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The Intergenerational Transmission of Substance Use and Problem Behavior: Impact on the Third Generation Child

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Abstract

The current study evaluated the intergenerational transmission of harsh parenting, substance use, and emotional distress across generations, and the association with child aggression. The study included 218 generation one (G1) mothers and fathers and their adolescent (generation two; G2) who participated from middle adolescence through adulthood, and the third-generation (G3) child between ages 3–5 years and 6–10 years old. G1 behavior was examined when G2 was 16 and 18 years old; G2 alcohol problems and marijuana use were assessed when G2 was 19 and 21 years old. G2 emotional distress and harsh parenting were examined when the G3 child was between 3 and 5 years old. Finally, G3 aggression was assessed between 6 and 10 years old. Results showed continuity of G1 behavior when G2 was in adolescence to G2 behavior in adulthood. G1 alcohol problems and G1 harsh parenting were both associated with G3 aggression through G2 alcohol problems, G2 emotional distress and G2 harsh parenting. Results suggest that G1 problem behavior as experienced by G2 adolescents in the family of origin plays an important role in G2 alcohol problems in emerging adulthood which leads to G2 emotional distress and G2 harsh parenting in adulthood, which is related to G3 aggression in the early elementary school years.

Keywords

Intergenerational transmission; substance use; harsh parenting; emotional distress; aggressive behavior

There is evidence that problem behavior such as harsh parenting, substance use, and emotional distress are transmitted across generations (Bailey, Hill, Oesterle, & Hawkins, 2006; Bailey, Hill, Oesterle, and Hawkins, 2009; Kavanaugh, Neppl, & Melby, 2018; Jeon & Neppl, 2019; Neppl, Conger, Scaramella, & Ontai, 2009). Indeed, generation one (G1) substance use and hostile parenting as experienced during generation two (G2) adolescence, increases G2 substance use and other deviant behaviors into emerging adulthood (Diggs & Neppl, 2018; Yap, Cheong, Zaravinos-Tsakos, Lubman, & Jorn, 2017). As adults, G2 is

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likely to continue such behavior, as well as become harsh parents themselves, which relates to negative outcomes for the third generation (G3) child (Jeon & Neppl, 2019; Neppl et al., 2009). Bailey et al. (2006) found evidence for G1 to G2 continuity of substance use, which led to problem behavior for the G3 child. In addition, G1 harsh parenting influenced G2 externalizing behavior, which related to G2 substance use and G3 externalizing behavior (Bailey, et al., 2009).

Despite this evidence, more research is needed regarding mechanisms that might help explain associations between G1 and G2 problem behavior, and problem behavior for the G3 child. For example, Bailey et al. (2006) suggest that potential pathways such as harsh parenting should be investigated in the association between G1 substance use and G3 problem behavior. According to the Family Stress Model (FSM; Conger & Conger, 2002), stressors as experienced in the family of origin are associated with emotional distress and disrupted family relationships in adulthood, and poor developmental outcomes for the next generation child. Specifically, early stressors such as family economic adversity relate to parental emotional distress that leads to harsh parenting practices, which in turn are associated with next generation externalizing behavior in early childhood (Neppl, Senia, & Donnellan, 2016), and alcohol use from adolescence to emerging adulthood (Diggs & Neppl, 2018). Therefore, it seems reasonable that G1 behavioral stressors negatively affect G2 problem behavior such as substance use in adulthood. This problem behavior then leads to G2 harsh parenting. Hence, G2 outcomes turn into predictors of G2 behavior that ultimately impact the G3 child. Understanding these associations are critical as G3 problem behavior in childhood relates to early alcohol and other substance use (Kerr, Capaldi, Pears & Owen, 2012). Thus, G3 behavior is both a consequence of G1 and G2 behavior and a marker of their own potential use (Kerr, et al., 2012). These pathways can be supplemented by the Social Learning Theory (Bandura, 1977), which allows for modeling and direct associations between parent and child behavior. That is, the intergenerational continuity of behavior may occur when individuals exposed to problem behaviors during childhood emulate this same type of problem behavior when they become adults. These environmental risk factors may also interact with genetic vulnerability to help explain problem behavior, as well as poor parenting practices (see Moffit, 2005). Moreover, due to heritability and parental rearing influences, there could be an underlying liability of transmissible risk where problem behaviors are a manifestation of behavioral under control (i.e., Tarter et al., 2015).

With these ideas in mind, the present investigation extends earlier research on the intergenerational transmission of problem behavior by prospectively evaluating possible mechanisms for the continuity of G1 to G2 problem behavior on later G3 outcomes. Specifically, we investigated the influence of G1 emotional distress, G1 alcohol problems, and G1 harsh parenting during G2 adolescence, on G2 alcohol problems and marijuana use from late adolescence into emerging adulthood. We also evaluated the influence of G2 alcohol and marijuana use in emerging adulthood on G2 emotional distress and harsh parenting when G3 was in preschool. We then examined the association between G2 harsh parenting and G3 externalizing behavior during the early elementary years. Finally, we examined the indirect pathways from G1 to G3 behavior and controlled for G2 substance use in adolescence.

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Continuity of Substance Use and Problem Behavior

It is well established that substance use is one type of problem behavior transmitted from the parent to the next generation child (Yap, et al., 2017). For example, parent alcohol use is related to adolescent alcohol use (Brook et al., 2010), alcohol use in emerging adulthood (Knight, Menard, & Simmons, 2014), as well as to other substances such as marijuana (McCutcheon et al., 2017). Nadel and Thornberry (2017) found that mother adult substance use defined by alcohol and marijuana use, was a risk factor for offspring substance use and other problem behaviors. Relatedly, Capaldi, Tiberio, Kerr, and Pears (2016) found that mother alcohol use was associated with their child's onset and use of alcohol. Thus, while mother use has received less attention in research than father use, mother substance use may play a significant role in child use (Capaldi, Tiberio, & Kerr, 2018). Moreover, adolescents may be more likely to develop problem drinking if exposed to parents who drank moderately or heavily than those with parents who never or occasionally drank alcohol (Alati et al., 2014). Indeed, adolescents with parents diagnosed with DSM-III-R substance abuse were more likely themselves to be dependent on alcohol and other drugs (Hoffmann & Cerbone, 2002). Finally, in addition to substance use disorders, adolescents exposed to parental problem drinking are at higher risk of life stress and psychological problems (Brook et al., 2010).

Research also demonstrates that those who engage in heavy drinking during adolescence likely continue this problematic drinking into emerging adulthood (Thompson, Stockwell, Leadbeater, & Homel, 2014). Indeed, Diggs and Neppl (2018) examined the continuity of alcohol use from middle adolescence to emerging adulthood. They found alcohol use at age 16 predicted binge drinking in late adolescence, which led to binge drinking in emerging adulthood. In addition, Henry and Augustyn (2017) found that individuals who began using cannabis by age 15 were more likely to meet criteria for a lifetime cannabis disorder. Finally, Windle and Wiesner (2004) classified adolescents into trajectory groups based on patterns of change in cannabis use and found that adolescent trajectory group membership significantly predicted cannabis and alcohol disorders in young adulthood. Though the stability of adolescent substance use is well documented, few studies, if any, have examined the influence of G1 problem behavior on the continuity of G2 substance use to predict G2 emotional distress and G2 harsh parenting in adulthood within the same model.

