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Sex differences in drug use among polysubstance users

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ABSTRACT

Background: Available evidence indicates women with substance use disorders may experience more rapid progression through usage milestones (telescoping). The few investigations of sex differences in treatment-seeking populations often focus on single substances and typically do not account for significant polysubstance abuse. The current study examined sex differences in a heterogeneous sample of treatment seeking polysubstance users. We examined patterns of drug use, age at drug use milestones (e.g., initial use, regular use), and progression rates between milestones. Nicotine and alcohol use were also evaluated.
Methods: Participants ($n = 543$; 288 women) completed personal histories of substance use, including chronicity, frequency, and regularity, as well as inventories assessing affect, and intellectual ability.
Results: Rates of drug use and milestone ages varied by sex and specific drug. Analyses suggested pronounced telescoping effects for pain medication and marijuana, with women progressing more rapidly through usage milestones.
Conclusions: Our data were generally supportive of telescoping effects, although considerable variance in progression measures was noted. The contrast between the marked telescoping observed in pain medication use and the absence of telescoping in other opioids was of particular interest. The discrepancy in telescoping effects, despite shared pharmacologies, suggests the need for further work examining underlying psychosocial factors. These results highlight that the specific sample population, substance, and outcome measure should be carefully considered when interpreting sex differences in substance use.

1. Introduction

A number of studies have examined sex differences in substance use trajectories. Much of this work has focused on alcohol use with population studies revealing that although traditional differences between men and women have narrowed over recent decades (Keyes et al., 2010), men are still more likely to develop alcohol use disorders (Hasin et al., 2007). Other research has examined transitions across drinking milestones (e.g., age at first use, age at problem use, age at treatment). Typically, these studies show that although women initiate use at older ages (Greenfield et al., 2010; Randall et al., 1999), they transition to later milestones (e.g., treatment entry) more quickly than men (e.g. Diehl et al., 2007; Ehlers et al., 2004; Randall et al., 1999), a pattern referred to as telescoping.

Examinations of telescoping in drug abuse have largely focused on cocaine (e.g., Griffin et al., 1989; McCance-Katz et al., 1999; White et al., 1996), opioids (e.g., Hernandez-Avila et al., 2004; Hser et al., 1987; Sartor et al., 2014) and cannabis (Ehlers et al., 2010; Hernandez-Avila et al., 2004; Khan et al., 2013). Although supportive of telescoping effects among women, the literature varies in selection of sample population and progression measures. Telescoping has included "initial use to treatment" (e.g., Sartor et al., 2014), "regular use to treatment" (Hernandez-Avila et al., 2004), "first use to disorder onset" (Khan et al., 2013), and "survival time to dependence" (Ehlers et al., 2010). Samples include in- and outpatient treatment seekers (e.g., Hernandez-Avila et al., 2004), methadone maintenance clients (Hser et al., 1987), drug court offenders (Haas and Peters, 2000), drug-related hospitalizations, (Griffin, 1989) and community samples (Ehlers et al., 2010). This literature generally does not account for polysubstance use (e.g., Hernandez-Avila et al., 2004; McCance-Katz et al.; but see Sartor et al., 2014). Thus, ambiguity regarding progression rates, milestone ages, and usage patterns between men and women persist.

In recent work, we examined alcohol use trajectories in a group of men and women seeking treatment for substance use disorders (Lewis and Nixon, 2014). Our only selection criteria were that participants were seeking treatment for a substance use disorder and

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consumed alcohol prior to treatment entry. We observed a telescoping of women's alcohol use trajectories. However, telescoping did not occur across all milestones; it was observed only in the more rapid transition to initial treatment. This finding, combined with psychosocial differences between men and women, suggested a continued need to consider sociocultural factors that influence treatment seeking and may alter long-term outcomes. The scope of the reported work precluded in-depth analyses of comorbid drug use. Therefore, the current work focused on drug use, examining prevalence rates of regular and problem use, specific drug preferences, ages at usage milestones (i.e., ages at first use, initiation of regular use, development of problem use), and comorbid alcohol/nicotine use. Analyses were conducted with specific attention to differences between men and women. We were particularly interested in telescoping, thus we questioned whether women and men differed in the time intervals between drug use milestones for several specific substances with high problem use prevalence in this population.

