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Rate of progression from first use to dependence on cocaine or opioids: A cross-substance examination of associated demographic, psychiatric, and childhood risk factors

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HIGHLIGHTS

- Conduct disorder and physical abuse predicted rapid onset of cocaine dependence.
- These same two risk factors predicted rapid onset of opioid dependence.
- Dependence on other substances predicted slower transitions to cocaine dependence.
- This same pattern was observed for opioid dependence.
- African Americans were at elevated risk for rapid onset of opioid dependence.

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ABSTRACT

Background: A number of demographic factors, psychiatric disorders, and childhood risk factors have been associated with cocaine dependence (CD) and opioid dependence (OD), but little is known about their relevance to the rate at which dependence develops. Identification of the subpopulations at elevated risk for rapid development of dependence and the risk factors that accelerate the course of dependence is an important public health goal.

Methods: Data were derived from cocaine dependent ($n = 6333$) and opioid dependent ($n = 3513$) participants in a multi-site study of substance dependence. Mean age was approximately 40 and 40% of participants were women; 51.9% of cocaine dependent participants and 29.5% of opioid dependent participants self-identified as Black/African–American. The time from first use to dependence was calculated for each substance and a range of demographic, psychiatric, and childhood risk factors were entered into ordinal logistic regression models to predict the (categorical) transition time to CD and OD.

Results: In both the cocaine and opioid models, conduct disorder and childhood physical abuse predicted rapid development of dependence and alcohol and nicotine dependence diagnoses were associated with slower progression to CD or OD. Blacks/African Americans were at greater risk than European Americans to progress rapidly to OD.

Conclusions: Only a subset of factors known to be associated with CD and OD predicted the rate at which dependence developed. Nearly all were common to cocaine and opioids, suggesting that sources of influence on the timing of transitions to dependence are shared across the two substances.

1. Introduction

An estimated 1.1 million Americans meet DSM-IV criteria for cocaine abuse or dependence, according to the National Survey on Drug Use and Health (NSDUH) (Substance Abuse Mental Health Services Administration, 2010). Opioid use disorders are even more prevalent (Compton, Thomas, Stinson, & Grant, 2007), and will likely remain a significant public health issue as the misuse of prescription opioids continues to rise (Blanco et al., 2007; Compton & Volkow, 2006; Martins, Keyes, Storr, Zhu, & Grucza, 2010). Understanding the development of cocaine and opioid use disorders, including identification of the subpopulations at elevated risk for rapid development

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of dependence and the psychiatric and childhood risk factors that accelerate the course of dependence are important public health goals.

1.1. Prevalence of cocaine dependence and opioid dependence by sex and race/ethnicity

Studies examining differences by sex or race/ethnicity in prevalence of cocaine and opioid use disorders have produced mixed results. A recent study by Lev-Ran, Imtiaz, Rehm, and Le Foll (2013) based on data from a large nationally representative sample, the National Epidemiological Study of Alcohol and Related Conditions, reported a higher prevalence of cocaine use disorders in men than women. However, a study by Wagner and Anthony (2007) based on another large nationally representative sample, the National Comorbidity Survey (NCS), found no evidence for sex differences in dependence risk among users. Further, studies of adolescent or college-aged samples have shown higher rates of cocaine dependence (CD) in females (Chen & Kandel, 2002; Kasperski et al., 2011). Far less attention has been given to sex differences in opioid use disorders. The one known study in this area reported a higher prevalence in men (Lev-Ran et al., 2013).

The literature on racial/ethnic differences in the prevalence of cocaine use disorders, though sparser, is more consistent. Investigations using two different large-scale community-based samples (National Household Survey on Drug Abuse (NHSDA) and National Epidemiological Survey of Alcohol and Related Conditions) reported higher rates of CD among African–American than European–American cocaine users (Chen & Kandel, 2002; Lopez-Quintero et al., 2011). Racial/ethnic differences in the prevalence of opioid dependence (OD) have not been investigated, but according to an NHSDA-based study, African Americans are more likely than European Americans to use heroin (Ma & Shive, 2000). Identifying possible distinctions by race/ethnicity in the pathway to cocaine or opioid dependence is an important step toward developing tailored prevention efforts.

1.2. Psychiatric comorbidity with cocaine dependence and opioid dependence

Both CD and OD frequently co-occur with other substance use disorders (SUDs). Elevated rates of alcohol use disorders, nicotine dependence, cannabis dependence, and OD have been observed in dependent cocaine users (Bierut, Strickland, Thompson, Afful, & Cottler, 2008; Goldstein, Dawson, Chou, & Grant, 2012; Tang, Kranzler, Gelernter, Farrer, & Cubells, 2007). Similarly, in clinical samples of dependent opioid users, the lifetime prevalence of alcohol dependence, cannabis dependence, and CD is high, ranging from approximately 40 to 70%, 20 to 50%, and 65 to 80%, respectively (Brooner, King, Kidorf, Schmidt, & Bigelow, 1997; Kidorf et al., 2004; Rodriguez-Llera et al., 2006).

