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Parental Divorce and Family History of Alcohol Disorder: Associations with Young Adults' Alcohol Problems, Marijuana Use, and Interpersonal Relations

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Abstract

Background—This study used prospective data from 706 young adults to evaluate the impact of parental divorce and family history of alcoholism (FH+) on the outcomes of offspring alcohol problems, marijuana use, and interpersonal relationships with parents.

Methods—Assessments of parental divorce were based on parent reports, and young adult outcomes were collected from an offspring cohort (n=706; X age=33.25 yrs.; females=53%) via computer-based individual interviews (CAPI and ACASI). Family history of alcohol disorders for parents was based on assessments by mothers, fathers, and young adults.

Results—Parental divorce significantly predicted marijuana use but not alcohol problems. Maternal, but not paternal, alcoholism also significantly predicted marijuana use. Two-way interactions indicated that sex moderated several of the relationships. For example, among those with divorced parents, daughters reported higher levels of conflict with fathers than sons, and sons reported lower levels of maternal support than daughters. Paternal alcoholism was also associated with higher levels of alcohol problems among sons relative to daughters. There was also a significant two-way interaction between divorce status and maternal alcoholism indicating that young adults who experienced both maternal alcoholism and parental divorce had the highest levels of marijuana use.

Conclusions—These findings highlight the role that parental divorce and FH+ have on alcohol problems, marijuana use, and interpersonal relationships in young adulthood, and how sex may moderate some of these more nuanced relationships.

Keywords

Parental Divorce; Family History of Alcoholism; Young Adult; Alcohol Use; Parent Conflict; Parent Support

A relatively recent literature has emerged on the combined influences of parental separation/divorce and family history of alcoholism (FH+) on offspring outcomes (Grant et al., 2015; Thompson et al., 2008; Waldron et al., 2014a, b). This literature has supported significant

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associations between these two risk factors and earlier onset substance use among adolescents and early young adults in several large twin cohort studies. Sadler et al. (2017) also used a twin study that demonstrated that these two risk factors were associated with lower educational attainment in adulthood across white and black samples. Using cross-sectional general population data from the National Epidemiologic Survey of Alcohol Related Conditions (NESARC), Thompson et al. (2008) reported that after controlling for parental history of drug disorders, major depressive disorder, and antisocial behavior problems, parental divorce still significantly predicted alcohol dependence in offspring.

These prior research findings suggest the potential value of studying the joint contributions of parental divorce and FH+ on offspring outcomes. In this study, we used a developmental perspective (Schulenberg, Maggs, & O'Malley, 2003; Windle & Davies, 1999) that focused on functioning in young adulthood with regard to substance use indicators (alcohol problems, marijuana use) and interpersonal relations (interpersonal conflict and support) with parents. Young adulthood is a phase in the lifespan, relative to earlier phases (e.g., emergent adulthood, adolescence), when a number of relevant changes often occur for the variables of interest in this study. For example, with regard to substance use, many investigators have reported a decline (maturing out) in substance use (Bachman et al., 2002), as well as a major decrease in the initial (or first) onset of substance disorders (Verges et al., 2012; 2013). Likewise, stress associated with multiple role changes (e.g., marriage, parenthood) may occur, and the quality of interpersonal relationships with parents may serve to buffer (or exacerbate) the stressfulness of these changes (Bachman et al., 2002; Kandel, Davies, & Raveis, 1985). Hence, this study examines outcomes related to current young adult functioning in the domains of substance use and interpersonal relationships with parents because they serve as indicators, or markers, of broader young adult functioning. The dual risk factors of parental divorce and FH+ were studied in relation to these important young adult developmental outcome domains.

In this study, we focused on three issues to extend research on this topic. First, much of the research in this area has focused on adolescents and emergent adults (ages 19–25 years), with a few studies (Thompson et al., 2008; Waldron et al. 2014b) including a broader age span (e.g., 18–65+ and 12–31 years, respectively), though not focusing specifically on development and developmental outcomes. In this study, we sought to extend the findings of these prior studies that included young adults (Thompson et al., 2008; Waldron et al. 2014b) to examine the joint contributions of parental divorce and FH+ on young adult development at age 33 years. By focusing on this phase of the lifespan, we expanded our outcomes to include not only relevant current substance outcomes (i.e., alcohol problems, marijuana use), but also features of interpersonal relationships (i.e., conflict, support) with parents to facilitate a broader view of their possible long-term associations with parental divorce and FH+. A number of studies on parent-adult child relationships have indicated ongoing conflict with fathers for offspring from divorced families relative to non-divorced families, along with less strong supportive relationships with mothers (Aquilino, 1994; Daatland, 2007; Kalmijn, 2015; Zill et al., 1993). To our knowledge, this issue of young adult relationship quality with parents has yet to be addressed by considering the joint risk factors of parental divorce and FH+.

Second, the measurement of FH+ has been mixed in prior studies, with some studies reporting only on paternal alcoholism (Grant et al., 2015), other studies reporting on either maternal or paternal alcoholism to designate family history positive status (Thompson et al., 2008), and still others reporting on the separate and co-occurrence of maternal and paternal alcoholism (Thompson et al., 2013; Waldron et al., 2013). Findings regarding the risk associated with offsprings' problem-drinking and alcohol disorders for one versus both parents have generally indicated increased risk when both parents (versus one parent) have an alcohol disorder, though the magnitude of the increase for both parents (expressed as an odds ratio) has varied from 2.75 (Lieb et al., 2002) to 4.44 (Yoon et al., 2013). Thompson et al. (2013) also reported a doubling of risk for alcohol dependence among offspring of divorced parents who were FH+ for alcohol dependence, and a tripling of risk if both parents were FH+.

