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Exploration of the telescoping effect among not-in-treatment, intensive heroin-using research volunteers

Jonathan J.K. Stoltman[a], **Eric A. Woodcock**[a], **Jamey J. Lister**[a], **Mark K. Greenwald**[a,b,*], and **Leslie H. Lundahl**[a]

[a]Department of Psychiatry and Behavioral Neurosciences, School of Medicine, and Wayne State University, Detroit, MI 48201, USA

[b]Department of Pharmacy Practice, Eugene Applebaum College of Pharmacy and Health Sciences, Wayne State University, Detroit, MI 48201, USA

Abstract

Background—Addiction research literature suggests some demographic groups exhibit a later age of substance use initiation, more rapid escalation to dependence, and worse substance use-related outcomes. This 'telescoping' effect has been observed more often in females but has not yet been examined in not-in-treatment heroin users or racial subgroups.

Methods—Not-in-treatment, intensive heroin-using adults screened for laboratory-based research studies (N = 554; range 18–55 yr; mean age: 42.5 yr; 60.5% African American [AA]; 70.2% male) were included in this secondary analysis. A comprehensive drug history questionnaire assessed heroin-use characteristics and lifetime adverse consequences. We examined telescoping effects by racial and gender groups: Caucasian males and females; AA males and females.

Results—Caucasian males initiated heroin use significantly later than AA males but this difference was not observed for age at intensive heroin use (≥3 times weekly). Caucasian males reported significantly more lifetime heroin use-related consequences, were more likely to inject heroin, and reported more-frequent past-month heroin use, but did not differ from AA males in lifetime heroin quit attempts or prior heroin treatment. Females, compared to males, reported later onset of initial and intensive use, but there was no gender-telescoping effect from initial to intensive heroin-use.

Conclusions—In this not-in-treatment sample, Caucasian males exhibited more rapid heroin-use progression and adverse consequences than AA males, i.e., within-gender, racial-group telescoping. Despite later-onset heroin use among females, there was no evidence of gender-

*Corresponding author at: Department of Psychiatry and Behavioral Neuro-sciences, Tolan Park Medical Building, Suite 2A, 3901 Chrysler Service Drive, Detroit, MI 48201, USA. Tel.: +1 313 993 3965; fax: +1 313 993 1372., mgreen@med.wayne.edu (M.K. Greenwald).

Contributors

J.J.K.S. conceptualized and performed the data analyses, and drafting the manuscript. E.A.W. and J.J.L. helped plan data analyses and edit the manuscript. M.K.G. contributed to study design, data coordination, and editing the manuscript. L.H.L. oversaw psychiatric screening, conceptualized the data analyses, and edited the manuscript. All authors have reviewed manuscript content and approved the final version for publication.

Conflict of interest

All authors declare no conflict of interest with respect to the conduct or content of this work.

related telescoping. Given the resurgence of heroin use, differential heroin-use trajectories across demographic groups may be helpful in planning interventions.

Keywords

Telescoping effect; Heroin; Race; Gender

1. Introduction

Heroin use is a growing problem in the United States (Cicero et al., 2014; SAMHSA, 2013). Current understanding of heroin-use trajectories, i.e., progression from initial to intensive use or dependence, and clinical outcomes is largely based on investigations of treatment-seeking populations (Anglin et al., 1987; Back et al., 2011b; Darke et al., 2003; Kosten et al., 1985; Ross et al., 2005). However, most heroin users are not in treatment (SAMHSA, 2013), suggesting further study of non-treatment seeking individuals – an understudied group (Ross et al., 2005) – could inform prevention and intervention strategies.

Substance-use trajectory studies have often focused on a 'gender *telescoping effect*' (Greenfield et al., 2010; Kay et al., 2010; Piazza et al., 1989; Zilberman et al., 2004), whereby females report later onset of initial substance use, but transition faster to intensive use/dependence, and experience worse outcomes than males. Gender telescoping has been observed among users of nicotine (Oncken et al., 2004), cannabis (Hernandez-Avila et al., 2004), cocaine (Haas and Peters, 2000), and both heroin and prescription opioids (Sartor et al., 2014) as well as non-treatment seeking prescription opioid users (Back et al., 2011a). Findings are equivocal among alcohol-dependent populations: some studies replicated the Piazza et al. (1989) findings of gender telescoping (Bravo et al., 2013; Diehl et al., 2007; Johnson et al., 2005; Mann et al., 2005; Piazza et al., 1989; Randall et al., 1999) whereas others did not (Alvanzo et al., 2011; Keyes et al., 2010; Lewis and Nixon, 2014). For example, Alvanzo et al. (2011) found that males progressed to alcohol dependence faster than females, and Caucasian males and females progressed faster than African Americans and Hispanics. Discrepant findings may reflect sampling differences, e.g., non-replication studies primarily relied on representative population samples whereas other studies used treatment samples (which emphasizes the value of examining different substance using populations).