Harsh Parenting and Emotional Distress

There is also evidence that parenting in the family of origin is associated with parenting behavior in the subsequent generation (e.g., Conger, Neppl, Kim, & Scaramella, 2003; Pears & Capaldi, 2001; Simons, Whitbeck, Conger, & Wu, 1991). For example, Conger et al. (2003) found a direct association between G1 hostile parenting experienced during G2 adolescence and G2 hostile parenting to their G3 child in adulthood. Bailey et al. (2009) found continuity in parental monitoring and harsh discipline practices across generations. Moreover, research also suggests that G1 parenting is associated with G2 alcohol use. Indeed, harsh parenting practices predict adolescent drinking (Kim-Spoon, Farley, Holmes, & Longo, 2014) that extends into emerging adulthood (Aquilano & Supple, 2001). As such, G2 problem behavior may be an important mechanism to help explain the intergenerational

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transmission of harsh parenting. In an early study, Caspi and Elder (1988) demonstrated that G1 hostile parenting predicted G2 problem behavior in childhood which was associated with G2 hostile parenting to G3. Similarly, Neppl et al. (2009) found that G2 externalizing behavior in adulthood mediated the association between G1 harsh parenting during G2 adolescence and G2 harsh parenting to G3 during adulthood. More recently, Augustyn, Thornberry, and Henry (2019) demonstrated that child maltreatment victimization increased alcohol use and other problem behavior in adolescence, which increased their engagement in maltreatment behaviors in adulthood. Finally, Bailey et al. (2009) found associations between G1 harsh discipline and G1 substance use with G2 externalizing behavior when G2 was in early adolescence. Subsequently, G2 externalizing behavior in early adolescence was related to G2 substance use when G2 was in adulthood, which was then associated with G3 externalizing at the same time period (Baily et al., 2009).

The continuity of emotional distress (which may include anxiety, depressive symptoms, and hostility) across generations is also well-documented (Stein et al., 2014). For example, Kim, Capaldi, Pears, Kerr and Owen (2009) examined the intergenerational transmission of broad internalizing behavior including depression across three generations. They found that G1 mother internalizing behavior assessed when G2 was 9 to 12 years old was associated with G2 internalizing at age 13 to 18 years old. Similarly, G2 mother internalizing behavior was associated with the internalizing behavior of the G3 child. Others demonstrate that maternal depressive symptoms increase risk for depression in both adolescence (Monti & Rudolph, 2017) and adulthood (Betts, Williams, Naiman, & Alati, 2015). Indeed, Jones et al. (2016) found that family history of distress influenced mental functioning throughout adulthood. In addition, after controlling for externalizing symptoms, Rothenberg, Hussong, and Chassin (2018) found that depressive symptoms mediated the intergenerational transmission of family conflict.

Moreover, adolescent substance use is associated with later emotional distress, which can influence their own child's behavioral outcomes. Indeed, emotional distress such as depression often co-occurs with substance use in adulthood (Biederman et al., 2005), predicts substance use (King & Chassin, 2008), or is a consequence of using substances (Trim, Meehan, King, & Chassin, 2007). It also relates to child problem behavior (Kavanaugh, et al., 2018; Kim-Cohen, Moffitt, Taylor, Pawlby, & Caspi, 2005; Neppl et al., 2016). For example, Thornberry, Freeman-Gallant, and Lovegrove (2009) found that mother depressive symptoms when their child was 7 years old mediated the association between mother adolescent drug use and their child's early onset of antisocial behavior. Mother depressive symptoms indirectly related to child antisocial behavior through its impact on parenting. Relatedly, Diggs and Neppl (2018) found that early stress (i.e., economic adversity) was associated with parental emotional distress, which led to harsh parenting behavior toward their child. Thus, parental emotional distress may not only be transmitted across generations, but also provide a link between parent substance use and child problem behavior. That is, it is plausible that adolescent substance use can lead to later emotional distress, which influences harsh parenting behavior in adulthood. Taken together, the current study extends this work by evaluating G1 problem behavior as experienced in G2 adolescence on G2 substance use in emerging adulthood, to G2 emotional distress and harsh

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parenting to G3 in adulthood, as well as to G3 problem behavior in the elementary school years.

The Present Investigation

The current study examined the transmission of problem behavior across generations. Specifically, we evaluated the influence of G1 problem behavior on the continuity of G2 substance use, G2 emotional distress and harsh parenting in adulthood, and G3 aggressive behavior within the same model. We used data from a two-decade longitudinal study of G2s and their families followed from adolescence to adulthood. We measured G1 emotional distress, alcohol problems, and harsh parenting during G2's adolescence (Time 1). G2 alcohol problems and marijuana use were assessed in late adolescence (Time 2) and emerging adulthood (Time 3). G2 emotional distress and harsh parenting to G3 were assessed during G3's preschool years (Time 3), and G3 aggressive behavior was examined in the early elementary years (Time 5). We expected continuity of emotional distress, substance use, and harsh parenting from G1 to G2. We further expected that G1 behavior would relate to G2 substance use in late adolescence and expected continuity of G2 substance use from late adolescence to emerging adulthood. G2 substance use in emerging adulthood would then relate to G2 emotional distress. It was expected that G2 emotional distress would relate to G2 harsh parenting in adulthood, which would then predict G3 child aggression (see Figure 1).

We also controlled for original family structure, G1 per capita income, G1 mother and father age, G2 early adolescent alcohol use, G2 gender, G2 marital status, G2 age at time 4, and G3 gender and G3 age at times 4 and 5. Previous research shows that these variables may be related to substance use and parenting behaviors. For example, economic hardship relates to both emotional distress and family conflict (Neppl et al., 2016). Younger mothers may be more likely to show signs of harsh parenting toward their children than mothers who are older in age (Scaramella, Neppl, Ontai, & Conger, 2008). Moreover, in young childhood, males tend to have higher levels of externalizing behavior than their female counterparts (Pogarsky, Thornberry, & Lizotte, 2006).

Method

Participants

Data come from the Family Transitions Project (FTP), a longitudinal study of 559 youth and their families. The FTP includes participants merged from two earlier studies known as the Iowa Youth and Families Project (IYFP) and the Iowa Single Parent Project (ISPP). Data were first collected from IYFP (N = 451) in 1989 and continued annually through 1992. Participants included the target adolescent, their parents, and a sibling within 4 years of age (52% male). IYFP families were initially recruited to study the effects of family economic stress in the rural Midwest, following an economic farm crisis that occurred in the late 1980s. The target adolescents were in seventh grade when families were first interviewed (*M* age = 12.7 years). All families were recruited across schools in eight rural counties in Iowa (99% Caucasian). Seventy-eight percent of families agreed to participate, and most families were lower middle- or middle-class with about 34% residing on farms, 12% living

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in nonfarm rural areas, and 54% living in towns with fewer than 6,500 people. In 1989, parents averaged 13 years of education and had a median family income of $33,700. Fathers averaged 40 years of age and mothers averaged about 38 years of age.

