respectively. These two pathways highlight mastery and delinquency as individual processes that underlie the influence of parenting on adolescent health behaviors, as well as the utility of conceptualizing health behavior outcomes as promoting and risk oriented. Finally, gender comparisons showed that delinquency was an important mediator for the influence of supportive parenting on adolescent males' health risk behaviors, whereas supportive parenting directly prevented adolescent females' health risk behaviors. This distinction may be due to gender differences in delinquency; future studies should consider differential manifestations of delinquency in the reciprocal link between delinquency and substance use. Future intervention and prevention programs should focus on promoting specific parenting dimensions as well as strengthening individual mastery so as to prevent health risk behaviors and foster health promoting behaviors. Further, such programs should not only aim to prevent health risk behaviors, but also to promote positive health behavior outcomes. The current study provides insight into the developmental processes of health behaviors in adolescence by emphasizing the direct and indirect influences of distal and proximal social factors of health promoting and health risk behaviors.

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Author contributions J. A. Kwon conceived of these research questions, performed the statistical analyses, interpreted the data, and drafted the final manuscript; K. A. S. Wickrama conceived of the study, participated in its design, interpreted the data, and helped draft the manuscript.

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