Because a secondary interest in this study was the investigation of sex as a moderator of parental divorce and FH+ for a wider-range of substance use and interpersonal relationship outcomes in young adulthood, we assessed both maternal and paternal alcoholism. This enabled us to distinguish, for instance, if maternal or paternal alcoholism in conjunction with parental divorce was more strongly associated with son or daughter alcohol problems, marijuana use, and interpersonal conflict and support. Some studies have indicated significant sex differences for offspring with regard to parental alcoholism (Sørensen et al., 2011; Yoon et al., 2013), with female offspring at higher risk of alcohol or substance disorders. Other studies have indicated no sex differences with regard to offspring's risk for alcohol or substance disorders (Lieb et al., 2002; Mellentin et al., 2016). And yet, a recent study indicated that maternal alcohol problems among children of divorced parents was associated with a delayed onset of alcohol initiation among girls (Waldron et al., 2018).

Third, a limited number of studies have focused on adolescent and young adult substance use outcomes in relation to the age of offspring when the parental divorce occurred. For those substance-related studies that have been completed, early adolescence has been identified as a risk period for early alcohol initiation (Grant et al., 2015; Waldron et al., 2014a; Waldron et al., 2014b). Other, non-substance-focused studies (Cherlin et al., 1998) indicated that parental divorce occurring between the ages of 7 to 22 years yielded poorer mental health outcomes in adulthood than parental divorce after age 22 years. We sought to extend the investigation of this research focus on age-of-offspring-when-parental-divorce-occurred to the outcome domains of substance use and parent-adult child interpersonal relationship factors within the context of a FH+.

The goals of this study were to evaluate the individual and moderated influences of parental divorce, family history of maternal and paternal alcoholism, and sex on both substance-related (alcohol problems, marijuana use) and interpersonal factors (support from and conflict with parents). Variation in age of parental divorce was investigated as an additional risk factor for the young adult outcomes. Specific hypotheses were:

1. Children of divorced parents (CODPs) will have higher levels of alcohol problems and marijuana use than non-CODPs.

2. FH+ status will predict higher levels of alcohol problems and marijuana use relative to family history negative (FH−) status.

3. Positive CODP status will interact with FH+ status to predict higher alcohol problems and marijuana use, as well as more negative interpersonal functioning (i.e., higher conflict, lower support) with parents.

4. A younger age at divorce will be associated with higher levels of alcohol problems and marijuana use.

As noted previously, a secondary aim was to examine possible sex differences for the aforementioned hypotheses. Prior research on children of divorced parents summarized by Amato (2000; 2010) indicated mixed findings with regard to sex differences in adjustment outcomes in childhood, adolescence, and adulthood. Although there are theories related to sex differences, such as in the area of depression, currently there is little theory or consistent empirical findings to guide specific hypotheses for sex differences in this research area and we therefore have no *a priori* hypotheses related to this issue.

MATERIALS AND METHODS

Participants

The data were collected as part of a larger, multi-wave panel design focused on risk factors and adolescent substance use (Windle & Wiesner, 2004). The initial principal objective of the study was to assess developmental changes in alcohol and other substance use among 1205 teens during the high-school years (with four waves of assessment at six-month intervals occurring from 1988–1990) in relation to a range of risk factors (e.g., temperament, peer substance use, and FH+). Data were collected within high-school settings and the overall student participation rate was 76%. At Wave 1, the sample consisted of high-school sophomores (52%) and juniors (48%) recruited from two homogeneous suburban public high-school districts (a total of three high schools) in Western New York. Sample retention across the first four waves of measurement was uniformly high, in excess of 90%. Subsequent to receiving informed consent both from a parent and the target adolescent, a trained survey research team administered the paper-and-pencil survey to adolescents in large groups (e.g., 40–50 students) in their high school setting at each wave. The survey took about 45–50 minutes to complete and subjects received $10.00 for their participation.

There was approximately a seven-year gap between the Wave 4 assessment in adolescence and the Wave 5 data collection that occurred when the average age of the young adults was 23.8 years, and then five-year gaps between Wave 6 (age=28.9 years) and Wave 7 (age=33.5 years). Across the course of this 23-year longitudinal study, for young adults, 46.8% of subjects participated at all 7-waves, 20.4% at 6-waves, 17.8% at 5-waves, 13% at 4-waves, and less than 2% at less than four waves; hence, 85% of the young adult sample participated at five or more waves of measurement.

The Waves 5–7 assessments were modified from Waves 1–4 in that data collection changed from a large group, in-school survey format to individual interviews of the young adults in their homes or at the researchers' institutional facility. At all waves of the study,

confidentiality was assured with a U.S. Department of Health and Human Services Certificate of Confidentiality. This study was reviewed and approved by the Institutional Review Board of the University at Buffalo. Signed informed consent was obtained from participants before each wave of assessment.

With regard to similarities of our sample's substance use relative to national data, the prevalence of using marijuana one or more times in the last six-months in our sample was 15.4%; for the same year (2010) as our data collection, the prevalence of using marijuana one or more times in the Monitoring the Future Surveys (Schulenberg et al., 2017) for young adults aged 31–35 years was 14.6% annually and 9–11% in the last 30-days. In previous analyses, we also found that during the adolescent years our sample's use of alcohol, marijuana, cigarettes, and other substances was similar to that reported in national surveys (Windle, 1996).

To address possible systematic bias associated with selective dropout, we specified and tested two statistical models (2-group MANOVAs, dropouts vs. retained groups) that used Wave 4 data for participants who participated in this study (i.e., of the 706 who participated at Wave 4) and those who did not meet criteria to participate in this study (i.e., the dropout sample). We selected variables from both primary caregivers and adolescents to span factors that may reflect bias, including indicators of socioeconomic status, alcohol and other substance use, and family cohesion. The first MANOVA model focused on the following seven primary caregiver (dependent) variables: family income, family size, primary caregiver education level, partner's education level, primary caregiver alcohol use, primary caregiver marijuana use, and family cohesion. This model yielded a non-significant omnibus *F-test* statistic (*F* with 7, 227 *df=1.44)* and none of the univariate breakdowns was statistically significant. A similar MANOVA model was tested with the following six adolescent (dependent) variables: alcohol use, binge drinking, marijuana use, other illicit drug use, stressful life events, and family cohesion. This model yielded a non-significant omnibus *F-test* statistic (*F* with 6, 308 *df=1.31)* and none of the univariate breakdowns was statistically significant. Based on these findings, there was little evidence of selective dropout for the sample used in this study.

