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Longitudinal pathways from unconventional personal attributes in the late 20s to cannabis use prior to sexual intercourse in the late 30s

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Abstract

A quarter of people living with human immunodeficiency virus (HIV) infection in the United States are women. Furthermore, African American and Hispanic/Latina women continue to be disproportionately affected by HIV, compared with women of other races/ethnicities. Cannabis use prior to intercourse may be associated with increased risky sexual behaviors which are highly related to HIV. The ultimate goal of this research is to better understand the relationships between unconventional personal attributes (e.g., risk-taking behaviors) in the late 20s, substance use (e.g., alcohol) in the mid 30s, and cannabis use prior to intercourse in the late 30s using a community sample; such an understanding may inform interventions. This study employing data from the Harlem Longitudinal Development Study includes 343 female participants (50% African Americans, 50% Puerto Ricans). Structural equation modeling indicated that unconventional personal attributes in the late 20s were associated with substance use in the mid 30s ($\beta=0.32$, $p<.001$), which in turn, was associated with cannabis use prior to sexual intercourse in the late 30s ($\beta=0.64$, $p<.001$). Unconventional personal attributes in the late 20s were also directly related to cannabis use prior to sexual intercourse in the late 30s ($\beta=0.39$, $p<.01$). The findings of this study suggest that interventions focused on decreasing unconventional personal attributes as well as substance use may reduce sexual risk behaviors among urban African American and Puerto Rican women. Also, the implications of this study for health care providers and researchers working in HIV prevention are that these precursors may be useful as patient screening tools.

Keywords

Harlem Longitudinal Development Study; structural equation modeling; unconventional personal attributes; substance use; sexual risk behaviors

Introduction

According to a report from the Centers for Disease Control and Prevention (CDC, 2015b), a quarter of people living with the human immunodeficiency virus (HIV) infection in the United States are women. African American and Hispanic/Latina women continue to be disproportionately infected by HIV, compared with women of other races/ethnicities. Of the total estimated number of women living with diagnosed HIV at the end of 2015, 26% were

African Americans, and 5% were Hispanics/Latinas (CDC, 2015a). Heterosexual intercourse is the primary mode of HIV acquisition among women (CDC, 2015b). Risk factors for HIV infection among women of color include, but are not limited to, lower education and income, marital status, drug use, history of sexually transmitted infections (STI), multiple sex partners, inconsistent condom use, and violent victimization (Adimora et al., 2006; Amaro & Raj, 2000; Javanbakht et al., 2010; McNair & Prather, 2004; Moreno, EI-Bassel, & Morrill, 2007; Patrick, O'Malley, Johnston, Terry-McElrath, & Schulenberg, 2012; Roye, Krauss, & Silverman, 2010).

Most of the HIV epidemiologic and behavioral studies of women of color have focused on women who are at increased risk (e.g., STI clinic attendees), pregnant women (Rosenthal et al., 2014), and HIV-infected women (Hutton et al., 2013). Findings from those studies may not reflect the experiences of risks of heterosexually active women of color residing in an urban area who do not meet high-risk inclusion criteria. The current longitudinal study examines the pathways from unconventional personal attributes (e.g., risk-taking behaviors) in the late 20s to cannabis use prior to intercourse in the late 30s via substance use (e.g., alcohol) in the mid 30s using a community sample of African American and Puerto Rican women. The ultimate goal is to better understand the relationships between unconventional personal attributes, substance use, and cannabis use prior to intercourse among African American and Puerto Rican women; such an understanding may inform interventions.

Cannabis use potentially increases sexual desire (Gorzalka, Hill, & Chang, 2010) and has effects on cognitive ability such as decreased memory performance (Harvey et al., 2007; Thoma et al., 2011) and increased disinhibition (Skosnik, Spatz-Glenn, & Park, 2001). Limited laboratory research on cannabis administration demonstrates that acute cannabis use is associated with increased risky decision making (Lane, Cherek, Tcheremissine, Lieving, & Pietras, 2005). Therefore, it follows that cannabis use may be associated with increased risky sexual behaviors which are highly related to HIV/STI.

From a theoretical perspective, expectancy theory (Hays, 1985) may explain the mechanism underlying the use of cannabis before having sexual intercourse. Expectancy theory posits that positive outcome expectancies may originate from exposure to the conditioning stimuli, associated with previous expectancies about the drug, physical dependence, personal and cultural beliefs about the drug effects and situational/environmental factors. Studies have also shown that young people hold sex-related cannabis expectancies such as sexual facilitation (Hendershot, Magnan, & Bryan, 2010; Schafer & Brown, 1991).