Beginning in 1991, the ISSP included target adolescents who were in ninth grade and the same age as the IYFP targets who had been participating for the previous two years (*M* age = 14.8 years) Single-parent mothers and a sibling within 4 years of age of the ISSP target adolescent also participated (N = 108). Families in the ISSP were headed by a single mother who had experienced divorce within two years prior to the start of the project. Only three families did not participate. Like the IYFP, participants in the ISPP were Caucasian, primarily lower middle- or middle-class, one-parent families who lived in the same Midwestern area. Non-residential fathers were also recruited to participate in a short telephone survey. Measures and procedures for ISSP paralleled those for the IYFP.

In 1994, the IYFP and ISSP samples were combined to create the FTP when target adolescents from both studies were in twelfth grade. In the first year of the FTP, target youth participated in the study with their parents as they had during earlier years of adolescence. Starting in 1995, the target adolescents (one year after completing high school for most) participated in the study with their romantic partners. In 1997, the study expanded to include the first-born child of the target adolescents, now adults. The target's child had to be at least 18 months old to be eligible for the study. By 2005, children ranged from 18 months to 13 years old.

The present study included 218 G2 adults who participated from adolescence through adulthood and had an eligible G3 child participating in the study by 2005. It also included G2's mother and father (when applicable). Informed consent was obtained by G1 and G2, each for their own participation and the participation of the G3 child. The data were analyzed using five developmental time periods. Time 1 examined G1 emotional distress, G1 alcohol problems, and G1 harsh parenting to G2 during G2's adolescence (age 16, 18; 1992, 1994). Time 2 included G2 alcohol problems and G2 marijuana use (age 19; 1995). Time 3 included G2 alcohol problems and G2 marijuana use two years later (age 21; 1997). Time 4 included G2 emotional distress and G2 harsh parenting towards G3 when the child was between the ages of 3 and 5 years old (1997–2005). Time 5 included G3's aggressive behavior between the ages of 6 and 10 (1999–2005).

The current study includes data from the first time G3 participated in each developmental period between the ages of 3 to 5 (1997–2005) and the ages of 6 to 10 (1999–2005). This was to assure the same child was not counted within that age range multiple times at both time 4 and 5. At time 4, there was a total of 181 3-year-olds, 24 4-year-olds, and 5 5-year-olds. At time 5, there was a total of 132 6-year olds, 37 7-year olds, 38 8-year olds, 2 9-year olds, and 1 10-year old (99 females, 111 males). The FTP has been approved by the Institutional Review Board at Iowa State University.

Procedures

During the years of 1992, and 1994, when G2s were in the 10^{th} and 12^{th} grades, all families of origin were visited twice each year by a trained interviewer in their homes.

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Each visit lasted approximately 2 hours, with the second visit occurring within 2 weeks of the first. During the first visit, each family member completed questionnaires pertaining to their relationships, substance use, and individual characteristics. During the second visit, family members participated in structured interaction tasks that were videotaped. The family interaction task was used for the present study, in which family members discussed questions from a series of 20 cards labeled for either the mother or the adolescent. Each person took turns reading questions related to subjects such as school activities, family rules, and household chores. Whoever read the card first was instructed to read each question out loud and give their answer. Then, the others were instructed to give their answers, followed by a discussion involving all family members about the answers that were given. Once they felt they had said everything they wanted to about the question, they were instructed to go onto the next card. The interviewer set up the video camera, instructed the family through a practice card, and then left the room while the participants completed the task. Independent trained observers coded the quality of interactions using the Iowa Family Interaction Rating Scales (Melby et al., 1998), which have been shown to demonstrate adequate reliability and validity (Melby & Conger, 2001).

From 1997 through 2005, G2 parents, their romantic partner, and first-born G3 child were visited in their home annually by a trained interviewer. During this visit, the G2 and his/her romantic partner completed a number of questionnaires which included measures of parenting, substance use, and individual characteristics. In addition to questionnaires, G2 adults and their G3 child participated in videotaped interaction tasks. The parent-child puzzle completion task was used in the current analyses. G2s and the G3 child were presented with a puzzle that was too difficult for the child to complete on their own, and parents were instructed that children must complete the puzzle alone, but they could provide any assistance if necessary. The puzzle task lasted 5 minutes. The puzzles varied by age so that the puzzle slightly exceeded the skill level of the child. Trained observers watched the video-recorded puzzle tasks to code aspects of parenting using the Iowa Family Interaction Rating Scales (Melby et al., 1998).

Measures

The means, standard deviations, sample sizes, and minimum and maximum scores for all study variables are provided in Table 1.

G1 Emotional Distress (Time 1).—Emotional distress was assessed through G1 self-report using items from the depression, anxiety, and hostility subscales from the SCL-R-90 (Derogatis, 1994) when the G2 adolescent was 16 and 18 years old. Response categories assessed how distressed mothers and fathers felt during the past week, ranging from 1 (not at all) to 5 (extremely). For the depression scale, parents were asked 12 questions regarding depressive symptoms such as feeling no interest in things or feelings of worthlessness (α = .94). The anxiety subscale included 10 questions assessing behavior such as nervousness or shakiness inside, suddenly feeling scared for no reason, and feeling fearful (α = .91). Finally, hostility included 5 items asking questions related to getting into frequent arguments, having temper outbursts that you were unable control, and having the urge to break or smash things (α = .77). Items from each subscale were averaged across the two

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waves for mothers and fathers and then parental depressive symptoms, anxiety, and hostility were used as three separate indicators for the latent construct in the model, demonstrating good internal consistency (α = .72).

G1 Alcohol Problems (Time 1).—G1 alcohol problems were assessed via self-report when G2 adolescents were 16 and 18 years of age. Three items assessing drinking behavior were standardized and summed for mothers and fathers separately. Then, mother and father scores were averaged to create a parental alcohol problems construct in the model. The independent items used were frequency of being drunk in the past year on a scale from 0 (never) to 3 (often), frequency of consuming 2 or 3 drinks in a single occasion in the past year, and consuming 4 or more drinks in a single occasion in the past year, with the latter two both on scales from 0 (never) to 3 (3 or more times/week). Internal consistency among these variables was sufficient (α = .82).

G1 Harsh Parenting (Time 1).—Hostility, angry coerciveness, and antisocial behavior displayed by G1 to the G2 adolescent during the videotaped family discussion task were assessed when G2 adolescents were 16 and 18 years of age. Each behavior was scored on a 9-point scale, ranging from 1 (no evidence of the behavior) to 9 (the behavior is highly characteristic of the mother). Hostility was characterized by hostile, annoyed, critical, and disapproving behavior toward the adolescent. Angry coercion was defined by an attempt to control or change the adolescent's behavior in a hostile manner. Antisocial behavior involved egotistic, immature, rebellious, and indifferent behavior toward the adolescent. Mother and father scores on each of the three behaviors were averaged together across the two waves, and then parental hostility, angry coercion, and antisocial behavior were used as separate indicators for the latent construct in the model (α = .94). The inter-rater reliability was substantial (α = .94).

