Polydrug use among urban adolescent cigarette smokers

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HIGHLIGHTS

- 96% of urban adolescent smokers (N = 169) from San Francisco reported polydrug use.
- Adolescents reporting only light/intermittent smoking may be using multiple drugs.
- 18% (n = 29) reported early use (age ≤16) of harder drugs and depressive symptoms.
- Depressive symptoms could precede more problematic drug use.
- Early prevention/cessation intervention including depression screening is called for.

ARTICLE INFO

ABSTRACT

Purpose: Adolescent smokers are at increased risk for polydrug use, which is associated with more consequences than use of a single drug. Here we classified subgroups of polydrug use among urban adolescent cigarette-smokers; described the sociodemographic, smoking, and depression correlates; and identified three-year outcomes associated with subgroup membership.

Methods: Adolescent cigarette smokers (N = 176; M_{age} = 16.1; 35% male; 27% white) completed surveys assessing drug use, smoking characteristics, demographics, and depressive symptoms at baseline and 12, 24, and 36 months follow-up.

Results: Almost all participants (96%) reported using, on average, two (SD = 0.97) substances (including other tobacco products) in addition to cigarettes. Latent class analysis revealed two distinct classes of polydrug users. "Limited Range Use" (84%) class members reported current use of other tobacco, alcohol, and marijuana, as did "Extended Range Use" (16%) class members who also reported current use of "harder drugs" (i.e., cocaine/crack, hallucinogens, ecstasy, and misused prescriptions). The classes did not differ on demographics or baseline likelihood of marijuana (χ^2 = 0.25; p < 0.62) or alcohol use (χ^2 = 3.3; p < 0.07). At baseline, a larger proportion of *Extended Range Use* class members reported both smoking the entire cigarette and symptoms of clinical depression. *Extended Range Use* class membership at baseline predicted higher mean depression scores at 24 and 36 months.

Conclusion: Adolescent cigarette-smokers who reported extended range use (18%) also reported symptoms of clinical depression at baseline and follow-up. These findings indicate a need for early monitoring of depression symptoms and prevention and cessation interventions targeting this high-risk group.

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1. Introduction

Adolescent cigarette smokers are more likely than their nonsmoking peers to drink alcohol and use other drugs, (Chang, Sherritt, & Knight, 2005) and they are more likely to report polydrug use (concurrently using two or more substances) (Chen, Unger, Palmer, et al., 2002; Kandel & Kandel, 2014). Polydrug use in adolescence is common; for

example, 41% of U.S. 10th graders (μ_{age} = 16) reported concurrent use of tobacco, alcohol, and marijuana in 2010 (Conway, Vullo, Nichter, et al., 2013). Polydrug use is associated with worse health and social outcomes (Fallu, Brière, & Janosz, 2014; Kelly, Evans-Whipp, Smith, et al., 2015) compared to single-substance use, including cognitive deficits (Hanson, Medina, Padula, et al., 2011) and substance-related legal, relational, and work problems in young adulthood (Griffin, Bang, & Botvin, 2010). Moreover, adolescent smokers and polydrug users are more likely to report symptoms of depression. Early onset depression is promoted by early onset polydrug use, (Felton, Kofler, Lopez, et al., 2015) and is

independently associated with negative health outcomes (Maslowsky, Schulenberg, O'Malley, et al., 2014).

Negative outcomes from adolescent polydrug use are exacerbated by smoking, which is independently associated with increased risk for lifetime nicotine dependence (US Department of Health and Human Services, 2012) and substance use disorders, including alcohol dependence, in early adulthood (Brook, Brook, Zhang, Cohen, & Whiteman, 2002). Use of a single substance (e.g., alcohol, marijuana, or other drugs) anytime during childhood, adolescence, and emerging adulthood predicts major depressive disorder at age 27, (Brook et al., 2002) and both current and lifetime nicotine dependence are associated with persistent depressive symptoms (Hu, Davies, & Kandel, 2006). Each of these outcomes is linked to enduring physical, social, and mental health problems, the consequences of which are more severe for adolescents who initiate early (Fallu et al., 2014; Taylor, Malone, Ianoco, et al., 2002). Hence, it is important to identify dominant patterns of polydrug use among adolescent smokers to best inform prevention and cessation interventions in this high-risk population.