Opioid telescoping has been studied only in treatment-seeking populations and yielded inconclusive findings. Hernandez-Avila et al. (2004) found that opioid-dependent females progressed to treatment faster than males, whereas Holscher et al. (2010) did not observe this effect. These incongruent results could be due to methodological factors, such as Holscher et al. (2010) using age at first injection to represent age at initial use. Recently, Sartor et al. (2014) found progression to opioid dependence was faster for females than males, and faster for African-Americans than Caucasians, demonstrating the importance of racial and gender stratification.

The present secondary analysis investigated: (1) differential telescoping effects by gender and/or race in a metropolitan-based sample of not-in-treatment, intensive heroin users; and (2) whether demographic group differences in trajectory from initial to intensive heroin use

relate to current heroin-use patterns. Based on previous literature, we hypothesized a gender telescoping effect such that females would report later initial use but faster transition to intensive and worse outcomes of use.

2. Methods

2.1. Participant selection

Not-in-treatment, intensive heroin-using adults (18–55 yr) were recruited from the community through print advertisements and word-of-mouth referral for multiple experimental opioid studies (1998–2014). Secondary analysis was conducted on screening data pooled from these studies. The local Institutional Review Board approved all studies, which were conducted according to the Declaration of Helsinki. Candidates who denied major medical or psychiatric contraindications (e.g., heavy alcohol use, major depression, cardiovascular/pulmonary diseases, or conditions that might need treatment) during a structured phone interview were invited to undergo comprehensive in-person screening following written informed consent. Opioid-positive (>300 ng/ml), alcohol-free individuals (<.002%) were included in this analysis.

2.2. Measures

Lifetime and current heroin use was assessed *via* a standardized, self-report battery of substance use created locally by experts in the substance abuse field, the Drug History and Use Questionnaire (available upon request). Variables of interest included two heroin-use chronological landmark variables: age at onset both of *initial* and *intensive* heroin use (≥3 times weekly); and lifetime heroin-use characteristics. Also examined were duration of heroin use (age at study *minus* age of initial use), number of heroin-quit attempts (range: 0–100), treatment ever sought for heroin use (yes/no), injection heroin use (ever/never), and total number of heroin use-related negative consequences (21-items, e.g., heroin overdose, financial problems due to heroin use; each ever/never; see Woodcock et al. [2015, in press] for table including all items). Finally, we included current heroin-use characteristics, including number of past-month heroin-use days (30 maximum) and total past-month heroin use (mean daily uses in the past week *multiplied by* past-month use days).

2.3. Data analyses

Two-way multivariate analysis of variance (MANOVA) examined effects of gender and race on heroin-use landmark variables (age at onset of *initial* and *intensive* heroin use). Progression latency (age at onset of intensive use *minus* age at initial heroin use) was examined using two-way ANOVA. Heroin-use characteristics were examined using two-way MANCOVA (controlling for duration of heroin-use) and chi-square tests when appropriate. Due to non-normally distributed data, $\log_{10}$ transformations were used to normalize all continuous variables included in analysis.

Telescoping would be indicated by: (1) delayed age at *initial* onset of use, but no difference between groups in age at onset of *intensive* heroin use, with (2) a concomitant shorter mean latency to intensive use accompanied by worse consequences of use. Criterion to reject the

null hypothesis was set at $p < .05$ for all analyses, conducted using SPSS v.21 (IBM Corp, 2012).

3. Results

3.1. Participant characteristics

Complete data were available for 554 from a total sample of 567. Participants were excluded for reporting 'other' or having incomplete race data ($n = 13$). Participants included in analysis were mostly African American (60.5%) and male (70.2%), with mean (±1 SD) age of 42.5 (±9.3) yr and education of 12.4 (±1.6) yr. Mean age for initiating heroin use was 23.4 (±7.7) yr and age at onset of intensive heroin use was 25.6 (±8.0) yr. Average past-month heroin use was 28.2 (±4.5) days and duration of heroin use was 19.2 (±11.8) yr. Lifetime incidence of heroin injection was reported by 69.0% of the sample. Heroin-use characteristics for groups and significant *F*-test values are presented in Table 1.