Investigators should be aware of the importance of research involving the administration of cannabis to women of color residing in an urban area who are sexually active. Also, treatment professionals and educators should be aware that cannabis use may be associated with HIV-related risk behaviors, and tailor the intervention in accord with the findings of research. As a first step towards such research and interventions, the current study seeks to find the possible precursors of cannabis use prior to sexual intercourse.

One of the possible precursors of sexual risk behaviors is personal factors. More specifically, unconventional personal attributes such as rebelliousness and sensation seeking behaviors

were associated with sexual risk behaviors. A research paper using a sample of undergraduate students showed that proactive rebelliousness was a particularly influential predictor of risky sexual activities (Lafreniere, Menna, & Cramer, 2013). In addition to rebelliousness, sensation seeking behaviors have found to be related to risky sexual behaviors. A study with 2,386 adult participants showed that sensation seeking was positively associated with drug use before or during sex (Charnigo et al., 2013).

A variety of adverse health behaviors has been found to be more common among rebellious compared with non-rebellious individuals, including: use of alcohol (Lee, Brook, Nezia, & Brook, 2016; Scholes-Balog, Hemphill, Reid, Patton, & Toumbourou, 2013; Stautz & Cooper, 2013); smoking tobacco (Hwang & Park, 2015); smoking marijuana (McCabe, Louie, & King, 2015); and cocaine use (Hamil-Luker, Land, & Blau, 2004). Also, sensation seeking (defined as the tendency to enjoy and pursue exciting, risky activities) is associated with drinking alcohol (De Haan, Egberts, & Heerdink, 2015), cigarette smoking (Perkins et al., 2008; Spillane et al., 2012; Spillane, Smith, & Kahler, 2010), marijuana use (Meil et al., 2016), and other illicit drug use (Ballon, Brunault, & Cortese, 2015). The use of legal and/or illegal substances is then related to sexual risk behaviors (Benotsch, Snipes, Martin, & Bull, 2013).

Our study is unique since it is a longitudinal study beginning when the participants were about 19 years of age, and now extending to about 39 years old. This extensive period of time makes it possible to observe the participants over the span of three critical developmental stages (i.e., late teens, late 20s, and late 30s). Also, the current study used a community sample which is able to reflect the experiences of risks of heterosexually active women of color residing in an urban area who do not meet high-risk inclusion criteria.

We hypothesized that: 1) Unconventional personal attributes in the late 20s will be associated with substance use in the mid 30s which in turn, will be related to cannabis use in the late 30s. 2) Unconventional personal attributes in the late 20s will be also directly related to cannabis use in the late 30s. 3) The pathways will be maintained after control on a number of HIV risk factors (e.g., condom use in late adolescence).

Methods

Participants

This study, a part of the Harlem Longitudinal Development Study (Lee, Brook, Finch, & Brook, 2016), includes 343 female participants (50% African Americans, 50% Puerto Ricans) who completed questionnaires at time 6 (T6). Data on the participants were first collected in 1990 (time 1; T1, $N=712$) when the participants were students attending schools in the East Harlem area of New York City. At T1, the questionnaires were administered in classrooms under the supervision of the study research staff with no teachers present. The mean age of the participants at T1 was 14.1 years (standard deviation; $SD=1.3$ years). At time 2 (T2; 1994 – 1996; $N=649$), the National Opinion Research Center interviewed the participants in person or by phone. The mean age of the participants at this wave was 19.2 years ($SD=1.5$ years). At time 3 (T3; 2000 – 2001; $N=335$ – due to budgetary limitations, we took a subsample of T2 participants), the Survey Research Center of the University of

Michigan collected the data. The mean age of the participants at T3 was 24.4 years (SD=1.3 years). At time 4 (T4) and time 5 (T5), the data were collected by our research group. At T4 (2004 – 2006; $N=498$), the mean age was 29.2 years (SD=1.4 years). At T5 (2011 – 2013; $N=405$), the average age of the participants was 35.9 years (SD= 1.4 years). At T6 (2014 – 2016; $N=343$), the mean age of the participants was 39.1 years (SD= 1.4 years). The current study included data from the T2, T4, T5, and T6 waves.

The Institutional Review Board (IRB) of the New York University School of Medicine approved the study for T4, T5 and T6, and the IRBs of the Mount Sinai School of Medicine and New York Medical College approved the study for the earlier waves. A Certificate of Confidentiality was obtained from the National Institute on Drug Abuse for T1–T6. At each time wave, we obtained informed assent or consent from all of the participants. Additional information regarding the study methodology is available from a previous report (Lee, Brook, Finch, & Brook, 2015).

