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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.

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Contributors

Author Sara Jo Nixon designed the study, wrote the protocol, and contributed to data collection. Authors Ben Lewis and Lauren A. Hoffman equally contributed to statistical analyses, literature searches, written text documenting previous findings, and the discussion and results sections. Dr. Lewis wrote the introduction and methods. Dr. Lewis, Ms. Hoffman, and Dr. Nixon edited various portions of the manuscript. All authors contributed to and approve of the final manuscript.

Conflict of Interest

All authors affirm that they have no conflicts of interest.

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Keywords

Sex Differences; Drug Use; Polysubstance Use; Telescoping

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 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 2006–2009. 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 disproportionately 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), $X^2=7.00$, $p<.01$. 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 of 7.44 oz. of absolute alcohol was consumed, daily. A trend toward greater daily drinking was observed among men, relative to women (8.24 vs. 6.64 oz./day, or approximately 13.7 vs. 11.1 standard drinks/day), $t(433)=1.90$, $p=.06$, however no difference in reported negative consequences (DrInC score) due to drinking was detected.

3.1.4 Drugs of Choice—*To characterize recent drug use, participants were asked to list the three most-often used drugs in the six months before treatment entry (i.e., “Drugs of Choice”; DOC1-DOC3).* Table 2 presents the frequency at which drug categories were listed for DOCs 1–3, as well as those listed for any DOC, regardless of ranking. Only drug categories listed as DOCs by greater than 5% of respondents (i.e., $n<26$) were analyzed. Disproportionate reporting by sex was detected for marijuana, pain medications, and benzodiazepines. A lesser proportion of women reported marijuana as any DOC (OR 0.46, 95% CI: 0.32–0.65, $p<.01$). In contrast, greater proportions of women reported pain medications (OR 1.88, 95% CI: 1.24–2.86, $p<.01$) and benzodiazepines (OR 2.29, 95% CI: 1.24–4.21, $p<.01$) as DOCs. When primary (DOC1) responses were considered, these patterns remained consistent (OR 0.54, 95% CI: 0.36–0.82, $p<.01$; OR 2.33, 95% CI: 1.29–4.22, $p<.01$; OR 4.91, 95% CI: 1.08–22.39, for marijuana, pain medications, and benzodiazepines, respectively).

3.2 Results - Set 2

3.2.1 Telescoping and Milestone Use—Drug use in this sample was primarily characterized by cocaine, marijuana, and opioid (including both ‘Pain Medications’ and ‘Narcotics’) use. Thus, these substances were the focus of analyses examining sex

differences in milestone ages and telescoping variables. Secondary investigations included demographic and affective variables, as well as comorbid alcohol and nicotine use. Only differences not observed in the overall sample were reported in text. Where appropriate, usage characteristics (e.g., route of administration) are reported.

Participants were included in a specific drug group only if they endorsed both problem use of that drug, and included it as one of their DOCs. Individuals meeting this criteria represented 92% of problem users ($n=499/543$). Polysubstance use within this sample made isolating “pure” groups of single-drug users impractical, thus comparison between drug groups was not conducted. Table 3 reflects overlap in the number of individuals meeting criteria for the primary drugs under study as well as additional substances not analyzed in the current work.

3.2.2 Opioid Use—Among individuals meeting criteria for inclusion in the opioid group ($n=123$; 77 women), ages at opioid use milestones, including initial use, initiation of regular use, and initiation of problem use, were considered. Three telescoping variables were computed, using the difference between each milestone age (i.e., initial to regular; regular to problem; initial to problem). No sex differences in age of initial or regular use were noted, and no difference in progression between these stages was observed. Women progressed from regular to problem use more rapidly than men ($M_s = .47$ and 2.65 yrs, respectively), $t(121)=2.16, p=.03$. Consistent with this finding, women experienced problem use at an earlier age than men ($M_s = 22.70$ vs. 26.09 yrs, respectively), $t(117)=2.61, p=.01$. These data are detailed in Table 4a, below.