In the current study we used data from 706 participants, and 53% were females. Although more cases were available if data were restricted only to young adults (*n*=855), family-based data that included both young adult's and at least one parent's data were available for 706 participants. It is important to note that both parents (mothers and fathers) were not invited to participate until Wave 5 and some parents elected not to participate. Furthermore, we excluded 33 young adult participants due to parental death. Preliminary analyses indicated higher rates of depression for these participants and we sought to retain a "purer" non-divorced parental offspring group without the confounding of parental death and associated elements (e.g., potential reduction in family income, family grief). At Wave 7, the average age of the young adult participants was 33.25 years (SD=1.19), average educational attainment level was 16.34 years (SD=2.13), and average income was 7.68 (SD=1.47), with income categories ranging from *1=less than $6,000* to *10=$150,000 or more (7=$40,000–$54,999; 8=$55,000–$69,999)*. With regard to employment, 77.9% were employed full-time, 11.8% part-time, 4.7% were homemakers, and 4.7% were unemployed. With regard to

marital status, 53.7% were married, 39.7% were single (never married), 6.4% were divorced, and 0.1% were widowed.

Missing values for approximately 20% of the individual responses were estimated using the full information maximum likelihood method.

Procedure

At Wave 7, one-on-one interviews were conducted either in the subjects' homes or at the investigators' host institute. Subjects were paid $40 to complete an interview that lasted approximately 2 hours. Using computerized-interview data collection methods, FH+ data and personal psychiatric data were collected at Waves 5 and 6, with parents and young adults as informants.

Measures

Sociodemographic variables—A series of questions were asked pertaining to sex, marital status, education level, occupational status, and family income.

Parental divorce—At the four waves of assessment during adolescence (at six-month intervals), and then during Waves 5 to 7, primary caregivers were asked if they had been divorced (No or Yes) and, if so, how long ago had the divorce occurred. Participants who provided an affirmative response for parental divorce received a score of "1"; all other participants received a score of "0" for this binary variable.

Psychiatric Disorders—The World Health Organization—Comprehensive International Diagnostic Interview (WHO—CIDI) was used at Waves 5 and 6 to assess participating mothers' and fathers' lifetime substance abuse and mental health disorders (WHO, 1997). The WHO-CIDI is a flexible semi-structured interview schedule in that diagnoses may be made across several classification systems (e.g., DSM-IV, ICD-10); DSM-IV diagnosis were used in this study. The WHO-CIDI was administered to participants by trained lay interviewers following interviewer training at the University of Michigan. Reliability and validity data for the WHO-CIDI have been reported (WHO, 1997). The WHO-CIDI interview, or interviews with minor modifications that are similar to it, have been used extensively in epidemiologic studies in the United States (Kessler et al., 2005) and internationally (Andrade et al., 2003). We used data from maternal and paternal participants' self-reports of alcohol disorders.

Family History of Alcohol Disorders—The Family History Assessment Module (FHAM; Bucholz et al., 1994; Rice et al., 1995) was developed for the Collaborative Study on the Genetics of Alcoholism. In this study, it was completed by participating parents (in reference to their spouse) and young adults (in reference to their parents) at Waves 5 and 6 to assess family history diagnoses of first-degree relatives for alcohol disorders. The FHAM was administered to more comprehensively assess familial psychiatric disorders, since the WHO-CIDI collected psychiatric data on only the target participant being interviewed. For example, more mothers than fathers participated; thus, we were able to collect psychiatric data on non-participating fathers via participating mothers and young adult children using

the FHAM. Several studies have supported high retest and interrater reliability and validity of this family history measure (Buckholz et al., 1994, 1995; Hesselbrock et al., 1999). A positive diagnosis for parental disorder was indicated if the ratings of any of three raters (self, spouse, young adult) met the criteria for an alcohol disorder; DSM-III-R diagnostic criteria were used in this study. While the CIDI used DSM-IV criteria and the FHAM used DSM-III-R criteria, findings by Grant (1996) indicated that the agreement between DSM-III-R and DSM-IV diagnosis for lifetime Alcohol abuse and/or dependence was 0.90.

Interrater agreement (i.e., kappas) for the three raters were in the fair agreement range of .22–.31 (Landis & Koch, 1977). The typical non-agreements were in the direction of a higher diagnosis rate provided by fathers and mothers regarding their own alcohol disorder status relative to other raters. These findings are not surprising because the alcohol disorder may have occurred prior to marriage and/or prior to the birth and life experience of the young adults and not have been discussed or known by raters.

Alcohol Problems Index (API)—At Wave 7, young adults completed thirteen items which were used to assess a range of undesirable consequences of drinking alcohol during the previous six months (Windle & Windle, 2017). Items measured experiences during, or as a consequence of, alcohol use in domains such as compulsive drinking style and loss of behavioral control. Each item was scored "0" if no problem was endorsed and "1" if 1 or more occurrences of the problem was endorsed. Total scores ranged from 0–13 alcohol problems. The alpha with this sample was .79, and prior reports of test-retest reliability coefficients across six-month intervals have ranged from .61–.69 (Davies & Windle, 1997).

Marijuana use—At Wave 7, young adults were asked to self-report the frequency of their marijuana use during the last 6 months using a 7-point Likert scale that ranged from *1="never used"* to *7="used every day*".

Quality of Relationships Inventory (QRI)—The QRI (Pierce, 1994; Pierce et al, 1991) is an 18-item self-report measure that was used at Wave 7 to assess young adults' relationship-based perceptions of social support from and conflict with their parents. The QRI assesses dimensions of: 1) *relationship support*, which reflects the extent to which the participant can rely on the referent person (e.g., father) for assistance across different types of situations (e.g., *"To what extent can you really count on this person to distract you from your worries when you feel under stress?"*); and 2) *interpersonal conflict*, which refers to the extent that the participant experiences angry or ambivalent feelings toward the referent person (e.g., *"How angry does this person make you feel?")*. A 4-point Likert scale was used that ranged from *1="not at all"* to *4="very much".* The alphas for the conflict and support scales were .92 and .91, respectively.