3.2. Telescoping effect

3.2.1. Age at initial use—Results indicated a significant gender × race interaction on age at initial heroin use. Simple contrasts indicated Caucasian males (CAm) were significantly older than African American males (AAm) at first heroin use, $F_{(1, 550)} = 6.53$, $p = .011$. AA females (AAf) started later than AAm, but there was no gender difference among Caucasians. A gender main effect indicated females started heroin use later than males. There was no race main effect.

3.2.2. Age at intensive use—A gender main effect revealed that females reported later-onset intensive use. There were no other significant differences.

3.2.3. Latency—Heroin-use progression latency was skewed: 49.1% progressed to intensive use within one year of initial use, 26.9% within two years, and 24.0% in ≥3 yr. Two-way ANOVA revealed a race main effect for progression latency, with CA reporting shorter latency than AA. There were no other significant differences.

3.3. Heroin-use characteristics

Two-way MANCOVA identified a gender × race interaction on total past-month heroin-use. Simple contrasts indicated CAf had higher past-month frequency of use than CAm, $F_{(1, 523)} = 13.64$, $p < .001$, and AAf, $F_{(1, 523)} = 11.73$, $p < .001$. There were main effects of race (CA > AA) and gender (females > males) on heroin-use frequency.

Main effects for race were found on total lifetime consequences of heroin use: CAs endorsed more consequences than AAs, had more quit attempts, and were more likely to have injected heroin. No gender effects were observed for heroin-quit attempts or consequences. Ever-seeking heroin treatment did not differ by race or gender.

4. Discussion

Prior studies on heroin-use telescoping among treatment seekers have analyzed gender and race as separate factors. This study concurrently examined gender and racial group

differences on heroin-use trajectories and outcomes of not-in-treatment, intensive heroin users, an understudied and important population. We identified a novel trajectory of use whereby Caucasian males (CAm) reported later initial heroin use than African American males (AAm) but a similar age at onset for intensive heroin use, suggesting a telescoped trajectory from initial to intensive use between these groups. To our knowledge, this is the first study to report a within-gender, racial telescoping effect in heroin-users.

Overall, participants in this sample progressed from initial to intensive heroin use in ≈2.5 yr, suggesting the window for intervention is narrow (Back et al., 2011a). In addition to shorter transition from initial to intensive use, Caucasian participants reported more adverse consequences, greater past-month use, more lifetime heroin-quit attempts, and greater likelihood of lifetime heroin injection relative to AA. However, CA were not more likely to have ever sought treatment.

We found females were older than males at onset of initial and intensive heroin use, similar to Sartor et al. (2014); however, we found a different telescoping pattern by race than Sartor et al. (2014), as CA progressed faster than AA to intensive use. These disparate findings may be due to participant characteristics, e.g., our entire sample consisted of primary heroin users, whereas 80% of the Sartor et al. sample indicated heroin as their primary opioid. We did not observe gender-telescoping like Holscher et al. (2010), albeit their focus on age of initial injection rather than any heroin use, a treatment-seeking sample, and lack of examination of racial-group differences makes comparisons difficult. However, we found that females reported significantly greater past-month heroin use (despite shorter duration of use) than males, which has not been routinely observed among not-in-treatment samples (e.g., Kelly et al., 2009). As noted, CA exhibited the shortest transition latency and most consequences of heroin use. Therefore, while our finding of a within-race telescoping trajectory (CAm vs. AAm) is novel, the lack of greater heroin-use consequences for CAm vs. AAm in this not-in-treatment sample is inconsistent with findings from treatment samples. This discrepancy may be related to differences between samples (e.g., greater negative drug-use consequences may motivate the latter individuals to seek treatment).

This study has a number of strengths and limitations. Among the strengths is its focus on a sample not currently seeking treatment, though the majority (≈70%) endorsed having sought heroin treatment previously. Examination of this heroin-use stage, when participants are mostly not treatment-naïve but presently not-in-treatment or seeking treatment through study enrollment, captures a more fluid sub-population of heroin-users. Limitations of this study include use of a convenience sample for secondary analysis drawn from 16 yr of recruitment; excluding those with serious medical or psychiatric conditions that could differentially affect the subgroups studied (possibly impacting latency estimates); potential recall biases that might artificially ‘shift’ age of use (Bright and Soulakova, 2013; Johnson and Schultz, 2005). Also, the present study defined telescoping as the latency between heroin-use landmarks, therefore, we have limited ability to compare our results directly to those of other studies that defined telescoping as time-to-treatment. While nearly all participants in this study would probably meet criteria for (moderate to severe) opioid use disorder based on their heroin-use frequency and consequences, another limitation is the lack of formal diagnostic assessment. Finally, our findings may not generalize to non-heroin

substance users, not-in-treatment heroin-users who do not volunteer for studies, those who have never experienced treatment, or racial/ethnic groups beyond AA and CA. Future research should examine mediating/moderating factors (e.g., length and type of treatment) on clinically-relevant outcome measures.