G2 Alcohol Problems (Time 2).—Five independent self-reported items at age 19 were averaged together to create the G2 alcohol problems construct. First, G2s reported on their frequency of consuming 3 or 4 drinks in a row in the past 30 days and consuming 5 or more drinks in a row in the past 30 days on a scale from 0 (never) to 5 (every day). They also reported their frequency in the past year of being drunk, in trouble with their parent(s), as well as being in trouble with the police due to their drinking on a scale from 0 (never) to 3 (four or more times). These five items were standardized and summed to create a measure of G2 alcohol problems at time 2 in the model. Internal consistency among the items was sufficient (α = .87).

G2 Marijuana Use (Time 2).—Also at age 19, G2 adolescents assessed how often they had used marijuana in the past 30 days on a scale from 0 (never) to 5 (every day) via self-report.

G2 Alcohol Problems (Time 3).—Six independent self-reported items at age 21 were averaged together for the G2 alcohol problems construct at time 3. The same five items used in the time 2 alcohol problems construct were used, as well as the frequency of wanting to quit drinking but couldn't on a scale from 0 (never) to 3 (four or more times). These six

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items were standardized and summed to create a measure of G2 alcohol problems at time 3 in the model. Internal consistency among the items was sufficient (α = .76).

G2 Marijuana Use (Time 3).—Also at age 21, G2 emerging adults assessed how often they used marijuana in the past 30 days on a scale from 0 (never) to 5 (every day) via self-report.

G2 Emotional Distress (Time 4).—G2 parents reported on their level of emotional distress using the same items as G1 emotional distress from the depression, anxiety, and hostility subscales from the SCL-R-90 (Derogatis, 1994) at the age of first assessment when the G3 child was between the ages of 3 and 5 years old. Items from each subscale were averaged and then used as three separate indicators for the latent construct in the model (α = .86).

G2 Harsh Parenting (Time 4).—As with G1 to G2, hostility, angry coerciveness, and antisocial behavior from the G2 mother to the G3 child were assessed via observer report during the 5-minute puzzle task in childhood. Scores included the first time the task was completed when the child was between the ages of 3 and 5. Each of the three behaviors were used as separate indicators for the latent construct in the model and were internally consistent (α = .93) as well as demonstrated excellent inter-rater reliability (α = .95). The observers used to code the G1 to G2 parenting tasks were different from observers who coded the G2 to G3 puzzle task. Thus, different informants produced the behavioral scores for harsh parenting at Times 1 and 4.

G3 Aggression.—G2 parents completed the Child Behavior Checklist for ages 6–18 (Achenbach & Rescorla, 2000) when their child was between 6 and 10 years old. Scores included the first time the child was assessed during that age range. Aggressive behavior included 18 items from the aggression subscale. G2 parents rated each behavior on a 3-point scale, ranging from 0 (not true) to 2 (very true) regarding their child's behavior over the past two months. Items included: argues a lot, gets into fights, attacks people, makes threats, hot temper, and is disobedient at home and school. The Cronbach's alpha coefficient indicated adequate internal consistency (α = .84). Items were summed to create the manifest dependent variable in the model.

Control Variables.—First, original family structure (ISPP = 0, IYFP = 1) was taken into account. The G1 control variables measured when the G2 adolescent was 16 years old included mother and father age and family per capita income (divided by $10,000). G2 earlier alcohol use at age 16 was assessed via self-report asking the frequency of drinking beer, wine, and liquor in the past 30 days rated on a scale from 0 (never) to 3 (at least 1 time/week). Both G2 and G3 gender was also used as control variables in the model (0 = female, 1 = male). G2 age at time 4 and G3 age at times 4 and 5 were taken into account. Finally, G2 marital status at time 4 (0 = not married, 1 = married or living with someone in a marriage-like relationship) was used as a control variable in the model.

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Analytic Plan

SPSS was used to report means, standard deviations, and Cronbach's alphas on all study variables. Attrition analyses were also conducted in SPSS using independent samples *t*-tests to assess whether or not G2s who were included in the analysis had different levels of substance use at times 2 and 3 than those who were not included. Results indicated that mean levels of alcohol problems or marijuana use at times 2 or 3 did not differ significantly between those who were included in the analyses versus those who were not ($m = -.09$ vs. .06 for time 2 alcohol problems; $m = .21$ vs. .12 for time 2 marijuana use; $m = -.34$ vs. .23 for time 3 alcohol problems; and $m = .24$ vs. .19 for time 3 marijuana use). Factor loadings and the zero-order associations between variables (see Table 2), using bivariate correlations at a significance level of 0.05, were examined in M*plus* Version 8.0 (Muthen & Muthen, 2012) with a measurement model. Structure equation modeling (SEM) was estimated using M*plus* Version 8.0 to examine pathways of how predictor variables were associated with the outcome variables on the hypothesized paths (see Figure 1), using full information maximum likelihood (FIML) procedures to account for missing data. In longitudinal research, FIML is a procedure recommended and commonly used to account for missing data (Allison, 2003). FIML provides a better estimation of model parameters than methods such as listwise or pairwise deletion (Jeličić, Phelps, & Lerner, 2009). The chi-square estimate and significance value were used to assess model fit, as well as root mean square error approximation (RMSEA), and comparative fit index (CFI; Browne & Cudeck, 1993).

A measurement model was first examined to assess the associations among all study variables, as well as obtain factor loadings for the latent constructs. Next, a prospective structure equation model was tested to assess relations among hypothesized pathways as well as to establish temporal ordering. Pathways included in the prospective structure equation model are shown in Figure 1. All control variables were utilized in the final model. More specifically, G1 family per capita income, G1 mother age, G1 father age, G2 alcohol use at age 16, and original family structure were allowed to covary with G1 emotional distress, G1 alcohol problems, and G1 harsh parenting. These control variables were used as predictors of the G2 and G3 constructs in the model. G2 age and marital status were allowed to be correlated with G2 emotional distress and G2 harsh parenting as well as specified to predict G3 aggression. G3 age at time 4 was allowed to be correlated with G2 emotional distress and G2 harsh parenting, as well as predict G3 aggression. G3 age at time 5 was allowed to be associated with G3 aggression. Finally, G3 gender was used to predict G3 aggression. All control variables were specified to be associated with each other.

In addition, indirect pathways were examined using bootstrapped sampling techniques in M*plus* Version 8.0, per recommendation of Preacher and Hayes (2008) due to how easily multivariate normality can be violated when estimating multiple indirect effects. We tested the indirect effects using the bootstrap option in M*plus* with 1,000 iterations to obtain bias-corrected estimates and 95% confidence intervals (CI) of the indirect effects. All indirect pathways were tested from G1 substance use and problem behavior to G3 aggressive behavior through G2 substance use, emotional distress, and harsh parenting. The indirect effect from G2 emotional distress to G3 aggressive behavior was also examined.