Statistical Analysis Plan—To evaluate our initial two hypotheses about higher levels of alcohol problems and marijuana use among offspring of parental divorced families and from FH+ families, we specified a "main effects" multivariate general linear model (GLM) with alcohol problems and marijuana use as the dependent variables, and the four main effects of sex (1=male, 2=female), parental divorce status (0=no divorce, 1=divorce), paternal alcoholism (1=negative, 2=positive), and maternal alcoholism (1=negative, 2=positive); the

three covariates of age, educational level, and household income were also included in the model. For the third set of hypotheses, which included model specified interactions, we used two multivariate GLMs: one of the GLMs was for the two substance-related dependent variables of alcohol problems and marijuana use, and the other was for the four interpersonal dependent variables (mother and father conflict and support). For each of the two multivariate equations, the specification included four main effects of sex, parental divorce status, paternal alcoholism, and maternal alcoholism; 6 two-way interactions for pairwise relationships among the main effects (e.g., sex x parental divorce status); and the three covariates of age, educational level, and household income. Using conventional standards for evaluating statistical power (i.e., alpha=.05, power=.80), the two multivariate models were adequately powered to test the null hypothesis. For the four interactions, statistical power was adequate for some interactions (e.g., sex X parental divorce status on conflict with father) but in the .70 region for other interactions (e.g., sex by paternal alcoholism on alcohol problems). Statistical power for some of the other interactions (e.g., maternal x paternal alcoholism) were in the .40–.50 region. Statistical power considerations were included in discussing the interaction findings.

To evaluate the role of age of offspring when the parental divorce occurred, we used a similar GLM (excluding parental divorce status and including age at parental divorce) for the subset of offspring whose parents had divorced (n=125). We also conducted a sensitivity analysis for the FH+ diagnosis by comparing our multi-rater family history findings with single-rater findings of alcohol diagnosis derived via the WHO-CIDI which was administered separately to mothers and fathers. The sample sizes were reduced for mothers and fathers for the CIDI-based diagnoses (relative to the multi-rater diagnosis), but we determined whether different model-based results would occur contingent on the multi-rater diagnoses and diagnoses from individual interviews-only with participating parents.

RESULTS

Descriptive analyses indicated that 125 participants (17.7%) had divorced parents and 581 (82.3%) had intact parents. There were no sex differences in the representation of parental divorce (χ^2 with 1 df=0.60, ns). However, there were statistically significant differences for parental divorce with regard to paternal (χ^2 with 1 df=5.02, $p < .05$) and maternal alcoholism (χ^2 with 1 df=10.99, $p < .001$), with a higher representation of parental divorce among FH+ fathers (45.5% vs. 34.9%) and FH+ mothers (24.8% vs. 13.1%). Among the 125 divorced families, the paternal FH+ prevalence was n=57 and maternal prevalence was n=31; further cross-classifications indicated that paternal and maternal alcoholism occurred in 16 of the 125 divorced families (hence only paternal FH+ was manifested for an n=41 and for maternal FH+ an n=15). There were no significant differences across parent divorce groups for age, education, or household income. The correlation matrix for the subsequent GLMs is provided in Table 1, along with means and standard deviations for the variables.

Alcohol problems and marijuana use: Main effects model (Hypotheses 1 and 2)

The multivariate GLM indicated statistically significant overall model findings for alcohol problems (F=4.67, df=7, 697, $p < .001$) and marijuana use (F=8.01, df=7, 697, $p < .001$).

Within the model (please see Supplemental Table 1 provided on-line), parental divorce status differed significantly for marijuana use, with divorce associated with higher marijuana use. Maternal alcoholism also differed significantly for marijuana use, with positive status associated with higher marijuana use. Neither parental divorce status nor parental alcoholism significantly differed for alcohol problems. As an ancillary sensitivity analysis, we also included parental cannabis disorders as a predictor in the multivariate GLM, but it was not statistically significant and did not alter the significance of other estimated parameters.

Alcohol problems and marijuana use: Interaction model (Hypotheses 3)

The multivariate GLM indicated statistically significant overall model findings for alcohol problems (F=3.65, df=13, 692, $p<.001$) and marijuana use (F=6.07, df=13,692, $p<.001$). Table 2 summarizes the findings for the model. Only one of the hypotheses about parental divorce X FH+ interactions was significant. Parental divorce X maternal alcoholism was statistically significant for marijuana use, indicating that young adult offspring of mothers who were alcoholic and divorced had higher levels of marijuana use.

Several other significant interactions, some including sex, were indicated in Table 2. For alcohol problems, two interactions were significant—sex by paternal alcoholism, and maternal by paternal alcoholism. Figure 1 illustrates the sex by paternal alcoholism interaction and shows that, for sons, higher levels of alcohol problems were indicated for paternal alcoholism relative to family history negative sons and relative to differences between daughters who were FH+ for paternal alcoholism and daughters who were FH−. The maternal by paternal alcoholism interaction indicated that combined maternal and paternal alcoholism yielded higher offspring alcohol problems than alcoholism among only one parent or the FH− sample.

For marijuana use, in addition to the parental divorce by maternal alcoholism interaction described above, 2 two-way interactions were indicated: divorce status by sex and maternal by paternal alcoholism. For the divorce status by sex interaction displayed in Figure 2, sons from divorced parents reported significantly higher marijuana use relative to sons from non-divorced parents and these differences were larger than the differences between daughters of divorced and non-divorced parents. Similar to the findings for alcohol problems, the maternal by paternal alcoholism interaction indicated that combined maternal and paternal alcoholism yielded higher offspring marijuana use than alcoholism by only one parent or by the FH− sample.

