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The latent structure and predictors of non-medical prescription drug use and prescription drug use disorders: A National Study

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ABSTRACT

Background: Despite growing concerns about non-medical prescription drug use and prescription drug use disorders, whether vulnerability for these conditions is drug-specific or occurs through a shared liability and common risk factors is unknown.
Methods: Exploratory and confirmatory factor analysis of Wave 1 of the National Epidemiologic Survey on Alcohol and Related Conditions were used to examine the latent structure of non-medical prescription drug use and prescription drug use disorders. Multiple Indicators Multiple Causes (MIMIC) analysis was used to examine whether the effect of sociodemographic and psychiatric covariates occurred through the latent factor, directly on each drug class or both.
Results: A one-factor model described well the structure of both non-medical prescription drug use and prescription drug use disorders. Younger age, being White, having more intense pain or one of several psychiatric disorders increased the risk of non-medical prescription drug use through the latent factor. The same covariates, except for anxiety disorders also significantly increased the risk of prescription drug use disorders through the latent factor. Older age directly increased the risk of non-medical use of sedatives, and alcohol use disorders decreased the risk of non-medical tranquilizer use. No covariates had direct effects on the risk of any prescription drug use disorders beyond their effect through the latent factor.
Conclusion: The risk for non-medical prescription drug use and prescription drug use disorders occurs through a shared liability. Treatment, prevention and policy approaches directed at these drugs as a group maybe more effective than those focused on individual classes of drugs.

1. Introduction

Prescription drugs such as opioid analgesics, sedatives, tranquilizers and stimulants are essential medications for the treatment of pain, insomnia, anxiety, attention-deficit hyperactivity disorder (ADHD), and other psychiatric disorders (Olfson et al., 2013a,b; Resnik and Rehm, 2001). However, management of these medications is complicated by their liability to lead to abuse or dependence (Blanco et al., 2007; Compton and Volkow, 2006; Martins et al., 2012). Prescription drugs can also increase the risk of psychiatric and other medical disorders (Compton and Volkow, 2006; McCabe et al., 2005; Simoni-Wastila and Strickler, 2004; Swanson and Volkow, 2008), particularly when not used as directed by a physician. Between 1991–1992 and 2001–2002 the prevalence of non-medical use of prescription drugs increased by 53%, and the prevalence of prescription drug use disorder increased 67%, calling attention to the need to balance access for appropriate use of those medications with the need to curtail their non-medical use (Blanco et al., 2007).

Non-medical use of prescription drugs is often defined as using a psychotropic medication without a prescription, in greater amounts, more often, or longer than prescribed, or for a reason other than a doctor said you should use them (Blanco et al., 2013a; Martins et al., 2012). In the US, approximately 2.7% of the population (7 million persons) aged 12 years or older report non-medical prescription drug use at some point in their lives (SAMHSA, 2011), making it the second most used group of drugs, only after cannabis (Grant et al., 2004a). The number of individuals with past-year prescription drug use disorders is also considerable, ranging in 2009 from 160,000 individuals with sedative use disorder to close to two

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million people with prescription opioid use disorders (SAMHSA, 2011).

Non-medical use of prescription drugs has been associated with adverse health effects (Simoni-Wastila and Strickler, 2004), including respiratory depression, gastrointestinal dysmotility, central nervous system depression, cardiac dysrhythmia, hypertension, tachycardia, seizures, incoordination (Hernandez and Nelson, 2010), overdose (Bohnert et al., 2010, 2011) and premature mortality (Hall et al., 2008; Paulozzi et al., 2006). Non-medical prescription use and prescription drug use disorders are also associated with increased prevalence of substance use, mood and anxiety disorders (Kaloyanides et al., 2007; McCabe et al., 2006; Schepis and Hakes, 2011). Hence, their study has important implications for developing effective prevention and intervention strategies (McCabe et al., 2008) that may improve the population's health. Despite growing concern about these issues, to date, no study has examined whether the association of non-medical prescription use and prescription drug use disorders with their correlates occurs independently for each individual drug or through a common liability that underlying vulnerability to all drugs. This information is important because disorder-specific influences may require disorder-specific interventions, whereas influences at the latent variable level may be more amenable to interventions with broader impact.