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Results

The fit of the measurement model, including all control variables, to the data was good: χ^2 = 271.03, *df* = 184, $p < .001$, CFI = .97, RMSEA =.05. Standardized loadings of indicators onto the latent factors ranged from .85 to .97 for G1 harsh parenting, .81 to .99 for G2 harsh parenting, .57 to 1.0 for G1 emotional distress, and .77 to .85 for G2 emotional distress and were all statistically significant at $p < .001$. Most notably, G1 emotional distress was associated with G2 emotional distress. G1 alcohol problems were associated with G2 alcohol problems at times 2 and 3. G1 harsh parenting was associated with G2 harsh parenting. Finally, G2 emotional distress and harsh parenting when the G3 child was between the ages of 3 and 5 were both positively correlated with G3 aggressive behavior between the ages of 6 and 10.

The prospective model was estimated with all specified control variables. The model fit the data well, and result are presented in Figure 2 with standardized path coefficients. Emotional distress was stable across generations (G1-G2; β = .24, SE = .09, $p < .01$) and was correlated with G1 harsh parenting ($r = .18$, SE = .04, $p < .05$). G1 emotional distress predicted higher levels of marijuana use at age 19 (β = .15, SE = .20, $p < .05$), but did not predict G2 alcohol problems at the same time point (β = .01, SE = 1.12, $p = .85$). G1 alcohol problems was associated with G2 alcohol problems at time 2 (β = .16, SE = .11, $p < .05$), but was not related to G2 marijuana use at time 2 (β = .04, SE = .02, $p = .58$). Although the zero-order correlation between G1 and G2 harsh parenting was significant in the measurement model, when taking all other associations into account, this association was only marginally significant in the prospective model (β = .13, SE = .06, $p = .08$). G1 harsh parenting predicted higher levels of both G2 alcohol problems (β = .21, SE = .18, $p < .01$) and G2 marijuana use (β = .22, SE = .03, $p < .01$) at time 2.

G2 alcohol problems at age 19 predicted further alcohol problems (β = .54, SE = .05, $p < .001$) as well as marijuana use at age 21 (β = .27, SE = .01, $p < .001$). Marijuana use continued from ages 19 to 21 (β = .42, SE = .08, $p < .001$), but did not predict continued alcohol problems 2 years later (β = −.10, SE = .32, $p = .09$). G2 alcohol problems and marijuana use were correlated at both time points ($r = .21$, SE = .20, $p < .01$; $r = .33$, SE = .16, $p < .001$ respectively). Although G2 marijuana use at time 3 was associated with G2 emotional distress in the measurement model, when G2 alcohol use was added to the model, only alcohol problems at time 3 predicted G2 emotional distress at time 4 (β = .34, SE = .01, $p < .001$). G2 emotional distress was associated with G2 harsh parenting at the same time point, when the G3 child was between the ages of 3 and 5 years old (β = .29, SE = .35, $p < .001$), which in turn was directly associated with G3 aggression between the ages of 6 and 10 (β = .27, SE = .27, $p < .01$).

Indirect Effects

We tested the indirect effects of the associations between G1 problem behavior and G2 substance use, G1 harsh parenting and G2 harsh parenting, as well as effects of problem behavior on G3 aggression (see Table 3). All indirect effects in the model were tested, but only significant findings are shown in Table 3. For effects on G2 substance use, G1 emotional distress was related to G2 marijuana use at age 21 through G2s' use of marijuana

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at age 19. G1 alcohol problems and G1 harsh parenting were both indirectly associated with G2 alcohol problems and marijuana use at time 3 through G2 alcohol problems at time 2. Additionally, G1 harsh parenting was associated with G2 marijuana use at time 3 through G2's use of marijuana at time 2. In the model, G1 harsh parenting was not directly associated with G2 harsh parenting when taking into account all other variables, but was associated with G2 harsh parenting via G2 alcohol problems and G2 emotional distress. In terms effects on G3 aggression, there was a significant indirect effect from G2 emotional distress to G3 aggression through G2 harsh parenting when G3 was between the ages of 3 and 5. G1 alcohol problems and G1 harsh parenting were both associated with G3 aggression though G2 alcohol problems, G2 emotional distress, and G2 harsh parenting.

Discussion

The present investigation examined the role of G1 emotional distress, alcohol problems, and harsh parenting on G2 substance use, emotional distress and harsh parenting during adulthood, as well as G3 aggression in early childhood. This study adds to the literature examining mechanisms that might help explain associations between G1 to G2 problem behavior and problem behavior for the G3 child. First, results showed evidence of direct intergenerational transmission of G1 to G2 emotional distress, alcohol problems, and harsh parenting. This is consistent with earlier studies demonstrating continuity of such behavior across generations (Bailey et al., 2006; Kavanaugh et al., 2018; Neppl et al., 2009). Moreover, although the zero-order correlation between G1 and G2 harsh parenting was significant, in the prospective model this path was only marginally significant, but showed that G1 harsh parenting was associated with G2 harsh parenting via G2 substance use and G2 emotional distress. Others have found that G1 and G2 harsh parenting is associated through G2 problem behavior (Belsky, Conger, & Capaldi, 2009; Neppl et al., 2009). Results also demonstrated that G1 harsh parenting in G2's adolescence directly related to both G2 alcohol problems and G2 marijuana use at age 19, and the model showed continuity of G2 alcohol problems and marijuana use through the early emerging adulthood years. This is consistent with previous research demonstrating associations between G1 harsh parenting and G2 problem behavior (Hops, Davis, Leve, & Sheeber, 2003), as well as studies that have found continuity of substance use from adolescence to adulthood (Diggs & Neppl, 2018; Thompson, et al., 2014).

We extended earlier research by evaluating the influence of G1 problem behavior and G2 substance use on G2 emotional distress and harsh parenting when G3 was 3 to 5 years old, and G3 aggression during the early elementary years. Results showed significant indirect pathways from both G1 alcohol problems and G1 harsh parenting to G3 aggression through G2 alcohol at age 19 to G2 alcohol at 21 to G2 emotional distress to G2 harsh parenting. Finally, G1 emotional distress related to G3 aggression via G2 emotional distress to G2 harsh parenting. This is consistent with the premise that stressors experienced in the family of origin influence emotional health and parenting in adulthood, which affects the wellbeing of the next generation child (Neppl, et al., 2016). Relatedly, Bailey et al. (2006) examined the role of G1 substance use on G3 problem behavior and found that G1 substance use indirectly related to G3 problem behavior through G2 problem behavior and substance use.