Interpersonal factors for mothers and fathers: Interaction model (Hypotheses 3)

The multivariate GLM indicated statistically significant overall model findings for conflict with father (F=3.71, df=6, 687, $p<.001$), support from father (F=5.31, df=6, 687, $p<.001$), conflict with mother (F=2.18, df=6, 687, $p<.05$), and support from mother (F=2.58, df=6, 687, $p<.05$). Table 3 summarizes the findings for this model. In contrast to our hypotheses, the parental divorce by FH+ interactions were not significantly associated with interpersonal conflict with and support from parents. However, for conflict with father, there was one significant interaction—sex by parental divorce status. The significant interaction is

displayed in Figure 3 and indicated that among those young adults with divorced parents, daughters reported much higher conflict with fathers than did sons.

For mother support, there was a significant sex by parental divorce status interaction shown in Figure 4. The interaction indicated that sons from divorced families reported lower maternal support relative to sons from non-divorced families and this difference was greater than differences between daughters of divorced and non-divorced families.

Sensitivity analysis

The two multivariate GLMs described above were repeated using alcohol diagnoses based on WHO-CIDI interviews conducted separately with mothers and fathers. This provided a reduced sample size, especially for fathers, as 422 fathers completed the WHO-CIDI and 607 mothers completed the WHO-CIDI. The overall findings for these models largely paralleled those reported above which used a multi-rater family history diagnosis method. In a few instances, due to the reduced statistical power, significance levels changed from being significant at $p < .001$ level to the $p < .05$ level. The only effect that was not maintained was the maternal by paternal interaction for alcohol problems and marijuana use, though the strength of bivariate correlations between the family history interaction variable and alcohol problems and marijuana use did not change. We concluded that the multivariate GLM findings were generally robust across family history diagnostic rating methods.

Age at parental divorce (Hypothesis 4)

The average age at parental divorce was 9.31 years (SD=4.56 years) and ranged from birth year to 18 years of age. There were no statistically significant differences across sex groups or across maternal alcoholism groups for age of parental divorce. There was a small difference between paternal alcoholism groups in that those young adults from FH+ families were, on average, about 1.5 years older when the divorce occurred relative to those who were from FH− families. Bivariate correlations (see Supplemental Table 2 provided on-line) between age at parental divorce and the six dependent variables yielded three significant associations; two negative correlations for alcohol problems ($r = -.19$, $p < .05$) and marijuana use ($r = -.18$, $p < .05$) and a positive correlation for father support ($r = .25$, $p < .01$). GLMs with sex, paternal and maternal alcoholism, and age at divorce as main effects and age, educational attainment, and family income as covariates, were conducted for each of the dependent variables. Two-way interactions between sex and age at parental divorce were also analyzed but none was statistically significant. Parallel to the findings for the bivariate correlations, age at parental divorce significantly predicted alcohol problems, marijuana use, and father support. Hence, younger age at parental divorce was associated with more alcohol problems and higher marijuana use, and older age of offspring at parental divorce was associated with higher perceived support from fathers.

DISCUSSION

Consistent with the emerging literature (Grant et al., 2015; Thompson et al., 2008; Waldron et al., 2014a, b), the risk factors of parental divorce and FH+ contributed to both substance use outcomes (alcohol problems and marijuana use) and interpersonal functioning (conflict

and support with parents) in young adults aged 33 years. Much of the previous research in this area has supported the contribution of these two risk factors to an earlier age of substance use onset (Grant et al., 2015; Waldron et al., 2014a, b) and to lower young adult educational attainment (Sadler et al., 2017), and, for parental divorce, a higher prevalence of alcohol dependence (Thompson et al., 2008). In the current study, we extended research that included young adults in samples with a wider age range (Thompson et al., 2008; Waldron et al., 2014b) by using a developmental orientation to focus on current, age-salient domains related to substance use and to interpersonal relationships between young adult children and their parents. Our results yielded some positive findings for parental divorce and FH+ for both outcome domains.

Specifically, our first hypothesis was supported partially in that children of divorced parents reported higher levels of marijuana use in young adulthood relative to children from intact families. These findings are consistent with prospective studies that have indicated that parental divorce is associated with subsequent and persistent marijuana use among offspring (Arkes, 2013; Hayatbakhsh et al., 2006). Thus, in addition to studies indicating support for parental divorce being associated with offspring's earlier onset substance use (Grant et al., 2015; Waldron et al., 2014a, b) and alcohol dependence (Thompson et al., 2008), findings from the current study add to this literature by indicating significant associations between parental divorce and higher levels of marijuana use in young adulthood.

However, contrary to our hypothesis, parental divorce was not associated with more alcohol problems in young adulthood. Nevertheless, our findings were consistent with the unexpected findings of Grant et al. (2015) who reported that offspring from parent-separated families, relative to offspring of intact families, reported a *later onset* of alcohol dependence symptoms and a *later onset* of alcohol dependence. Thus, findings from the current study and the Grant et al. study suggest that parental divorce may have a delayed, inhibitory influence on the expression of alcohol problems and disorders in offspring, although our findings indicate that such an inhibitory effect did not extend to marijuana use. Future research is needed to further examine multiple alcohol phenotypes (e.g., alcohol use, alcohol problems, alcohol disorders), co-occurring conditions (e.g., comorbid depressive or antisocial symptoms), and their temporal features (e.g., duration of alcohol use, onset and recency of disorders) to advance the literature on this topic.