At T6, we attempted to follow up all those who participated at T2. We compared the demographic variables for the 343 female adults who participated at both T2 and T6 with the 306 who participated at T2 but not at T6. There was a difference between the T6 non-participants (60% African Americans, 40% Puerto Ricans) and the T6 participants (50% African Americans, 50% Puerto Ricans) in the proportion of African Americans and Puerto Ricans ($\chi^2(1) = 4.88, p < 0.05$). However, the mean scores of condom use ($t = -0.93, p = 0.35$) and sexual assault ($t = -0.72, p = 0.47$) at age 19 among T6 non-participants was not significantly different from the mean score for the women who participated at T6.

Measures

Control variables

- a. Condom use at age 19 was a single item: “How often were condoms used when you had sex?” using a 5-point Likert scale that ranged from “never” to “always.”
- b. Sexual assault at age 19 was a single item: “Have you been pushed by someone to have sex?” using a yes or a no answer option.”
- c. Educational level at age 39 was a single item with an eight category option: 11th grade or below=0; 12th grade or GED=1; business or technical school=2; college freshman=3; college sophomore or associate’s degree=4; college junior=5; college senior (Bachelor’s degree)=6; postgraduate business, law, medical, masters, or doctoral program=7.
- d. Employment status at age 39 was a dichotomized variable: employed=1; not employed=0.
- e. Marital status at age 39 was a dichotomized variable: cohabiting or married and living together=1; otherwise=0.

Unconventional personal attributes at age 29

- a. Sensation seeking behavior (D. N. Jackson, 1984) was assessed with a 6 item scale, e.g. “Do you like wild parties where anything goes?” using a 4-point

Likert scale that ranged from “not at all” to “extremely.” The Cronbach’s alpha was 0.67.

- b. Rebelliousness (Smith & Fogg, 1979) was assessed with a 3 item scale, e.g., “When rules get in the way, do you ignore them?” using a 4-point Likert scale that ranged from “not at all” to “extremely.” The Cronbach’s alpha was 0.63.

Substance use at age 36

- a. Alcohol use was assessed by a single item, “On average, how many drinks (beer, wine, or hard liquor) have you had in the past 5 years?” using a 6-point ordinal scale that ranged from “none” to “more than 6 drinks a day.”
- b. Cigarette use was assessed by a single item, “On average, how many cigarettes do you smoke in the past 5 years?” using a 7-point ordinal scale that ranged from “none” to “more than one and a half packs a day.”
- c. Cannabis use was assessed by a single item, “On average, how often have you used cannabis in the past 5 years?” using a 5-point ordinal scale that ranged from “never” to “once a week or more.”
- d. Other illicit drugs use was assessed by a single item, “On average, how often have you used other illegal drugs in the past 5 years?” using a 5-point ordinal scale that ranged from “never” to “once a week or more.”

Cannabis use prior to sexual intercourse at age 39

Cannabis use prior to sexual intercourse was assessed at age 39 by a single item, “Over the past year, how often have you been under the influence of the use of cannabis while having sex?” using a 6-point Likert scale that ranged from “never” to “always.”

Analytic plan

We used Mplus (Version 6) to perform structural equation modeling (Muthén & Muthén, 2010). Following Newcomb and Bentler (Newcomb & Bentler, 1988), we partialled out the effects of condom use, sexual assault at age 19, educational level, employment status, and marital status at age 39. The Mplus Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR) were used to assess the fit of the model. For the CFI, values between 0.90 and 1.0 indicate an adequate fit (Muthén & Muthén, 2010). For the RMSEA, values below 0.10 indicate an adequate fit (Kelloway, 1998). For the SRMR, values below 0.05 indicate an adequate fit (Byrne, 1998; Diamantopoulos & Siguaw, 2000). We report the standardized regression coefficient (reported as β) and its standard score value (reported as z).

Results

All women in this study have had sexual intercourse with a male partner. Also, 99.5% of the women reported that they had sexual intercourse with a male partner at least once in the past

year. In addition, the distributions of all answer options for each of the variables in this study are presented in Table 1.

We tested the measurement model, as well as the structural model, controlling for the participant's condom use and sexual assault in late adolescence, educational level, employment status, and marital status in the late thirties. All factor loadings were significant ($p < 0.001$). The CFI was 0.97, the RMSEA was 0.05, and the SRMR was 0.04, which indicated an adequate model fit. The standardized coefficients (β) and z -statistics in the parenthesis from the structural model are presented in Figure 1 for the structural model.