2. Materials and methods

All procedures were approved by the Medical Institutional Review Board at the University of Florida. Prior to study participation, individuals ($n = 647$) provided written informed consent. All participants were compensated for their time. The current report presents data gathered in the context of screening to determine eligibility for further experimental participation. Thus, all data were self-report. Data were obtained from inpatients at two treatment programs in North Florida from 2006 to 2009. All participants were adults (aged 18 or older).

Participants completed questionnaire packets that included inventories of state anxiety (AI; Spielberger et al., 1983) and depressive symptoms (BDI-II; Beck et al., 1996). General intellectual abilities, including abstracting and vocabulary skills, were also assessed (SILS-A, SILS-V; Zachary, 1986). Participants completed detailed 4-generation family trees (adapted from Mann et al., 1985) for substance use and nicotine use. Personal histories of substance use were collected, including frequency, chronicity, and regularity of use. Consequences of alcohol use were measured using the Drinker's Inventory of Consequences (DrInC; Miller et al., 1995).

Drug use history and chronicity were gathered across eleven drug categories. Categories and their corresponding examples included: "Marijuana" (No examples); "Cocaine" (Cocaine and Crack Cocaine); "Amphetamines" (Crank, Crystal Meth, Speed, White Crosses); "Narcotics" (Heroin, Opium, Morphine, Methadone); "Benzodiazepines/Tranquilizers" (Valium, Xanax, Librium); "PCP" (No examples); "Barbiturates" (Downers, Phenobarbital, Red Devils); "Inhalants" (Paint, Gas, Freon, Glue, White-out, Toluene); "Hallucinogens" (Acid, LSD, Mushrooms, Ecstasy); "Pain Medications" (Darvon, Demerol, Percocet, Codeine, Darvocet); "Muscle Relaxers" (Soma, Flexeril, Soprodol). Participants were instructed to provide usage information only for non-prescribed drug use; for each of the above substances they were instructed to indicate whether they had ever used, used on a regular basis, or had experienced problem use, and to provide the ages of initiation for these events. 'Regular' and 'problem' use were self-reported, with endorsement of problem use not contingent on endorsement of regular use. Participants listed their three most-often used drugs (Drugs of Choice; DOCs) in the six months before treatment entry. Drinking behavior was measured using the Quantity-Frequency Index (QFI; Cahalan et al., 1969), which quantifies consumption in average ounces of absolute ethanol per day, over the 6 months preceding treatment entry. Nicotine use was measured by daily cigarette consumption.

Following preliminary characterization of substance use in the initial sample ($n = 647$; Results 3.1.1), two sets of analyses were conducted. The first set examined a sample of participants endorsing "problem" drug use ($n = 543$; Results 3.1.2–3.1.5). The second investigated subgroups endorsing problem use of specific substances, with attention to telescoping and milestone use ages for those substances ($n = 499$; Results 3.2.1–3.2.4). Participants excluded from section 3.2 included problem users of drug classes that lacked sufficient representation for meaningful analysis.

Comparison of sex differences in demographic and affective variables, alcohol and nicotine consumption, and telescoping and milestone ages were examined with independent sample t-tests. Due to the descriptive nature of this work, familywise error correction was not applied. Drugs use histories, preferences and recent use were compared with odds ratios or chi square analyses, as appropriate.

3. Results

3.1. Initial sample – Set 1

In the initial sample of treatment-seeking individuals ($n = 647$; 333 women), odds-ratio analyses examining regular drug use (excluding alcohol and nicotine) indicated a greater proportion of women endorsed regular use, relative to men (OR 1.84, 95% CI: 1.03–3.28, $p = .04$). Subsequent analysis examining endorsement of problem drug use detected a trend toward higher prevalence in women, relative to men (OR 1.48, 95% CI: 0.97–2.26, $p = .07$).