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Results also showed that G1 emotional distress was associated with G2 marijuana use at age 19, but not with alcohol problems at the same time point. There is some evidence to suggest that marijuana use is related to coping with negative emotions and psychological distress (Hyman & Sinha, 2009; Moitra, Christopher, Anderson, & Stein, 2015). However, to our knowledge, limited studies have examined the intergenerational influence of emotional distress, substance use, and parenting in one model. Future studies should continue to investigate the role of G1 emotional distress on G2 substance use behaviors while taking other G1 problem behaviors such as alcohol use and harsh parenting into account. In addition, results showed that G2 alcohol problems at age 19 related to G2 marijuana use at 21 years old but not the other way around. This is consistent with the developmental sequence of drug involvement, where the use of alcohol and nicotine precede the use of marijuana (Kandel, 2003).

Moreover, the path from G2 marijuana use at age 21 to G2 emotional distress was also not significant. It is important to note that when alcohol problems were not included in the model, the path from G2 marijuana use to G2 emotional distress was significant, but when G2 alcohol problems were included in the model, this path was no longer significant. Indeed, there is evidence of comorbidity between alcohol problems and depression (Grant and Harford, 1995), and that drinking behaviors increase the risk for depressive symptoms (Pedrelli, Shapero, Archibald, & Dale, 2016; Peirce, Frone, Russell, Cooper, & Mudar, 2000). It could also be that rural young adults may be at a higher risk for substance use problems than those from urban areas (Martin, Inchley, Marshall, Shortt, & Currie, 2019; Rueter, Holm, Burzette, Kim, & Conger, 2007). In fact, a large majority of the rural G2 youth in the current study experienced a high prevalence of substance use disorders with many continuing into adulthood (Rueter, et al., 2007). Finally, results from the current study may also be in part due to the assessment of marijuana *use*, rather than problems with the substance, as it has been suggested that stronger associations may occur for abuse and dependence, rather than use (Bailey et al., 2006; Walters, 2002). Regardless, future studies should consider polysubstance use as alcohol and other drugs often occur in combination.

There are limitations worth noting. First, the sample was primarily white and came from the rural Midwest which could limit generalizability of findings. Also, multiple generation studies might include selective sampling over time. Thus, while the current findings are noteworthy, this model should be replicated with samples that are more diverse. Another limitation is the current study did not include G1 marijuana in the model as no G1 mothers or fathers engaged in marijuana use over the previous year. It is possible that in other samples, G1 marijuana use could relate to G3 aggressive behavior in the same manner as findings with alcohol problems in the current study. Moreover, frequency of marijuana use was the only item asked of G2s involvement specifically with marijuana. Thus, more items regarding amount or problems with only marijuana are needed. In addition, alcohol problems included two independent questions regarding frequency of drinking 3 or 4 more drinks in a row and 5 or more drinks in a row. Participants provided a response to both items, however it is not probable they would answer the same frequency for both items. This measure was worded such that consuming 3 or 4 drinks occurred on a separate occasion than drinking 5 or more drinks. Alcohol data were also collected some time ago and may not be consistent with current trends. However, results from the Iowa Youth Survey (IYS) indicate

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that adolescents in Iowa report alcohol problems such as binge drinking rates higher than national averages (Iowa Consortium for Substance Abuse Research and Evaluation, 2013). Finally, in addition to G1 environmental influences on G2 substance use and other problem behavior, there could be alternative explanations for the current findings. For example, there could be shared genetic risk for substance use and dependence for parents and adolescents (Polderman et al., 2015). Nevertheless, it is important to investigate environmental factors that could contribute to substance use and later problem behavior which have consequences for the G3 child.

These findings have several implications for future prevention and intervention efforts designed to break the intergenerational continuity of problem behaviors, such as substance use and emotional distress. Foremost, these results help elucidate the mechanisms through which such problem behaviors experienced in the family of origin have lasting effects across multiple generations. We found that intergenerational transmission of alcohol problems from G1 to G2 child, and subsequent continuity of alcohol problems into G2 young adulthood was a critical link in this process. Thus, the results underscore how intergenerational risk may be reduced if substance use can be curtailed in adolescence, before problematic use patterns are established. This view is supported by other research that has found evidence for intergenerational transmission of substance use when considering continuity from substance use during emerging adulthood, but not when limiting use to adolescence (Knight, Menard, and Simmons, 2014).

Although there are a number of universal prevention programs (school-based and family-based) that have been found to reduce the likelihood of substance use during adolescence (Fleming et al, 2012; Park et al., 2000; Spoth et al., 2009), recent trends in prevention science highlight the importance of adaptive intervention strategies that tailor the type of intervention in order to match the intervention strategy to the individual's risk (Collins, Murphy, & Bierman, 2004). For example, the Family Check-Up (FCU; Dishion et al., 2002) is a multimodal family intervention that is designed to reduce adolescent problem behavior and improve mental health by supporting family engagement and improving parenting practices. The FCU uses a comprehensive assessment of self-report and observational data to tailor the intervention to specifically address a family's strengths and needs and has been shown to reduce problem behavior and substance use among adolescents (Caruthers, Van Ryzin, & Dishion, 2014; Stormshak et al, 2011).

Although there is evidence that interventions can also reduce risk behavior among emerging adults, including binge drinking (Brody et al., 2012; Turrisi et al., 2013; Wood et al., 2010), very few family-based interventions have been designed to target this vulnerable age. Given the strong links found between G2 alcohol problems, emotional distress, and harsh parenting, our results also highlight the importance of identifying and addressing barriers to mental health services among all ages, but particularly during emerging adulthood when prevalence rates of depression and other mental health disorders are highest (Cadigan, Lee, & Larimer, 2019). Finally, our results also support the value of delivering interventions during the elementary school years, as aggressive behavior in childhood is both a consequence of G1 and G2 behavior, but is also shown to be a marker of the child's own eventual use. (Averdijk, Zirk-Sadowski, Ribeaud, & Eisner, 2016). In sum, results suggest

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that G1 problem behavior as experienced in G2 adolescence plays an important role in G2 substance use in emerging adulthood, which leads to G2 emotional distress and G2 harsh parenting in adulthood, which relates to G3 problem behavior in the early elementary school years.