Unconventional personal attributes in the late 20s were associated with substance use in the mid 30s ($\beta = 0.32$, $p < 0.001$), which in turn, was associated with cannabis use prior to sexual intercourse in the late 30s ($\beta = 0.64$, $p < 0.001$). Unconventional personal attributes in the late 20s were also directly related to cannabis use prior to sexual intercourse in the late 30s ($\beta = 0.36$, $p < 0.01$).

Discussion

As hypothesized, our findings indicated the significant pathways from unconventional personal attributes at age 29 to cannabis use prior to intercourse at age 39 via substance use at age 36. These results are consistent with those of other research papers (Benotsch et al., 2013; Stoolmiller et al., 2012). To explain the mechanisms underlying the pathway from unconventional personal attributes such as sensation seeking and rebelliousness to sexual intercourse under the influence of cannabis use, the current study explored an indirect pathway via the use of substances which also increases a greater risk of engaging in sexual intercourse with cannabis use. Sensation seekers who engage in thrilling experiences may use more substances, and then substance users may be exposed to HIV-related risk behaviors under the influence of cannabis use.

The pathways to sexual risk behaviors were maintained after control for condom use, sexual assault in late adolescence, educational level, employment status, and marital status in the late thirties. These associations extend from the late 20s into the late 30s, suggesting that unconventional personal attributes and substance use may have an impact on sexual risk behaviors over time. This may inform our understanding of the implications for guidance in preventive medicine, for example, such sexual risk behaviors may be partially controlled at later stages by inhibiting sensation seeking and rebellious behaviors as well as by decreasing the use of substances at earlier stages. A Sensation Seeking Targeting strategy (Donohew, Lorch, & Palmgreen, 1991) is a possible approach for interventions about these personality traits. Personality-targeted interventions (Conrod, Castellanos, & Mackie, 2008) can also be applied to female adults. More directly, prevention programs aimed at reducing sexual risk behaviors should include guidelines for safe sexual intercourse (e.g., condom distribution).

The intoxicating chemical in cannabis is tetrahydrocannabinol (THC). THC, the active physiological ingredient in cannabis, is a psychoactive substance which means that it passes through the blood-brain barrier and alters brain functions such as memory, perception, mood, and decision making which are ultimately related to sexual risk behaviors (Andrade,

Carroll, & Petry, 2013). According to research from the Potency Monitoring Project (Mehmedic et al., 2010), the average THC content of cannabis has soared from less than 1 percent in 1972, to 3 to 4 percent in the 1990s, to nearly 13 percent in 2008. Nowadays, the use of cannabis for recreational purposes is being legalized in certain states in the US. The findings of the current study may alert young women from becoming addicted to cannabis use and being at HIV-related risk.

Singer (Singer, 2000) describes substance abuse and sexually transmitted infections as “closely linked” and “interdependent threats to health and well being” that “constitute a major syndemic that already has taken a devastating toll on the lives of the urban poor” (p. 99). Thus, it is critical to provide prevention interventions for those urban women who use cannabis prior to sexual intercourse in the late 30s by informing substance use treatment and by emphasizing the importance about safe sex. If the associations prove to be causally related, substance use prevention efforts have the potential to decrease the burden of sexually transmitted infections in at-risk urban communities. Therefore, it is important that substance use prevention programs monitor their impact on sexual risk behaviors as Jackson and colleagues (C. A. Jackson, Henderson, Frank, & Haw, 2012) found that few interventions have evaluated their impact on both substance use and sexual risk behaviors.

Due to the strong relationship between substance use and sexual risk behaviors, a broader focus not only on risk factors but also on protective factors is clearly needed. This study provides evidence that interventions for urban African American and Puerto Rican women should be aimed at reducing sexual risk behaviors. Also, the implications of this study for health care providers and researchers working in HIV/STI prevention are that these precursors (e.g., sensation-seeking) may be useful as patient screening tools.

Our data are based on self-reports rather than on official records such as medical records. However, studies have shown that use of self-report data yields reliable results (Harrison, Martin, Enev, & Harrington, 2007). We also did not include specific ethnic variables such as acculturation for African American and Puerto Rican women. Future studies should include these assessments. Lastly, the sample in this study consisted of African American and Puerto Rican women residing in an urban area. Consequently, the results may not apply to the general population.