Due to qualitative differences between classifications of ‘Pain Medication’ and ‘Narcotics’ (e.g., prescription, routes of administration, psychosocial perceptions of use), they were analyzed separately. Among Narcotics users, analysis of milestone ages and telescoping variables ($n=50$; 26 women) failed to detect any sex-contingent differences. Analysis of Pain Medication users ($n=96$; 65 women) revealed that relative to men, women initiated use earlier ($M_s = 23.50$ vs. 19.29 yrs), $t(93)=2.46, p=.02$. No sex difference in progression to regular use, or age at initiation of regular use was noted. Women progressed from regular to problem use more rapidly (0.14 vs. 3.10 yrs; $t(93)=2.42, p=.02$), and experienced problem use earlier ($M_s = 22.78$ vs. 28.90 yrs; $t(94)=3.29, p<.01$). These data are presented in Tables 4b and 4c, below.

Chi-square analyses examining routes of administration detected no sex difference. There were no sex differences in daily cigarette or alcohol consumption (among non-abstainers).

3.2.3 Marijuana Use—In contrast to Cocaine and Pain Medication use, men in the marijuana group ($n=170$; 93 men) reported an earlier age of initiation than women (13.89 vs. 15.03 yrs), $t(168)=2.43, p=.02$. Ages of regular and problem use, and periods of progression to these milestones all failed to differ significantly by sex. When progression from initial to problem use was considered, a trend toward more rapid progression was noted for women, relative to men (2.14 vs. 4.05 yrs), $t(162)=1.84, p=.07$. Data are presented in Table 4d.

97% of responders indicated inhalation as their sole route of marijuana administration, thus no analysis of sex differences was conducted. Women reported greater state anxiety than did men (56.40 vs. 52.76), $t(166)=1.96, p=.05$. Men reported greater daily smoking (16.93 vs. 13.95 cigarettes), $t(153)=2.16, p=.03$. Daily alcohol consumption was equivalent between sexes.

3.2.4 Cocaine Use—Among the cocaine group ($n=412$; 217 women), analysis of use milestones indicated similar ages at initial and regular use between men and women. No difference in progression between milestones was noted. Women reported experiencing problem use earlier than men, ($M_s = 24.46$ vs. 26.58 yrs), $t(404)=2.42, p=.02$. Data are presented in Table 4e.

No sex difference in cocaine route of administration was detected. Daily alcohol consumption (among non-abstainers) did not differ between sexes, however men smoked more cigarettes/day (18.7 vs. 16.7), $t(357)=1.94, p=.05$.

4. DISCUSSION

The current study examined drug use in a broad, heterogeneous, sample of inpatient, treatment-seeking, poly-drug users. As reported in our earlier work examining drinkers within this sample, high rates of smoking and alcohol consumption were common (Lewis and Nixon, 2014). Although men appeared to engage in greater amounts of daily smoking and drinking, the magnitude of differences was small, with men consuming approximately 1–2 more cigarettes and 1–2 more standard drinks, daily, relative to women. Observations were unadjusted for body mass, thus, sex-contingent differences in gross measures of consumption appeared subtle. Despite similar general polysubstance use patterns, sex differences were observed in milestone ages, telescoping, and preferential use of specific drugs.

Initial substance usage patterns were examined with three self-report measures, including “regular” use, “problem” use, and “drug of choice” (DOCs 1-3) responses. Measures of regular and problem use provided context for historical usage, while DOC endorsement provided characterization of usage proximal to treatment entry. Thus, DOC endorsement was a criterion for inclusion in specific drug groups for telescoping analysis to ensure Ss had significant patterns of recent use. Although participants reported using a variety of drugs, DOCs were characterized primarily by cocaine, marijuana, and opioids, which were the focus of telescoping analyses. Substantial overlap between these groups was noted, precluding meaningful between-group comparison, however given this overlap, the marked contrast in telescoping effects across subgroups was provocative.

4.1 Cocaine Use and Telescoping

Evidence for cocaine-related telescoping was subtle. Men progressed from regular to problem use in approximately 1.8 years, women in approximately 1.1, with women reporting problem use at an earlier age. While consistent with a telescoping effect, only the difference in problem use age reached statistical significance. Our results are corroborated by other recent work detecting only subtle, if any, sex-contingent cocaine telescoping

(Sartor et al., 2014), although these findings may reflect contemporary use patterns, as at least one earlier study noted fewer years of use among women at time of first treatment (White et al., 1996; but see McCance-Katz et al., 1999).