The second hypothesis regarding the prediction of more alcohol problems and higher marijuana use for those offspring who were FH+ for parental alcoholism was only partially supported. In the "main effects" model, neither maternal nor paternal alcoholism significantly predicted higher levels of alcohol problems among offspring, though maternal alcoholism predicted higher levels of marijuana use. However, in the interactional GLM, the combination of paternal and maternal alcoholism jointly predicted higher levels of offspring alcohol problems and marijuana use, suggesting a "double whammy" if both parents were alcoholic. This finding of increased risk for adverse outcomes among offspring from dual alcoholic-parent families is consistent with the literature (Lieb et al. 2002; Thompson et al., 2013; Yoon et al., 2013). We did not investigate potential mechanisms for our findings, but clearly children in dual alcoholic-parent families may be subject to a broader range of genetic and environmental risk factors (e.g., poorer and more inconsistent parenting) that

may foster greater engagement in substance-using peer networks and a wider range of substance use. In addition to the findings related to dual alcoholic-parent families, paternal alcoholism interacted with offspring sex to predict young adult alcohol problems, with the effect being stronger for sons than for daughters. Similarly, maternal alcoholism significantly interacted with divorce status such that maternal alcoholism among divorced parents predicted higher offspring marijuana use. These moderated relationships may indicate poorer parenting and less parental availability, both of which may compromise emotionally-close parent-child relationships.

The third hypothesis (or set of hypotheses) proposed that the two risk factors of parental divorce and family history of alcoholism would significantly interact to predict higher alcohol problems and marijuana use, and more negative interpersonal functioning. With one exception, these hypotheses were not supported. As noted above, maternal alcoholism among divorced parents predicted higher offspring marijuana use, but none of the other interactions was significant. Rather, FH+, especially dual-alcoholic parent families, were consistent predictors of the substance-related outcomes (alcohol problems and marijuana use) but not parent-adult child conflict or support. By contrast, parental divorce had more pervasive associations with marijuana use, along with conflict and support interpersonal dimensions with parents. That is, FH+ had more prominent associations with substance use outcomes whereas parental divorce had more general influences for marijuana use and both conflict and support dimensions with mothers and fathers in young adulthood. It is possible that underlying patterns of communication among parents and children in divorced families and other risk factors (e.g., genetic propensities) carry over to the developmental period of young adulthood and continue to impact functioning in multiple spheres (Cherlin et al., 1998).

The fourth hypothesis was that a younger age at divorce among offspring would be associated with higher levels of alcohol problems and marijuana use. This hypothesis was supported and is consistent with findings that have supported this inverse relationship (i.e., a younger age at divorce leads to poorer young adult functioning) (Cherlin et al., 1998) and with other studies that have indicated significant relationships between an earlier age at divorce, specifically early adolescence, and an earlier age of alcohol initiation (Grant et al., 2015; Waldron et al., 2014a, b). Our findings indicated that a younger age at divorce was associated with more alcohol problems and higher levels of marijuana use. The effect sizes were low-to-moderate and suggest that somewhat different developmental processes for offspring may stem from an earlier versus later age at parental divorce. There are a range of possible mechanisms that may account for this “younger age at divorce” finding (e.g., financial and emotional support provided by fathers and ongoing personal contact with fathers), and subsequent research should include both age at divorce and possible moderators (e.g., child sex) to advance the literature.

A secondary goal of this study was to investigate the possible role of sex as a moderator of associations between the two risk factors of family history of alcoholism and parental divorce. There was some, though limited, support for sex as a moderator of the relationships with the substance use and interpersonal variables. Paternal alcoholism was associated with more alcohol problems for sons relative to daughters, and parental divorce was associated

with higher marijuana use for sons relative to daughters. Daughters of divorced parents reported higher levels of conflict with their fathers in young adulthood, and sons reported lower levels of support from their mothers. These significant sex moderated relationships merit future scrutiny to determine the specific mechanisms accounting for these differential associations with the two risk factors and substance use and interpersonal relationships. Although focused on adolescents, Finan et al. (2015) reported that poor father-daughter communication significantly predicted growth in externalizing problems (e.g., aggression, rule-breaking). Such poor father-daughter communication may be exacerbated in divorced families and further exacerbated by those where both parents are alcoholics.

Overall, the findings indicated that the dual risk factors of parental divorce and FH+ persist in their influences during the young adulthood phase of the lifespan. Hence, consistent with prior research (Thompson et al., 2008; Waldron et al., 2014b) that included young adults, our findings indicated that these dual risk factors were significantly associated, albeit in nuanced ways, with current substance use and interpersonal functioning in parent-adult child relationships. The findings did support the potential value of investigating sex differences in these relationships in young adulthood and the need for further in-depth inquiry into mechanisms of sex-general and sex-specific relationships regarding parent-adult child relationships. Furthermore, our findings based on this young adult phase in the lifespan extends research on these dual risk factors to domains of current functioning and hence extends much of the extant research on alcohol initiation (Waldron et al., 2014b) and lifetime alcohol dependence (Thompson et al., 2008).

This study has limitations, including that the sample used was primarily white and college-educated; therefore, there are constraints on the generalizability of the findings. With few exceptions (Grant et al., 2015; Sadler et al., 2017), most of the studies conducted in this research domain have focused on white samples, thus it would be beneficial for future research to expand the populations studied. Our parental divorce rate of 17.7% may have been at the lower end of the prevalence spectrum, although other large, national studies have reported similar rates. For example, Alonzo et al. (2014) used data from NESARC that indicated a parental divorce rate of 16.0%, and Centers for Disease Control and Prevention (2014) data with over 17,000 adults reported a prevalence of 23.3% for parental divorce. Current national data indicate that between 30–50% of children will experience parental divorce (National Center for Health Statistics, 2008). However, these divorce rates are moderated by a range of factors (e.g., region of the country, income). Another limitation is that the statistical power for some of the two-way interactions that were tested was lower than conventional standards. As such, these interactions need to be replicated in future studies; however, our interaction findings do suggest that exploring sex as a moderator of the dual risk factors of parental divorce and FH+ may foster increased knowledge of associations with substance use and interpersonal relationships. The current study also investigated long-term associations between parental divorce status and family history status and young adult outcomes, but did not investigate proposed underlying mechanisms. Such studies will be required to provide further guidance to the intervention community. Another limitation of this study was that there may not have been a direct mapping of biological parent alcohol disorder and current interpersonal relationships with their parents (who may have been biological or custodial). Nevertheless, interpersonal relationships with biological

