Full length article

Phenotypic and familial associations between childhood maltreatment and cannabis initiation and problems in young adult European-American and African-American women

Julia D. Grant[a,*], Arpana Agrawal[a], Kimberly B. Werner[b], Vivia V. McCutcheon[a], Elliot C. Nelson[a], Pamela A.F. Madden[a], Kathleen K. Bucholz[a], Andrew C. Heath[a], Carolyn E. Sartor[a,c]

[a] Department of Psychiatry, Washington University School of Medicine, 660 S. Euclid Avenue, Campus Box 8134, Saint Louis, MO 63110, USA
[b] George Warren Brown School of Social Work, Washington University, Saint Louis, MO 63110, USA
[c] Department of Psychiatry, Yale University School of Medicine, 389 Whitney Avenue, New Haven, CT 06511, USA

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ABSTRACT

Background: Childhood maltreatment is a known risk factor for cannabis initiation and problem use, but the extent to which this association is attributable to shared familial influences is unknown. We estimate the magnitude of associations between childhood maltreatment, timing of cannabis initiation, and cannabis-related problems, in European-American (EA) and African-American (AA) women, and parse the relative influence of additive genetic (A), shared environmental (C), and individual-specific environmental (E) factors on these constructs and their covariation.
Methods: Data were from diagnostic telephone interviews conducted with 3786 participants (14.6% AA) in a population-based study of female twins. Logistic regression analyses and twin modeling were used to test for associations, and estimate the relative contributions of genetic and environmental influences to childhood maltreatment and cannabis outcomes and their covariation.
Results: Maltreatment was significantly associated with increased likelihood of cannabis initiation before age 15 among EAs (OR = 6.33) and AAs (OR = 3.93), but with increased likelihood of later initiation among EAs only (OR = 1.68). Maltreatment was associated with cannabis problems among both groups (EA OR = 2.32; AA OR = 2.03). Among EA women, the covariation between maltreatment and cannabis outcomes was primarily attributable to familial environment (rC = 0.67–0.70); among AAs, only individual-specific environment contributed (rE = 0.37–0.40).
Conclusion: Childhood maltreatment is a major contributor to early initiation of cannabis as well as progression to cannabis problems in both AA and EA women. Distinctions by race/ethnicity are not in the relative contribution of genetic factors, but rather in the type of environmental influences that contribute to stages of cannabis involvement.

1. Introduction

Childhood maltreatment – experiencing sexual abuse, physical abuse or neglect in childhood – has long been established as a risk factor for early cannabis initiation (Bensley et al., 1999; Harrison et al., 1997; Nelson et al., 2006; Sartor et al., 2015; Werner et al., 2016) and cannabis use disorder (CUD) (Duncan et al., 2008; Kendler et al., 2000; Rogosch et al., 2010). Data from the National Epidemiologic Survey of Alcohol and Related Conditions demonstrate the robustness of these associations: elevated risk for CUD was observed in individuals who

reported childhood physical abuse, sexual abuse, or neglect even after adjusting for demographic characteristics and a wide range of psychiatric conditions (Afifi et al., 2012). There is also evidence that the magnitude and stability of the associations between childhood maltreatment and cannabis initiation and the transition to problem use differ between African-Americans (AAs) and European-Americans (EAs) (Sartor et al., 2015). In addition, in a recent study by our group using the current sample to examine specific traumatic experiences in relation to the timing of cannabis initiation, childhood sexual abuse predicted cannabis initiation after adjusting for correlated psychiatric conditions

in both AAs and EAs, but physical abuse predicted initiation only in EAs (Werner et al., 2016).

Racial/ethnic differences in the prevalence and patterns of cannabis use onset and CUD have been documented. Although AAs historically have been less likely than their non-Hispanic EA counterparts to report a lifetime history of cannabis use, this difference has gradually decreased (Johnston et al., 2014), with some studies reporting little to no difference (Ewing, 2002; Keyes et al., 2015; Shih et al., 2010). Furthermore, recent research suggests AAs are more likely to report use in the past year (Hasin et al., 2015b). Similarly, while the lifetime prevalence of CUD is comparable across EAs and AAs (Hasin et al., 2015a), the most recent data indicate that CUD is now more common in AAs than EAs (Hasin et al., 2015a; Wu et al., 2016). By contrast, evidence that rates of childhood maltreatment are greater in AAs compared to EAs is unequivocal. Numerous studies have found the prevalence of child abuse or neglect in AAs to be twofold or greater than that among EAs (Lee et al., 2012; Wildeman et al., 2014; Wulczyn, 2009).