4.2 Marijuana Use and Telescoping

Consistent with previous observations, men in the marijuana group initiated use at an earlier age (e.g., Gfroerer et al., 2002; Haas and Peters, 2000; but see Khan et al., 2013). Despite initiating use more than a year after men, women progressed from initial to problem use more rapidly, and reported experiencing problems nearly a year earlier. Although telescoping in marijuana use was detected, high variance in ages and progression measures, particularly among men, may have obscured localization of this effect. Significant sex effects were observed only for age of initiation and progression between initial and problem use. Visual inspection of these data suggests the difference in overall progression was driven by the transition from regular to problem use. Men and women progressed from initial to regular use in approximately 1.5–2 years. While men's progression continued at a similar rate from regular to problem use (~2 yrs), women appeared to progress more rapidly (~.7 yrs), consistent with observations in treatment seeking (Hernandez-Avila et al., 2004) and non-treatment seeking (Ehlers et al., 2010; Khan et al., 2013) samples.

Although our findings are provocative, future studies must examine these trends in areas where marijuana has been legalized or decriminalized. In contexts where law enforcement approaches to marijuana control are reduced and/or family members may openly consume or advocate for marijuana use, it is unknown how these trends may be affected.

4.3 Opioid Use and Telescoping

Initial analysis of opioid users indicated equivalent ages at initial and regular use, with differences in rate of progression appearing only at the transition from regular to problem use. Women progressed more rapidly to problem use and experienced earlier problem use, consistent with other work (Hernandez-Avila et al., 2004).

When subgrouped, narcotics use was characterized by a relatively slow progression from initial to regular use, followed by a rapid transition to problem use, regardless of sex. Among women, prescription opioid use followed this pattern closely. In contrast, men progressed markedly more slowly to problem use. To our knowledge, only one other study has specifically examined sex-contingent telescoping in pain medication abuse. This work, conducted by Back and colleagues (2011), noted telescoping among women, but observed a more rapid progression from initial to regular use, in contrast with the current data.

Given the shared pharmacology of these opioid subgroups, we considered whether sex differences may have been driven by differing routes of administration. Pain medication was primarily orally ingested (74% endorsement) or nasally insufflated (33%). Narcotics use appeared primarily intravenous (60%), followed by ingestion (37%). No sex differences were detected by route of administration, however we lacked sufficient power to analyze sex-contingent telescoping by route of administration within specific drug class. Thus, the possibility remains that route by drug by sex interactions exist.

Although the current study did not examine trends in population use, pain medication abuse has increased markedly in recent decades. From 1992–2002 the number of adults abusing controlled prescription drugs increased by 81% (CASA, 2005) and 17% from 2005–2006 (Back et al., 2010). In 2006, prescription opioids were the most commonly initiated illicit drug class within the past year (SAMHSA, 2007). From 1999 to 2010, kilograms of opioids sold rose from approximately 2 to 7 per 10,000 people in the United States, deaths due to opioid overdose from ~1.5 to ~5.5 per 100,000, and admissions for opioid-abuse treatment rose from ~1 to ~5 per 10,000 (Volkow et al., 2014). Reflecting these increases, rates of emergency room visits involving prescription medication abuse rose 183% from 2004–2011 (SAMHSA, 2013b). Although modest reductions in nonmedical use were noted from 2009–2011, these trends varied greatly by state (SAMHSA, 2013c).

Furthermore, recent evidence suggests that increasingly, heroin use is initiated as an alternative opioid by abusers of prescription pain medication. Users describe heroin's ease of administration, ease of acquisition, and price as preferable to prescription opioids (Cicero et al., 2014). Contemporary prescription drug monitoring programs, tamper-resistant drug formulations, and state laws designed to reduce diversion may increase the proportion of prescription opioid abusers making this transition. For the first time, heroin users who recently (since 2010) initiated regular opioid use include equal proportions of men and women (Cicero et al., 2014).

Furthermore, sources of abused opioids differ by sex. Among individuals with prescription opioid dependence, women disproportionately reported receiving their initial opioids from a physician (83%), relative to men (58%; Back et al., 2011). Among college-aged individuals, men are more likely to purchase prescription opioids from a dealer, while women obtain them more often from parents (McCabe et al., 2005). These findings highlight targets for prevention efforts that may be particularly relevant to deterring opioid use initiation among women, and taken together with the current data, suggest the need for increased attention and education toward these issues from healthcare professionals, including physicians, pharmacists and prescribing nurses. Prescribers should alert patients receiving opioids of the danger involved in medication sharing and should be trained to identify risk factors for opioid misuse. For instance, among women, cigarette use and serious mental illness appear uniquely associated with opioid misuse (Tetrault et al., 2008; Green et al., 2009).