or custodial parents is still of interest; genetic and environmental influences of a FH+ family may still contribute to disturbed interpersonal relationships with significant others, including custodial parents, and substance use. Yet another limitation of the study is that age of divorce is not randomly assigned so third variable explanations associated with early age of divorce could be the 'true cause' of the findings. Finally, this study did not investigate other domains (e.g., young adult substance use disorders, mental health, romantic relationships, occupational functioning, parental cannabis disorders) that would provide a broader perspective on the influences of parental divorce and FH+ on young adult developmental functioning.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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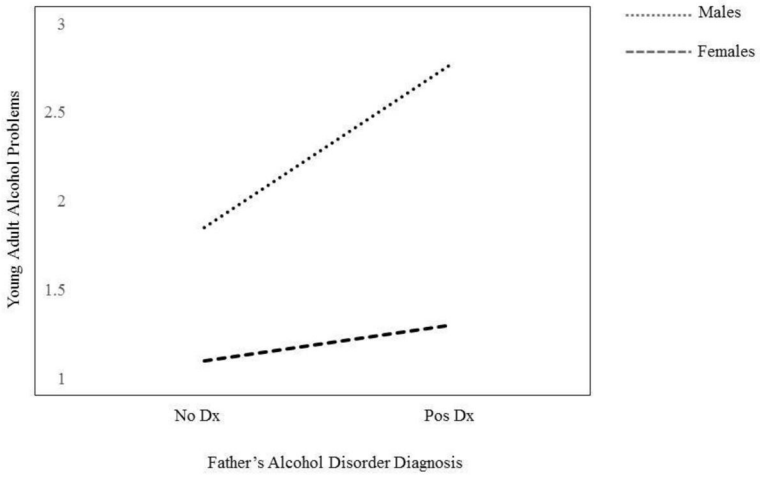

Figure 1.
Offspring Sex x Father's Alcohol Disorder on Offspring Alcohol Problems

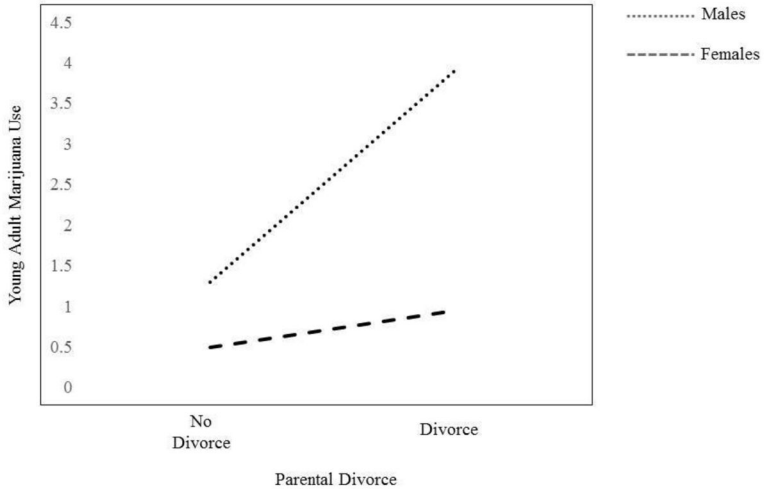

Figure 2.
Offspring Sex x Parental Divorce Status on Offspring Marijuana Use

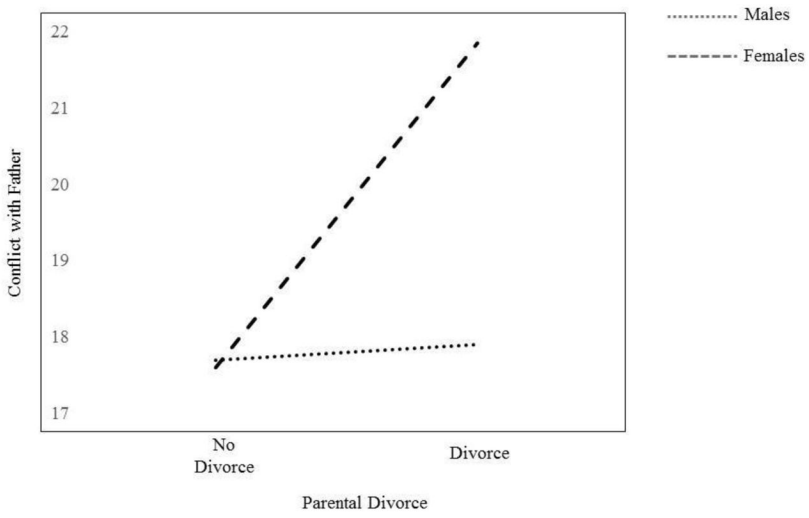

Figure 3.
Offspring Sex x Parental Divorce Status on Offspring Conflict with Father

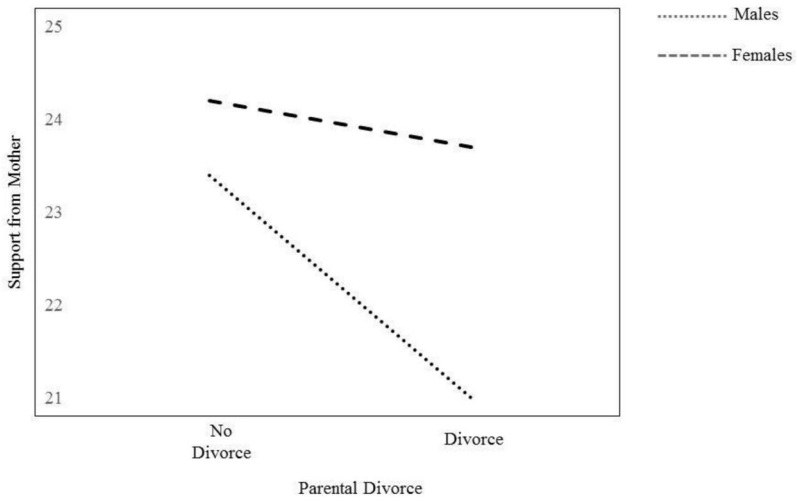

Figure 4.
Offspring Sex x Parental Divorce Status on Offspring Support from Mother