Typically, studies of polydrug use among adolescents employ variable-centered analysis rather than characterizing actual use patterns or risk profiles of individuals. Use patterns and risk profiles can be effectively investigated using latent class analysis (LCA), a statistical method that identifies subgroups that cannot be directly observed (i.e., "latent"). A recent systematic review of studies that identified latent classes of adolescent polydrug use (Tomczyk, Isensee, & Hanewinkel, 2016) concluded LCA delivers "solid information" on polydrug use during adolescence. Additionally, subgroups that had a higher probability of current or more frequent smoking were associated with more intense patterns of drug use (including alcohol), (Tomczyk, Hanewinkel, & Isensee, 2015) poorer health, higher levels of psychological distress, and risky sexual behavior including a greater number of sexual partners (Bohnert, Walton, Resko, et al., 2014; Connell, Gilreath, & Hansen, 2009). LCA has also been employed successfully to identify subgroups based on patterns of precursors to adolescent substance use relapse (Ramo, Prince, Roesch, et al., 2012) and to model adolescent high-risk behavioral outcomes (i.e., cigarette use, marijuana use, violent behavior, and delinquent behavior) associated with alcohol use initiation patterns (Komro, Tobler, Maldonado-Molina, et al., 2010). Our study is unique in that all participants were smokers and most reported households with high maternal educational attainment, which is typically associated with lower levels of smoking and drug use (Caldwell, 1994).

We used LCA in data collected from a cohort of urban adolescent smokers and sought to classify underlying subgroups of polydrug use and describe smoking and sociodemographic correlates of class membership. We then compared classes on drug use prevalence, smoking, and depression outcomes at 12, 24, and 36 months follow-up. We hypothesized that distinct classes of polydrug use would emerge and that classes characterized by use of a wider variety of substances would be associated with heavier cigarette smoking patterns (greater quantity and frequency of smoking, greater nicotine dependence, fewer quit attempts, lower self-efficacy for quitting or reducing smoking), and more extensive depression symptomatology at baseline and all follow-up time points.

2. Methods

2.1. Participants

Data for this study were derived from a 36 month prospective cohort study conducted at University of California San Francisco (UCSF). The study was designed to examine the influence of nicotine metabolism rate on smoking trajectory among adolescents. Data collection for this study ended in May 2015 and detailed methods have been published elsewhere (Rubinstein, Shiffman, Moscicki, et al., 2013). Briefly, 202 adolescent cigarette smokers from the San Francisco Bay Area were recruited between December 2009 and June 2012. Trained study personnel screened interested adolescents (e.g., those who responded to study fliers or online advertisements or who were referred by a current study participant) over the telephone. Inclusion criteria included age 13–17 years, smoking 1–5 cigarettes per day (cpd), and living in or near San Francisco, California.

Of the 202 adolescents enrolled 26 were found to be nonsmokers or to have quit smoking prior to enrollment and were excluded from the analyses, resulting in a final sample size of N = 176 for this study. Thirty-four participants were also found to smoke >5 cpd, and were included in the analyses. Adolescents who were invited to participate provided their written assent and the informed consent of one parent before taking part in the study. The UCSF Institutional Review Board approved the study procedures.

2.2. Measures

2.2.1. Demographics

Participants self-reported age, gender, and race/ethnicity.

2.2.2. Socioeconomic status

Maternal educational attainment (high school graduate or less; some college to college graduate; graduate/professional degree; don't know/does not apply) was used as a proxy for socioeconomic status.

2.2.3. Drug use

Participants reported past three-month use of cigar, pipe, chewing tobacco, snuff, alcohol, marijuana, cocaine/crack, ecstasy, methamphetamine, heroin, and other drugs (with write-in space to specify which "other" drugs). For each drug category, six response choices were dichotomized into "current use" (frequency of more than once a month) and "no current use" (frequency of less than or equal to once a month).

2.2.4. Cigarette smoking characteristics

Participants reported days smoked in the past 30 and amount of each cigarette usually smoked. Nicotine dependence was assessed using the modified Fagerstrom Tolerance Questionnaire (mFTQ), which has been validated for use in adolescent smokers (Prokhorov, De Moor, Pallonen, et al., 2000). The mFTQ is scored continuously from 0 to 9 (0–2: no dependence; 3–5: moderate dependence; 6–9: high dependence). Self-efficacy to quit or reduce cigarette smoking was assessed with two items: "If you decided to quit smoking completely, how sure are you that you would be able to do it?" and "If you wanted to cut down now, how sure are you that you would be able to do it?" (Scored from 1 "not at all" to 4 "very.")

2.2.5. Depression

Depressive symptoms were measured with the Center for Epidemiological Studies-Depression, Revised scale (CESD-R), which has been found to be an accurate and valid measure of depression using algorithmic classification methods (Van Dam & Earleywine, 2011) scored continuously (from 0 to 60). A score of at least 16 indicates the existence of clinically significant depression symptoms (Haroz, Ybarra, & Eaton, 2014).

2.3. Data analyses

Analyses were conducted in three stages. First, baseline frequencies of reported current drug use (including tobacco products other than cigarettes) were examined. Disparate frequencies across the 11 drug categories necessitated the creation of a smaller number of meaningful categories. Cigar (n = 67); pipe (n = 17); chewing tobacco (n = 4); and snuff (n = 3) were combined to create "other tobacco." Cocaine/crack (n = 3), methamphetamine (n = 0), ecstasy (n = 18), heroin (n = 0), and other drugs (n = 17) were combined to create "harder drugs," named for meaningfulness and easy identification. This resulted