Among participants endorsing regular use ($n = 594$; 313 women) of at least one substance, characterization of drug use began by utilizing odds-ratios to detect potential differences in regular or problem usage patterns between men and women, within each drug category. Results are reported in Table 1. Differences were noted for four categories of drugs: marijuana, benzodiazepines, pain medications, and muscle relaxants. Relative to men, higher proportions of women reported regular and problem use of benzodiazepines (OR 1.66, 95% CI: 1.12–2.44, $p = .01$; OR 1.78, 95% CI: 1.17–2.72, $p < .01$, respectively), pain medications (OR 1.82, 95% CI: 1.28–2.60, $p < .01$; OR 1.83, 95% CI: 1.26–2.67, $p < .01$, respectively), and muscle relaxants (OR 2.51, 95% CI: 1.55–4.07, $p < .01$; OR 3.91, 95% CI: 1.97–7.74, $p < .01$, respectively). Lower proportions of women reported regular (OR 0.27, 95% CI: 0.18–0.41, $p < .01$) and problem use (OR 0.70, 95% CI: 0.50–0.97, $p = .03$) of marijuana.

Further examination of polysubstance use involved comparison of the numbers of drug categories for which regular and problem use were endorsed. No sex difference was detected for regular or problem use; men endorsed using 2.94 ($SD = 1.97$) drug classes regularly, women endorsed 3.06 ($SD = 2.11$). Men endorsed problem use of 2.17 ($SD = 1.83$) drug classes, women endorsed 2.38 ($SD = 1.91$).

Subsequent analyses were limited to only those individuals endorsing problem use of at least one drug ($n = 543$), excluding nicotine and alcohol. This group, referred to hereafter as 'problem drug users', comprised the sample of interest for Sections 3.1.2–3.1.5.

3.1.1. Demographic analysis. Participants ($n = 543$) were aged 18–70 and included male ($n = 255$; 47% of the sample) and female ($n = 288$) problem drug users. The sample was comprised primarily of Caucasians (62%, $n = 333$, 196 women) and African-Americans (32%, $n = 175$, 76 women). Also included were American Indians (1%, $n = 6$, 1 woman), and individuals endorsing 'other' racial identification (2%, $n = 9$, 5 women). Seventeen individuals were of Hispanic ethnicity (3%, 9 women). Three participants failed to provide racial/ethnic information.

Men were older than women ($M = 38.26$ vs. 31.92), $t(538) = 7.42$, $p < .001$, but did not differ on education ($M = 12.25$ yrs; SD = 2.17), BDI ($M = 17.77$; SD = 10.96), AI ($M = 55.00$; SD = 12.20), SILS-V ($M = 15.43$; SD = 2.28) or SILS-A ($M = 13.63$; SD = 2.83).

3.1.2. Nicotine use. Regular smoking status was endorsed by 89% ($n = 482$) of problem drug users. Chi-square analyses indicated equivalent proportions of men and women endorsed regular smoking (87% of men, $n = 223$; 90% of women, $n = 259$).

Among these subjects there was a trend for women to initiate regular smoking earlier than men (16.29 vs. 17.38 years of age, respectively), $t(477) = 1.90$, $p = .06$. Men reported greater daily cigarette consumption, relative to women (18.38 [$SD = 10.11$] vs. 16.51 [$SD = 8.37$] cigs/day), $t(459) = 2.14$, $p = .03$.

3.1.3. Alcohol use. 87% ($n = 435$) of individuals providing drinking information consumed alcohol in the six months prior to treatment. Chi-square analyses indicated the remaining 13% ($n = 65$) were disproportionally represented by women; 17% of women ($n = 44$, of 262 responders) reported no six-month alcohol use, relative to 9% of men ($n = 21$, of 238 responders), $\chi^2 = 7.00$, $p < .01$. Among individuals drinking within six months prior to treatment, no sex difference in endorsement of current or past problem drinking was observed; 67% of women ($n = 146$) and 71% of men ($n = 152$) endorsed problem drinking. Among drinkers, an average