Table 1

Correlation Matrix for the Multivariate General Linear Models for Young Adult Alcohol Problems and Marijuana Use, and Parent-Adult Child Interpersonal Quality

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age	1.0												
2. Education	.01	1.0											
3. Income[1]	.14[c]	.24[c]	1.0										
4. Sex[2]	−.09[b]	.15[c]	−.05	1.0									
5. Parental Divorce[3]	.06	−.02	−.03	−.03	1.0								
6. Father's FH+[4]	.02	−.03	−.01	.02	.08[a]	1.0							
7. Mother's FH+[4]	.08[a]	−.05	.01	.02	.12[c]	.08[a]	1.0						
8. Alcohol Problems	−.01	.04	−.09[a]	−.16[c]	.00	.01	.02	1.0					
9. Marijuana Use	.03	−.18[c]	−.14[c]	−.12[c]	.11[b]	−.02	.10[b]	.20[c]	1.0				
10. Conflict with Father	.01	.00	−.15[c]	.02	.15[c]	.03	.06	−.03	−.13[c]	1.0			
11. Support from Father	−.06	.01	.03	.01	−.28[c]	.01	−.05	.10[b]	.02	−.49[c]	1.0		
12. Conflict with Mother	.00	.00	−.15[b]	.06	.03	.06	.02	−.04	−.06	.49[c]	−.28[c]	1.0	
13. Support from Mother	−.06	.03	.03	.15[b]	−.09[a]	.03	.03	−.04	−.06	−.30[c]	.62[c]	−.49[c]	1.0
Mean	33.25	16.34	7.68	1.53	1.18	1.37	1.15	1.27	0.93	17.74	21.19	18.76	23.21
S.D.	1.19	2.13	1.47	0.50	0.38	0.48	0.36	1.70	3.75	5.76	5.57	5.98	4.56

N=706

[1]Income: 1=Less than $6,000 to 10=$150,000 or more;

[2]1=Male, 2=Female;

[3]1=No parental divorce, 2=Parental divorce;

[4]1=No Lifetime Alcohol Diagnosis, 2=Lifetime Alcohol Diagnosis.

[a]p<.05,

[b]p<.01,

[c]p<.001

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Table 2

Multivariate General Linear Model for Young Adult Alcohol Problems and Marijuana Use

		Alcohol Problems		Marijuana Use	
Source	***df***	**Mean Square**	***F* Statistic**	**Mean Square**	***F* Statistic**
Age	1	0.48	0.17	2.43	0.19
Education	1	20.75	7.52[b]	143.44	11.12[c]
Income	1	29.20	10.58[c]	112.22	8.70[b]
Sex	1	39.40	14.28[c]	222.28	17.24[c]
Parental Divorce	1	0.52	0.19	127.55	9.89[b]
Father FH+	1	12.63	4.58[a]	16.87	1.31
Mother FH+	1	6.93	2.51	146.97	11.40[c]
Sex x Parental Divorce	1	0.72	0.27	82.31	6.38[a]
Sex x Father FH+	1	17.77	6.44[a]	16.23	1.26
Sex x Mother FH+	1	0.01	0.01	38.37	2.98
Parental Divorce x Father FH+	1	1.18	0.43	3.55	0.27
Parental Divorce x Mother FH+	1	2.10	0.76	51.63	4.00[a]
Father FH+ x Mother FH+	1	15.22	5.52[a]	72.00	5.58[a]
Residuals	692	2.76	---	12.89	---
Total	705	---	---	---	---
Adjusted R^2	---	---	.047[c]	---	.085[c]

N=706

[a] p<.05;

[b] p<.01;

[c] p<.001

Table 3

Multivariate General Linear Model for Parent-Adult Child Interpersonal Quality

		Father Conflict		Father Support		Mother Conflict		Mother Support	
Source	***df***	**Mean Square**	***F* Statistic**	**Mean Square**	***F* Statistic**	**Mean Square**	***F* Statistic**	**Mean Square**	***F* Statistic**
Age	1	10.29	0.33	57.03	1.99	12.16	0.35	39.69	1.97
Education	1	23.34	0.74	0.03	0.01	45.13	1.29	1.04	0.05
Income	1	521.65	16.51^{c}	20.90	0.73	620.75	17.71^{c}	20.70	1.02
Sex	1	208.67	6.60^{b}	43.75	1.52	30.19	0.66	186.58	9.24^{b}
Parental Divorce	1	334.40	10.58^{c}	1382.58	48.14^{c}	1.24	0.04	132.57	6.57^{a}
Father FH+	1	0.93	0.03	46.80	1.63	25.78	0.73	10.68	0.53
Mother FH+	1	32.76	1.04	27.15	0.94	8.68	0.25	4.62	0.23
Sex x Parental Divorce	1	356.91	11.30^{c}	96.34	3.35	0.80	0.02	93.98	4.66^{a}
Sex x Father FH+	1	9.53	0.30	5.69	0.20	15.51	0.44	4.79	0.24
Sex x Mother FH+	1	32.96	1.04	2.61	0.42	1.25	0.04	9.89	0.49
Parental Divorce x Father FH+	1	1.37	0.04	12.18	0.09	93.41	2.66	8.14	0.40
Parental Divorce x Mother FH+	1	4.09	0.13	69.19	2.41	0.11	0.01	19.87	0.98
Father FH+ x Mother FH+	1	0.13	0.01	2.30	0.08	54.59	1.56	2.42	0.12
Residuals	692	31.59	---	28.72	---	35.05	---	20.18	---
Total	705	---	---	---	---	---	---	---	---
Adjusted R^2	---	---	.048^{c}	---	.074^{c}	---	.021^{b}	---	.028^{b}

N=706

^{a}p<.05;

^{b}p<.01;

^{c}p<.001