Despite these limitations, the study supports and adds to the literature in a number of important ways. First, unlike most research that focuses on one point in time, we follow up our sample over a span of up to 20 years. The prospective nature of the data allows us to go beyond a cross-sectional analysis and to consider the temporal sequencing of variables. Second, this community sample varying in socioeconomic status is unique as it consisted of African American and Puerto Rican women studied until the late 30s. Third, a significant contribution of the paper is a set of findings examining the associations between unconventional personal attributes in the late 20s, substance use in the mid 30s, and cannabis use prior to sexual intercourse in the late 30s. Therefore, the current study would have important implications for prevention and treatment of STI/HIV among African American and Puerto Rican women.

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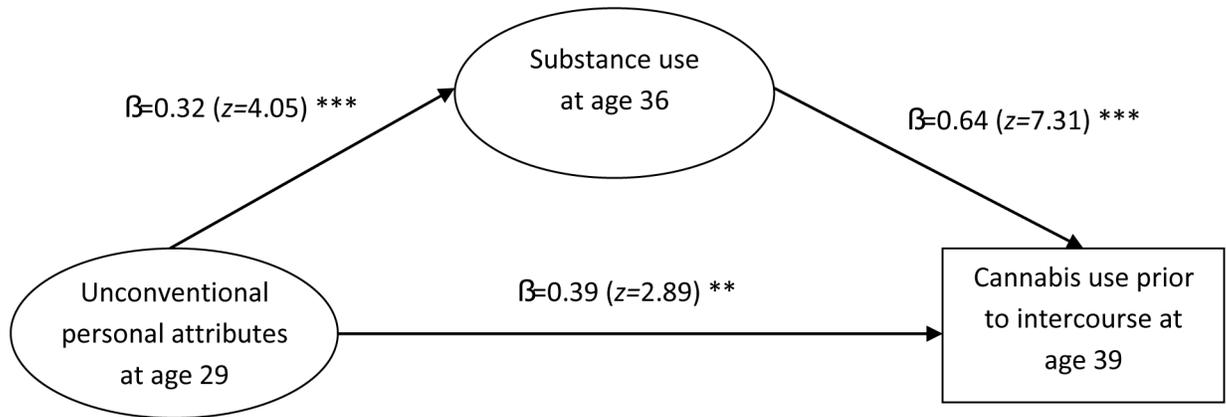


Figure 1.

Pathways from unconventional personal attributes to cannabis use prior to sexual intercourse

Note. CFI=0.97, RMSEA=0.05, SRMR=0.04;

** $p < 0.01$, *** $p < 0.001$;

Condom use, sexual assault at age 19, educational level, employment status, and marital status at age 39 were statistically controlled.

Table 1

Distribution of answer options for variables used in the study

Percentages in each of the answer options	
<i>Control variables</i>	
Condom use at age 19	Never=25%, once in a while=30%, sometimes=11%, often=9%, always=4%
Sexual assault at age 19	Yes=14%, no=86%
Educational level at age 39	11 th grade or below=11%, 12 th grade or GED=21%, business or technical school=11%, college freshman=6%, college sophomore or associate's degree=17%, college junior=4%, college senior (Bachelor's degree)=17%, postgraduate business, law, medical, masters, or doctoral program=13%
Employment status at age 39	Employed=81%, unemployed=19%
Marital status at age 39	Married and living together=51%, otherwise=49%
<i>Unconventional Personal attributes at age 29</i>	
Sensation seeking behavior	On average of the 3 items: completely false=68%, mostly false=17%, mostly true=14%, completely true=1%
Rebelliousness	On average of the 3 items: completely false=40%, mostly false=44%, mostly true=14%, completely true=2%
<i>Substance use at age 36</i>	
Alcohol use	None=22%, less than once a week=52%, once a week to several times a week=23%, 1 or 2 drinks a day=1%, 3 or 4 drinks a day=1%, 5 or more drinks every day=1%
Cigarette use	None=66%, a few cigarettes or less a week=7%, 1-5 cigarettes a day=8%, about half a pack a day=10%, about a pack a day=4%, about one and half packs a day=1%, more than one and half packs a day=4%
Cannabis use	Never=71%, a few times a year or less=14%, about once a month=3%, several times a month=4%, once a week or more=8%
Other illicit drugs use	Never=73%, a few times a year or less=15%, about once a month=1%, several times a month=5%, once a week or more=6%
<i>Cannabis use prior to sexual intercourse at age 39</i>	
Cannabis use prior to sex	Never=37%, a few times a year or less=32%, about once a month=9%, several times a month=7%, once a week or more=8%, always=7%