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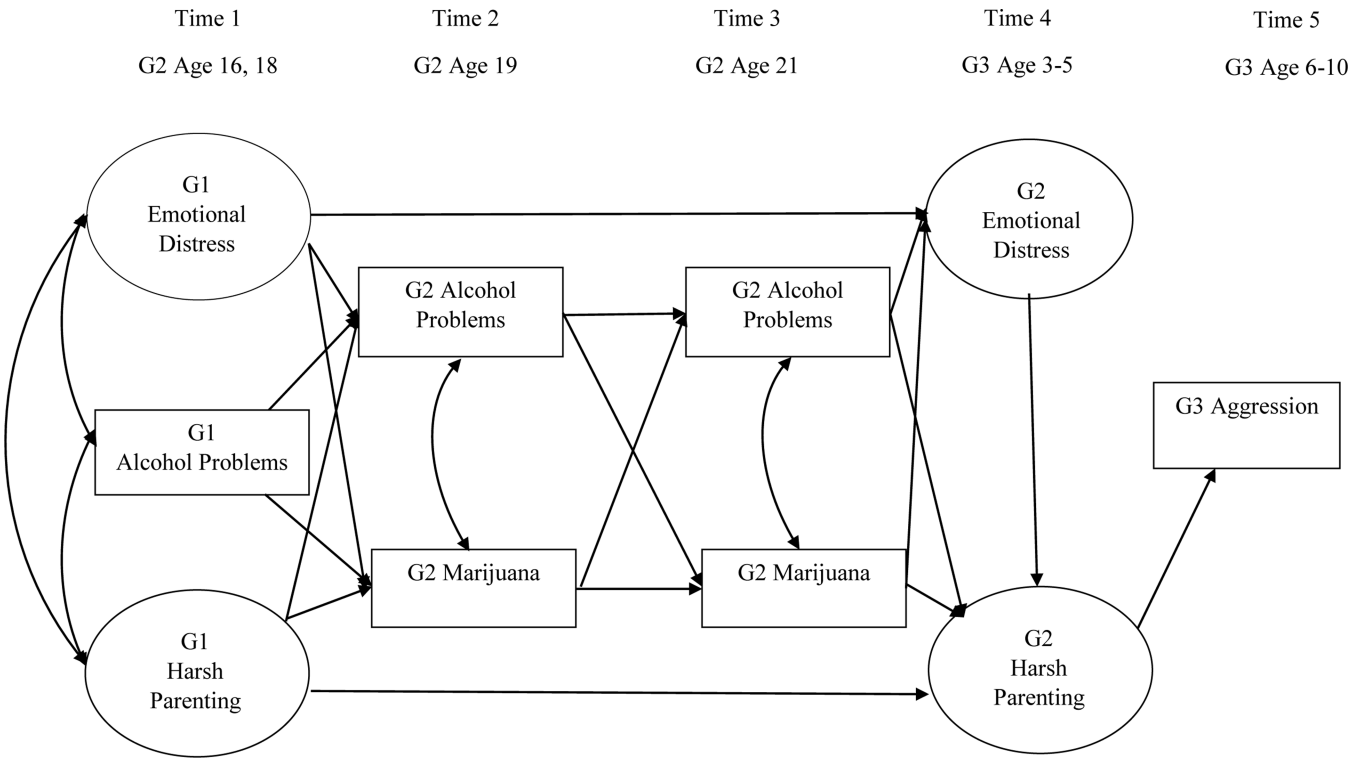

Figure 1.
Conceptual Model
Notes. G1 = Generation 1; G2 = Generation 2; G3 = Generation 3.

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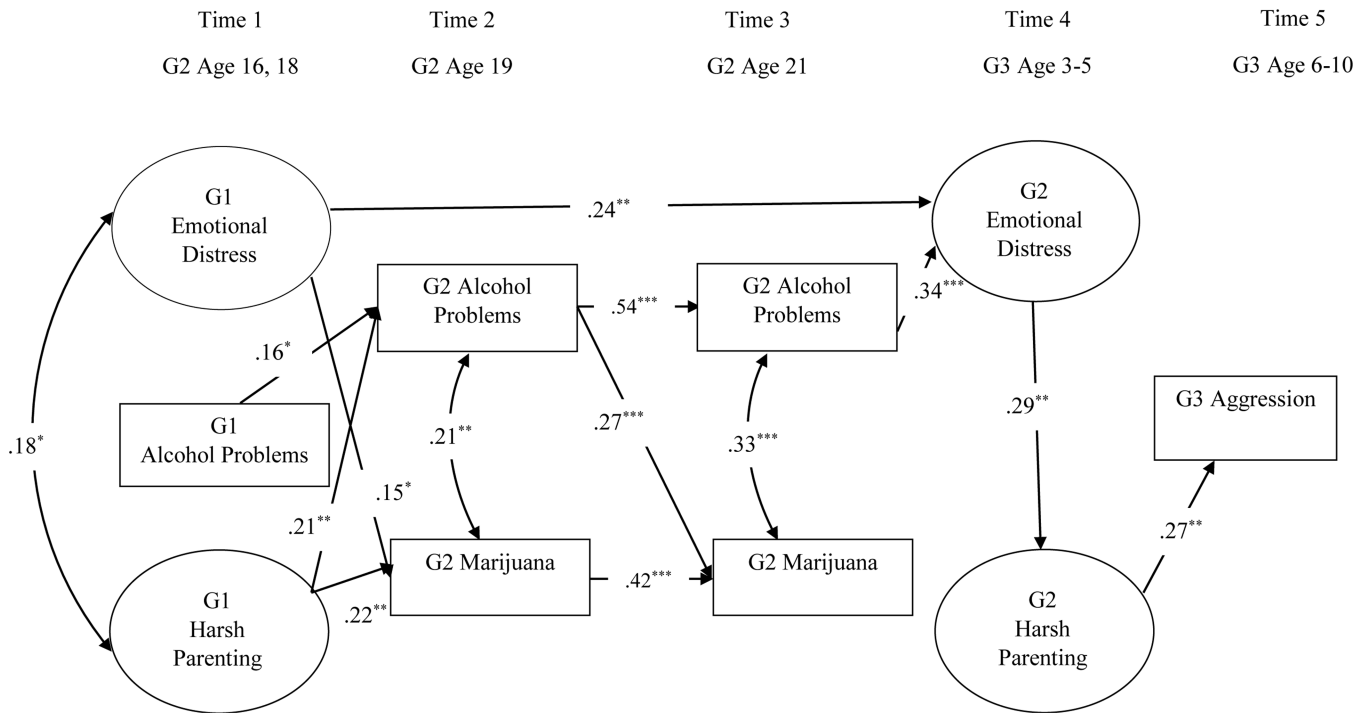

Figure 2.

Statistical Model

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

Notes. Model fit $\chi 2 = 317.53$ (233), $p < .001$, CFI = .963, RMSEA = .041. G1 = Generation 1; G2 = Generation 2; G3 = Generation 3. Standardized significant pathways shown in the model. This model includes the control variables of original family structure, G1 family per capita income, adolescent alcohol use at age 16, G1 mother age, G1 father age, G2 marital status and age at time 4, G2 gender, G3 gender, and age at times 4 and 5.

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Table 1.