4.4 Telescoping Trends

Overall, these results highlight the need for prevention and early intervention efforts, particularly those targeting women. Slowing transitions and reducing drug-associated consequences may be particularly critical for women, given the 'window of opportunity' for intervention is smaller for women.

Importantly, telescoping effects may be magnified, diminished, or may vary in their localization, depending on the specific substance in question. Contrasts between pain medication and narcotics subsamples are particularly interesting, as they highlight the variability in milestone ages and telescoping measures that may be associated with non-pharmacological (i.e., sociocultural) factors. These findings also contrast with our previous telescoping investigations of alcohol use (Lewis and Nixon, 2014), in which sex differences

were noted only in progression from problem use to treatment entry. Telescoping to treatment entry has been observed in other drug-specific investigations (e.g., Hernandez-Avila et al., 2004; McCance-Katz et al., 1999). This analysis was not feasible in the current work due to lack of drug-specific information regarding initial treatment entry (i.e., age of initial cocaine treatment). Future work examining telescoping, as reflected in time to treatment for specific drugs, while systematically accounting for polydrug use, would inform intervention efforts, and enhance interpretation of the telescoping literature.

4.5 Interpretational Issues and Limitations

Participants were drawn from two large providers serving urban and suburban counties in north and north-central Florida. Although incidence of substance use/abuse in Florida is comparable to national averages (Hughes et al., 2009), sociocultural and/or sociodemographic effects related to geographic location may influence results.

Our analysis involved parallel investigation of substance-specific telescoping in overlapping groups. Our few exclusionary criteria resulted in a broad, heterogeneous sample. These strategies precluded meaningful analysis between drug groups, and as noted above, may have limited our power to detect subtle effects in behaviors with high variability (e.g., progression of cocaine use). However, the marked contrast in results across specific drugs, despite this overlap, highlight the heterogeneity of telescoping effects. Furthermore, this approach confers greater applicability to the general population of substance abusers, for whom polysubstance use is common.

These data were based on self-report and thus may be susceptible to recall bias, including the possibility that recall was distorted to a greater degree among the older men in the sample. Although this possibility should be recognized, retrospective recall for use of marijuana, cocaine, and opioids appear stable (82–86% agreement) over periods up to 10 years, with low rates (often <1%) of age recall discrepancies (Shillington et al., 1995).

4.6 Summary

The current study describes treatment-seeking polysubstance users. Our results suggest that within this population, rates of drug use, milestone ages, and progression of substance use vary as a function of sex. Contrasts in telescoping across drug-specific subgroups highlight the nuance and complexity of these data, and emphasize the need for further examination. This initial description of telescoping in polysubstance users is important. Systematic exploration of relationships between milestone transitions and specific sociocultural factors (e.g., familial substance abuse), and use of more detailed measures (e.g., diagnostic interviewing), in future work will aid interpretation of these observations, and further inform prevention and treatment efforts.

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Highlights

- Treatment-seeking participants completed personal histories of substance use.
- Rates of drug use and milestone ages varied by sex and specific drug.
- Analyses suggested pronounced telescoping effects for pain medication and marijuana.
- Women progressed more rapidly through substance use milestones.

Table 1

Regular vs. Problem Use (by Sex)