In conclusion, the present findings indicate a telescoping effect in Caucasian males relative to African American males among presently not-in-treatment, intensive heroin users. Females were older than males at both heroin-use landmarks (i.e., ages of initial and intensive use). These findings improve our understanding of gender and racial group differences in trajectory of heroin use, encouraging inquiry into other factors (e.g., psychological characteristics) that may influence these demographic differences. Considered in the current epidemiological context of resurgent heroin use, we believe further investigation of drug-use progression in not-in-treatment populations – the hidden majority of heroin users – is needed and could help to inform demographically targeted and timely prevention and intervention.

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Drug Alcohol Depend. Author manuscript; available in PMC 2017 July 31.

Table 1

Heroin use characteristics[**].

Variable	African American males (*n* = 228)	Caucasian males (*n* = 161)	African American females (*n* = 107)	Caucasian females (*n* = 58)	Race	Gender	Race × gender
Age (yr)	46.5 (6.7)	37.7 (9.9)	45.3 (6.7)	35.3 (10.6)	$F_{(1, 550)} = 14.15^{Y++}$	$F_{(1, 550)} = 4.95^{X+}$	
Education (yr)	12.4 (1.6)	12.4 (1.3)	12.2 (1.8)	12.4 (2.0)			
Duration of heroin use (yr)	24.4 (11.2)	13.9 (9.9)	19.9 (10.9)	11.8 (10.2)	$F_{(1, 550)} = 81.90^{Y++}$	$F_{(1, 550)} = 10.38^{X++}$	
Age of initial heroin use (yr)	22.1 (7.7)	23.8 (7.2)	25.4 (8.0)	23.6 (8.0)		$F_{(1, 550)} = 4.17^{W+}$	$F_{(1, 550)} = 6.80^{++}$
Age of intensive heroin use (yr)	24.8 (8.4)	25.2 (7.3)	27.7 (7.9)	26.1 (8.4)		$F_{(1, 550)} = 6.26^{W+}$	
Heroin landmark latency (yr)	2.7 (4.8)	1.4 (3.1)	2.4 (4.2)	2.5 (5.7)	$F_{(1, 550)} = 8.78^{Y+}$		
Same year progression	39.9%	59.0%	46.7%	62.1%	$\chi^2[1] = 16.65^{Z++}$		$\chi^2[3] = 18.17^{++}$
Past month heroin use (max: 30 days)	27.7 (5.3)	28.9 (2.7)	28.0 (5.3)	29.1 (2.8)	$F_{(1, 524)} = 6.62^{Z++}$		
Past month heroin use frequency[*]	110.4 (97.5)	122.0 (107.1)	124.1 (99.6)	185.8 (153.8)	$F_{(1, 523)} = 10.91^{Z++}$	$F_{(1, 523)} = 12.37^{W++}$	$F_{(1, 523)} = 5.72^{+}$
Lifetime heroin quit attempts[*]	8.8 (14.4)	12.6 (22.5)	12.2 (22.8)	9.0 (18.6)	$F_{(1, 523)} = 7.05^{Z+}$		
Lifetime injection heroin use	50.4%	93.2%	58.7%	93.1%	$\chi^2[1] = 99.12^{Z++}$		$\chi^2[3] = 101.37^{++}$
Treatment sought for heroin use	70.5%	72.0%	70.0%	74.5%			
Lifetime heroin use consequences[*]	6.6 (4.7)	9.7 (4.4)	6.2 (4.7)	8.8 (4.5)	$F_{(1, 523)} = 43.50^{Z++}$		

[*] Values are subgroup means (SD); all continuous variables in bivariate analysis were $\log_{10}$ transformed.

[**] Model controlled for duration of heroin-use.

[Z] Caucasians higher average.

[Y] African Americans higher average.

[X] Males higher average.

[W] Females higher average.

[+] $p < .05$.

[++] $p \leq .01$.