Descriptive Statistics

	Mean	SD	Minimum	Maximum	N
G1 Emotional Distress					
Anxiety	1.27	0.32	1	3.25	212
Aggressive Behaviors	1.14	0.20	1	2.35	212
Depressive Symptoms	1.51	0.54	1	3.48	212
G1 Alcohol Problems	0.00	2.58	−2.29	9.05	208
G1 Harsh Parenting					
Hostility	3.94	1.82	1	9	202
Angry Coercion	2.56	1.63	1	9	202
Antisocial Behavior	4.35	1.63	1	9	202
G2 T2 Alcohol Problems	−0.09	4.10	−3.31	22.85	205
G2 T2 Marijuana	0.21	0.72	0	5	205
G2 T3 Alcohol Problems	−0.34	3.95	−3.51	26.49	204
G2 T3 Marijuana	0.24	0.87	0	5	204
G2 Emotional Distress					
Anxiety	1.21	0.40	1	4.64	212
Aggressive Behaviors	1.19	0.43	1	5	212
Depressive Symptoms	1.35	0.44	1	4.33	212
G2 Harsh Parenting					
Hostility	1.86	1.53	1	9	218
Angry Coercion	1.67	1.46	1	9	218
Antisocial Behavior	2.77	1.69	1	9	218
G3 Aggression	7.43	4.95	0	23	120
Family Structure (1 = IYFP)	0.81	0.40	0	1	218
G1 Per Capita Income	0.84	0.81	−4.65	5.80	203
G1 Mother Age	40.25	3.81	32	56	197
G1 Father Age	42.14	4.45	33	60	194
G2 Alcohol Use (Age 16)	0.71	0.73	0	3	199
G2 Gender (1 = Male)	0.40	0.49	0	1	218
G2 T4 Age	25.8	2.40	20	30	217
G2 Marital Status	0.86	0.35	0	1	217
G3 Gender (1 = Male)	0.54	0.50	0	1	218
G3 T4 Age	3.18	0.47	3	5	218
G3 T5 Age	6.10	0.44	6	10	120

Notes. SD = Standard Deviation. G1 = Generation 1, G2 = Generation 2, G3 = Generation 3.

T2 = Time 2, T3 = Time 3, T4 = Time 4, T5 = Time 5.

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Table 2.

Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. G1 Emotional Distress	-													
2. G1 Alcohol Problems	.04	-												
3. G1 Harsh Parenting	.18*	.07	-											
4. G2 T2 Alcohol Problems	.06	.17*	.19*	-										
5. G2 T2 Marijuana	.24***	.09	.30***	.29***	-									
6. G2 T3 Alcohol Problems	.09	.18**	.09	.61***	.13	-								
7. G2 T3 Marijuana	.17*	.07	.21**	.40***	.52***	.44***	-							
8. G2 Emotional Distress	.29***	.04	.15	.17*	.17	.31***	.25**	-						
9. G2 Harsh Parenting	.17*	−.02	.20**	.15	.05	.11	.11	.31***	-					
10. G3 Aggression	.08	.13	.12	−.02	.06	.16	.12	.23**	.24**	-				
11. Family Structure	−.32***	−.09	−.21**	.01	−.26***	−.01	−.15*	−.08	−.03	−.04	-			
12. G1 Per Capita Income	−.24**	−.07	−.10	−.10	−.10	.05	−.09	−.08	−.10	−.10	.18*	-		
13. G1 Mother Age	.06	−.09	−.28***	−.03	−.14*	−.07	−.12	−.06	−.03	.02	.09	.13	-	
14. G1 Father Age	.03	−.06	−.22**	−.08	−.10	−.10	−.12	.02	−.04	.05	.02	.07	.82***	-
15. G2 Age 16 Alcohol Use	.10	.17*	.14*	.22**	.22**	.33***	.15*	.13	.15*	.01	−.12	−.06	−.03	−.03
16. G2 T4 Age	−.09	.02	−.28***	.04	−.17*	.07	−.06	−.11	−.23**	−.10	.20**	.11	.07	.06
17. G2 Marital Status	.01	−.07	−.04	−.06	−.05	.00	.03	.01	.00	−.07	.10	−.04	−.07	−.05
18. G2 Gender (1 = Male)	−.03	−.09	−.09	.27***	.09	.29***	.16*	−.11	−.01	−.02	.02	−.04	−.08	−.09
19. G3 Gender (1 = Male)	.00	.11	.04	−.01	.01	.02	−.01	−.06	.01	.07	−.05	.00	.06	−.02
20. G3 T4 Age	.04	.06	.06	.00	.05	−.12	−.03	−.05	.13	.15	−.01	−.04	.10	.02
21. G3 T5 Age	.13	−.23	.07	.00	.04	.00	.00	.10	.14	.04	−.15	−.19	−.06	−.08

	15	16	17	18	19	20	21
1. G1 Emotional Distress							
2. G1 Alcohol Problems							
3. G1 Harsh Parenting							

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	15	16	17	18	19	20	21
4. G2 T2 Alcohol Problems							
5. G2 T2 Marijuana							
6. G2 T3 Alcohol Problems							
7. G2 T3 Marijuana							
8. G2 Emotional Distress							
9. G2 Harsh Parenting							
10. G3 Aggression							
11. Family Structure							
12. G1 Per Capita Income							
13. G1 Mother Age							
14. G1 Father Age							
15. G2 Age 16 Alcohol Use	-						
16. G2 T4 Age	−.15*	-					
17. G2 Marital Status	−.13	.23**	-				
18. G2 Gender (1 = Male)	−.14*	.12	.12	-			
19. G3 Gender (1 = Male)	.06	−.13	−.09	.06	-		
20. G3 T4 Age	.03	.21**	−.09	−.04	.19**	-	
21. G3 T5 Age	.08	−.43**	−.15	.07	−.06	−.08	-

*p < .05

**p < .01

***p < .001

Notes. G1 = Generation 1, G2 = Generation 2, G3 = Generation 3. T2 = Time 2, T3 = Time 3, T4 = Time 4, T5 = Time 5.

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Table 3.

Indirect Effects

Model Pathway	Unstandardized Estimate	Standardized Estimate	95% Bootstrapped CI
Effects on G2 Substance Use			
G1 ED→G2 T2 Marijuana→G2 T3 Marijuana	.201	.063	(.006, .649)
G1 Alcohol→G2 T2 Alcohol→G2 T3 Alcohol	.128	.085	(.012, .267)
G1 Alcohol→G2 T2 Alcohol→G2 T3 Marijuana	.014	.042	(.000, .037)
G1 HP→G2 T2 Alcohol→G2 T3 Alcohol	.253	.113	(.044, .518)
G1 HP→G2 T2 Alcohol→G2 T3 Marijuana	.028	.057	(.000, .077)
G1 HP→G2 T2 Marijuana→G2 T3 Marijuana	.045	.091	(.015, .113)
Effect of G1 Harsh Parenting on G2 Harsh Parenting			
G1 HP→G2 T2 Alcohol→G2 T3 Alcohol→G2 ED→G2 HP	.010	.011	(.000, .043)
Effects on G3 Aggression			
G1 Alcohol→G2 T2 Alcohol→G2 T3 Alcohol→G2 ED→G2 HP→G3 AGG	.004	.002	(.000, .025)
G1 HP→G2 T2 Alcohol→G2 T3 Alcohol→G2 ED→G2 HP→G3 AGG	.009	.003	(.000, .051)
G2 ED→G2 HP→G3 AGG	1.161	.079	(.071, 2.618)

Notes. CI = Confidence Interval; G1 = Generation 1, G2 = Generation 3, G3 = Generation 3; ED = Emotional Distress, HP = Harsh Parenting, AGG = Aggression; T2 = Time 2; T3 = Time 3. Only significant indirect effects are shown.

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