Drug	Regular Use			Problem Use			Odds Ratio 95% CIs
	Total n (% total)	Women n (%fem)	Men n (%males)	Total n (% total)	Women n (%fem)	Men n (%males)	
Marijuana	433 (72.90%)	193 (61.66%)	240 (85.41%)	231 (38.89%)	109 (34.82%)	122 (43.42%)	0.70* 0.50-0.97
Cocaine	469 (78.96%)	249 (79.55%)	220 (78.29%)	452 (76.09%)	238 (76.04%)	214 (76.16%)	0.99 0.68-1.45
Amphetamine	107 (18.01%)	53 (16.93%)	54 (19.22%)	86 (14.48%)	41 (13.10%)	45 (16.01%)	0.79 0.50-1.25
Narcotics	148 (24.92%)	86 (27.48%)	62 (22.06%)	132 (22.22%)	74 (23.64%)	58 (20.64%)	1.19 0.81-1.76
Benzodiazepines	140 (23.57%)	87 (27.80%)	53 (18.86%)	114 (19.19%)	73 (23.32%)	41 (14.59%)	1.78*** 1.17-2.72
Phencyclidine	20 (3.37%)	8 (2.56%)	12 (4.27%)	9 (1.52%)	4 (1.28%)	5 (1.78%)	0.71 0.19-2.69
Barbiturates	34 (5.72%)	18 (5.75%)	16 (5.69%)	27 (4.55%)	14 (4.47%)	13 (4.63%)	0.96 0.45-2.09
Inhalants	29 (4.88%)	18 (5.75%)	11 (3.91%)	25 (4.21%)	13 (4.15%)	12 (4.27%)	0.97 0.44-2.17
Hallucinogens	122 (20.54%)	61 (19.49%)	61 (21.71%)	71 (11.95%)	37 (11.82%)	34 (12.10%)	0.97 0.59-1.60
Pain Medication	188 (31.65%)	118 (37.70%)	70 (24.91%)	154 (25.93%)	98 (31.31%)	56 (19.93%)	1.83** 1.26-2.67
Muscle Relaxants	93 (15.66%)	66 (21.09%)	27 (9.61%)	54 (9.09%)	43 (13.74%)	11 (3.91%)	3.91*** 1.97-7.74

Bolded sections represent use differences by sex significant at the $p < .05$ level (

* $p < .05$.

** p<.01,
*** p<.001).

Odds ratios are expressed as [W_{users}/W_{non-users}]/[M_{users}/M_{non-users}].

Table 2

Drugs of Choice		Total N (% total)	Women n (% fem)	Men n (% males)	Odds Ratios 95% CI
Any DOC	Cocaine	435 (82.39%)	228 (80.57%)	207 (84.49%)	0.76 0.48–1.20
n=528	Marijuana	267 (50.57%)	118 (41.70%)	149 (60.82%)	0.46 0.32–0.65
	Pain Medications	124 (23.48%)	81 (28.62%)	43 (17.55%)	1.88 1.24–2.86
	Narcotics	61 (11.55%)	32 (11.31%)	29 (11.84%)	0.94 0.56–1.62
	Benzodiazepines	55 (10.42%)	39 (13.78%)	16 (6.53%)	2.29 1.24–4.21
	Amphetamines	51 (9.66%)	23 (8.13%)	28 (11.43%)	0.69 0.38–1.22
DOC1	Cocaine	310 (58.38%)	165 (58.30%)	145 (59.18%)	0.96 0.68–1.36
n=528	Marijuana	115 (21.78%)	48 (16.96%)	67 (27.35%)	0.54 0.36–0.82
	Pain Medications	59 (11.17%)	42 (14.84%)	17 (6.94%)	2.33 1.29–4.22
	Narcotics	20 (3.79%)	11 (3.89%)	9 (3.67%)	1.06 0.43–2.60
	Benzodiazepines	13 (2.46%)	11 (3.89%)	2 (0.82%)	4.91 1.08–22.39
	Amphetamines	11 (2.08%)	6 (3.12%)	5 (2.04%)	1.04 0.31–3.45
DOC2	Cocaine	129 (34.86%)	68 (35.42%)	61 (34.27%)	
n=370	Marijuana	124 (33.51%)	52 (27.08%)	72 (40.45%)	
	Pain Medications	41 (11.08%)	28 (14.58%)	13 (7.30%)	
	Benzodiazepines	26 (7.03%)	18 (9.38%)	8 (4.49%)	
	Narcotics	21 (5.95%)	13 (6.77%)	9 (5.06%)	