Given the escalating rates of cannabis use and CUD among AAs and the greater likelihood of exposure to childhood maltreatment in AAs relative to EAs, studies that focus on racial/ethnic similarities and differences in the nature of the association between cannabis involvement and childhood maltreatment are necessary. One aspect of this research that has been notably overlooked is the extent to which common familial influences might contribute to any observed associations. Childhood maltreatment frequently occurs in the context of familial risk factors, such as parental conflict or separation (Bidarra et al., 2016; Hindley et al., 2006) and parental alcohol problems (McLaughlin et al., 2000; Shin et al., 2009), which are also associated with early initiation of marijuana use (Waldron et al., 2014a,b) and CUD (Melchior et al., 2011; Schiff et al., 2014). Furthermore, there is evidence that experiences of childhood maltreatment cluster within pairs of identical and fraternal twins that are raised together (Schulz-Heik et al., 2010; Young-Wolff et al., 2011), although the extent to which these familial factors are environmental or genetic has not been explored. Familial factors, both genetic and environmental, play a prominent role in the etiology of cannabis use, while familial environmental factors appear to be less influential for cannabis-related problems. In Verweij et al.'s meta-analysis of twin studies of cannabis use and problem use (2010), estimates of genetic influences on the two outcomes were 40–48% and 51–59%, respectively, whereas estimates of shared environmental influences were 25–39% for initiation but only 15–20% for problem use. Nonetheless, the extent to which associations between cannabis use, CUD and childhood maltreatment can be attributed to common familial factors, either genetic or shared environmental, and to individual-specific experiences remains unknown.

In addition, nearly all prior family and twin studies of cannabis involvement have been conducted in samples of European descent. Two publications utilizing the data analyzed in the present study are amongst the few to document that cannabis use is equally heritable in AA and EA women (Agrawal et al., 2016; Sartor et al., 2009), but that individual-specific environmental influences on cannabis use are more prominent in AAs compared to EAs. Thus, it is possible that the extent to which familial and individual-specific factors influence the correlation between cannabis involvement and childhood maltreatment also differs across racial/ethnic groups.

The current investigation was designed to address two aims, using data from an all-female twin sample aged 18–27 years. The first was to examine the magnitude of phenotypic associations between childhood maltreatment and two stages of cannabis involvement, initiation and development of cannabis-related problems, in AA and EA women. The second, following up on phenotypic findings, was to estimate the relative influence of additive genetic, shared environmental, and individual-specific environmental factors on childhood maltreatment, cannabis outcomes, and their covariation. The latter aim allowed us to estimate the factors contributing to the well-documented association between childhood maltreatment and cannabis involvement.

2. Methods

2.1. Participants

The Missouri Adolescent Female Twin Study (MOAFTS) is a longitudinal study of substance use and related psychopathology in adolescent girls and young women, conducted with same-sex female twins born in Missouri to Missouri-resident parents between July 1, 1975 and June 30, 1985. Twins were identified through birth records and recruited for baseline assessment from 1995 to 1999. The sample was demographically representative of the Missouri population at the time the twins were born, with nearly 15% being AA and the remainder EA (see Heath et al., 1999, 2002; Waldron et al., 2013 for details). Wave 1 interviews were conducted with 3258 twins (median age = 15). Many but not all twin pairs from Wave 1 completed a brief 1-year follow-up (Wave 2, not a source of data for the current study), and a subsample from Wave 1 also completed a comprehensive 3-year retest interview (Wave 3, n = 1370, median age = 19). Between 2002 and 2005, all twins from the target cohort (excluding those who had withdrawn or whose parents asked that the family not be re-contacted) were contacted for Wave 4 interviews (n = 3787, median age = 22; 80% of the twins identified from birth records). Wave 5 interviews were conducted between 2005 and 2008 (n = 3428 twins; median age = 24).

The base sample for present analyses was individuals who completed the Wave 4 interview, since it covered lifetime psychiatric and psychosocial information in young adulthood and had the largest number of participants (one dropped due to incomplete data). Over 95% of Wave 4 participants completed at least one additional interview (Wave 1, 3, or 5) that served as a source of data for coding variables in the current analyses. The sample had a mean age of 21.7 (SD = 2.8) years at Wave 4, and included 1038 monozygotic (MZ) twin pairs (911 EA, 127 AA), 734 dizygotic (DZ) twin pairs (606 EA, 128 AA) and 242 twins (199 EA, 43 AA) whose co-twin did not participate. Zygosity was determined using an algorithm based on responses to standard questions regarding similarity (Nichols and Bilbro, 1966). Zygosity for both members of 940 EA and 150 AA twin pairs was confirmed using genotyping, yielding 90.2% and 92.7% accuracy, respectively, which is broadly consistent with reports on other samples of European (Eaves et al., 1989; Reed et al., 2005) and African descent (Whitfield, 2012).

2.2. Procedures

Data were collected via telephone interview using an adaptation of the Semi-Structured Assessment for the Genetics of Alcoholism (Bucholz et al., 1994; Hesselbrock et al., 1999), which assesses *Diagnostic and Statistical Manual of Mental Disorders (DSM)-IV* (American Psychiatric Association, 2000) psychiatric disorders, history of substance use, and related psychosocial constructs. The study was carried out in accordance with the latest version of the Declaration of Helsinki and approved by the Washington University School of Medicine Human Research Protections Office. Prior to participation, informed consent was obtained from all twins 18 years of age or older, as were parental consent and twin assent for twins under age 18.

2.3. Measures

2.3.1. Childhood maltreatment

Childhood maltreatment, defined as childhood physical abuse, sexual abuse, or neglect occurring before age 16, was queried in the traumatic events section of Waves 1, 3, and 4 interviews. Childhood sexual abuse was also assessed in the health problems and health habits section (at Waves 1, 3, and 4) and the parental discipline and childhood experiences section (at Wave 4). Criteria were met if any qualifying item was reported as occurring before age 16 at any assessment. (See Supplemental Table S1 for a list of interview questions and the prevalence of each form of maltreatment).