In addition to SUDs, high rates of comorbidity of attention-deficit hyperactivity disorder (ADHD) (Falck, Wang, & Carlson, 2008; Goldstein et al., 2012), major depressive disorder (Kandel, Huang, & Davies, 2001), and posttraumatic stress disorder (PTSD) (Back et al., 2000; Najavits et al., 1998; Wasserman, Havassy, & Boles, 1997) have been reported in cocaine dependent individuals. Rates of ADHD (Carpentier, Van Gogh, Knapen, Buitelaar, & De Jong, 2011; Rodriguez-Llera et al., 2006) and major depressive disorder (Brooner et al., 1997; Kidorf et al., 2004; Rodriguez-Llera et al., 2006; Sordo et al., 2012) are also elevated in individuals with OD, but there is no evidence for heightened risk for PTSD in this population (Kidorf et al., 2004; Rodriguez-Llera et al., 2006). However, the prevalence of conduct disorder is extremely high, estimated at 54% (Modestin, Matutat, & Wurmle, 2001) and 60% (Carpentier et al., 2011) in two treatment-seeking samples. Elevated rates of exposure to childhood physical and sexual abuse have also been observed in individuals dependent on cocaine or opioids (Afifi, Henriksen, Asmundson, & Sareen, 2012; Shin, Hong, & Hazen, 2010), likely due at least in part to the high degree of overlap in risk factors for child maltreatment and substance use disorders, such as poor parental monitoring and parental substance use problems (Fergusson, Lynskey, & Horwood, 1996; Walsh, MacMillan, & Jamieson, 2013.

1.3. Rate of progression from first use to dependence

Examination of the rate of progression from first use to dependence is important for the development of etiological models of CD and OD, as this phenotype captures the dynamic nature of substance dependence and can be informative for the identification of risk factors that accelerate its development. Risk for developing dependence is higher among cocaine users and opioid users than cannabis users (Anthony, Warner, & Kessler, 1994; Tsuang et al., 1999; Wagner, Lloyd, & Gil, 2002 but about equal to the risk for alcohol dependence among drinkers and far lower than nicotine dependence risk among tobacco users (Lopez-Quintero et al., 2011). However, the transition to dependence occurs much more rapidly for cocaine than alcohol (Ridenour, Lanza, Donny, & Clark, 2006; Wagner & Anthony, 2007). For example, Lopez-Quintero et al. (2011) reported that 7.1% of cocaine users developed dependence within the first year, compared to less than 2% of alcohol, nicotine or cannabis users. The rate of progression to OD has not been well documented, but one small high-risk family study of adolescents reported that the transition to dependence was shorter for opioids than cocaine, cannabis, tobacco, or alcohol (Ridenour et al., 2006).

Several studies have shown that women progress more rapidly from first cocaine use to abuse or dependence (known as "telescoping") (McCance-Katz, Carroll, & Rounsaville, 1999; O'Brien & Anthony, 2005) and from regular use to treatment onset (Haas & Peters, 2000), but the relevant literature for OD is limited to one study that found a faster transition from regular use to treatment for women (Hernandez-Avila, Rounsaville, & Kranzler, 2004). We are also aware of only one study to examine racial/ethnic differences in the rate of progression to CD or OD (O'Brien & Anthony, 2005), in which a more rapid progression from first cocaine use to CD was observed in non European–American (African–American and other race/ethnicity) than European–American cocaine users. None of the existing studies examining progression to CD or OD have incorporated psychiatric conditions or childhood risk factors.

In short, few of the demographic factors and none of the psychiatric or childhood risk factors associated with CD and OD have been investigated with respect to the rate of transition from first use to dependence, despite the potential utility of such an approach for understanding the development of CD and OD. The current study was designed to address that gap in the literature, using data from a sample in which all individuals met dependence criteria, thus avoiding the need to distinguish factors that contribute to the rate of transition to dependence from those that contribute to the risk to *ever* develop dependence.

2. Materials and methods

2.1. Sample

Data for the current study were derived from cocaine dependent and opioid dependent participants in a multi-site study of alcohol dependence, CD, and OD conducted through Yale University School of Medicine, the University of Connecticut Health Center, the University of Pennsylvania Perelman School of Medicine, the Medical University of South Carolina, and McLean Hospital. The sample for the multi-site study was comprised of alcohol, cocaine, or opioid dependent individuals and unaffected controls recruited for case–control genetic studies of SUDs and cocaine or opioid dependent probands and their relatives from family-based genetic studies. (See Sun et al. (2012) for details on ascertainment and procedures.) The study protocol and informed consent document were approved by the institutional review board at each participating institution.