Drug	Total N (% total)	Women n (% fem)	Men n (% males)	Odds Ratios 95% CI
Amphetamines	21 (5.68%)	7 (3.65%)	14 (7.87%)	
DOC3	37 (23.87%)	20 (24.10%)	17 (23.61%)	
<i>n=155</i>	33 (21.29%)	20 (24.10%)	13 (18.06%)	
Pain Medications	27 (17.42%)	13 (15.66%)	14 (19.44%)	
Benzodiazepines	17 (10.97%)	11 (13.25%)	6 (8.33%)	
Amphetamines	16 (10.32%)	7 (8.43%)	9 (12.50%)	
Narcotics	15 (9.68%)	7 (8.43%)	8 (11.11%)	

Bolded sections represent use differences by sex significant at the $p < .05$ level (

* $p < .05$,

** $p < .01$,

*** $p < .001$).

'Any DOC' represents endorsement of a particular drug as DOC1, DOC2, or DOC3, thus percentages listed for 'Any DOC' will sum >100%. Only drugs listed as DOCs by greater than 5% of participants were included. Drugs are listed in order of highest to lowest total percent. Odds ratios are expressed as $[W_{DOC}/W_{non-DOC}]/[M_{DOC}/M_{non-DOC}]$.

Table 3

Group overlap among individuals meeting drug group criteria

	Marijuana n(%)	Cocaine n(%)	Pain Med n(%)	Narcotics n(%)	Other Drug Problem+DOC
Marijuana (170)		122 (72%)	24 (14%)	12 (7%)	n=23 (14%)
Cocaine (412)	122 (30%)		47 (11%)	32 (8%)	n=36 (9%)
Pain Med (96)	24 (25%)	47 (49%)		23 (24%)	n=27 (28%)
Narcotics (50)	12 (24%)	32 (64%)	23 (38%)		n=11 (20%)

Percentages indicate proportion of left-most groups meeting criteria for inclusion in top-most groups

Table 4

Table 4a. Opioid Use Milestone Ages and Progression by Sex						
Sex	Initial M(SD)n	→	Reg. Use M(SD)n	→	Prob Use M(SD)n	
Men	21.04 (8.88) 45	2.14 (4.70) 43	23.37 (9.94) 43	2.65 (5.93) 43	26.09* (11.18) 46	
Women	19.39 (6.13) 76	3.03 (4.54) 76	22.42 (6.85) 76	0.47 (3.60) 76	22.70* (6.21) 77	

Table 4b. Pain Med Use Milestone Ages and Progression by Sex						
Sex	Initial M(SD)n	→	Reg. Use M(SD)n	→	Prob Use M(SD)n	
Men	23.50* (10.84) 30	2.10 (4.62) 30	25.60 (11.12) 30	3.10 (6.72) 30	28.9* (12.29) 31	
Women	19.29* (5.81) 65	3.35 (4.75) 65	22.65 (6.86) 65	0.14 (4.93) 65	22.78* (5.99) 65	

Table 4c. Narcotics Use Milestone Ages and Progression by Sex						
Sex	Initial M(SD)n	→	Reg. Use M(SD)n	→	Prob Use M(SD)n	
Men	20.83 (6.41) 23	1.95 (5.07) 21	22.86 (9.19) 21	0.62 (2.46) 21	23.92 (10.11) 24	
Women	19.76 (7.01) 25	2.36 (4.27) 25	22.12 (7.26) 25	0.68 (4.67) 25	22.54 (6.34) 26	

Table 4d. Marijuana Use Milestone Ages and Progression by Sex						
Sex	Initial M(SD)n	→	Reg. Use M(SD)n	→	Prob Use M(SD)n	
Men	13.89* (3.02) 93	2.07 (2.52) 91	15.96 (3.42) 91	2.04 (8.70) 90	18.04 (8.93) 92	
Women	15.03* (3.05) 77	1.63 (2.96) 75	16.57 (4.32) 75	0.68 (3.45) 71	17.08 (5.36) 72	

Table 4e. Cocaine Use Milestone Ages and Progression by Sex

Sex	Initial M(SD) <i>n</i>	→	Reg. Use M(SD) <i>n</i>	→	Prob Use M(SD) <i>n</i>
Men	22.18 (7.55) 192	2.46 (5.36) 188	24.72 (9.57) 188	1.84 (6.64) 187	26.57* (9.14) 194
Women	21.16 (6.16) 214	2.38 (5.50) 205	23.42 (7.53) 205	1.10 (4.86) 202	24.46* (7.70) 212

* denote significant age differences at use milestones

Bold indicates significant differences in progression between milestones