In order to address those gaps in knowledge, the present study builds on prior knowledge to examine in a national representative sample of the U.S. general population: (1) the latent structure of non-medical prescription use of stimulants, tranquilizers, opioids and sedatives; (2) the latent structure of prescription drug use disorders due to those medications; and (3) sociodemographic and psychiatric characteristics that may be related to each of the subtypes of drugs and of the group as a whole. Prior to our analysis, we hypothesized based on the published literature indicating high rates of comorbidity between substance use disorders and other psychiatric disorders (Agrawal et al., 2006; Fenton et al., 2010; Fischer et al., 2012; Poulin, 2007) that: (1) all psychiatric disorders and level of pain would be associated with increased prevalence of all past-year prescription drug use disorders; and (2) level of pain and some psychiatric disorders would differentially be associated with certain prescription drugs. Specifically, level of pain would be associated with increased prevalence of prescription opioid use disorder due to their analgesic properties, anxiety and alcohol use disorders would be associated with increased prevalence of sedative and tranquilizer use disorders due to their action on benzodiazepine receptors, and mood disorders would be associated with stimulant use disorders due to their mood elevating properties.

2. Methods

2.1. Sample and procedures

The National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) (Grant et al., 2004b, 2009) was the source of data. The NESARC target population at Wave 1, collected in 2001–2002, was the civilian non-institutionalized population 18 years and older residing in households and group quarters. The overall survey response rate was 81%. Blacks, Hispanics, and young adults (aged 18–24 years) were oversampled, with data adjusted for over-sampling, household- and person-level non-response. The weighted data were then adjusted to represent the U.S. civilian population based on the 2000 Census. Interviews were conducted with 43,093 participants by experienced lay interviewers (Grant et al., 2004b, 2009). All procedures, including informed consent, received full human subjects review and approval from the US Census Bureau and the US Office of Management and Budget.

2.2. Assessment

The Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-IV Version (AUDADIS-IV; Grant et al., 1995, 2003; Ruan et al., 2008), a fully structured diagnostic interview, includes computer algorithms and was used to generate 12-month DSM-IV diagnoses. The group of prescription drugs is comprised by sedatives (e.g., barbiturates), tranquilizers (e.g., benzodiazepines), opioids, and stimulants (e.g., amphetamines). Consistent with prior reports (Blanco et al., 2007, 2013c; Martins et al., 2012) non-medical use of a prescription drug was defined to respondents as using in the 12-months preceding the interview a prescription drug "without a prescription, in greater amounts, more often, or longer than prescribed, or for a reason other than a doctor said you should use them."

To maximize statistical power and increase the stability of the estimates, we collapsed psychiatric disorders into broad groups. Axis I disorders included in the analyses were alcohol and drug use disorders (abuse and or dependence, excluding prescription drug use disorders), mood disorders (major depressive disorder, dysthymia, bipolar I and bipolar II disorders) and anxiety disorders (panic disorder, social anxiety disorder, specific phobia and generalized anxiety disorder disorders). Axis II disorders examined included cluster A (paranoid and schizoid), B (antisocial and histrionic) and C personality disorders (avoidant, dependent, and obsessive-compulsive). The test–retest reliabilities for AUDADIS-IV diagnoses are fair to good for mood, anxiety, and personality disorders ($\kappa = 0.40–0.62$) and excellent for substance use disorders ($\kappa = 0.70–0.91$; Grant et al., 2009; Hasin et al., 2007). Pain in the four weeks prior to the interview was assessed with an item from the Short Form 12, version 2 (SF-12; Ware et al., 2002) ranging from 1 ("not at all") to 5 ("extreme"). We also included sex, age, race/ethnicity as covariates in our analyses because they have been shown in previous analyses to influence the risk for substance use disorders (Hernandez and Nelson, 2010; Martins et al., 2009).

2.3. Statistical analyses

Weighted percentages and corresponding standard errors were calculated to provide descriptive information about the relationship between sociodemographic and psychopathological correlates of non-medical use of prescription drugs and prescription drug use disorder. Because individuals often engage in non-medical use of more than one drug, the groups presented in the results overlap and those cannot be directly compared using standard bivariate tests such as chi-squares or odds ratios (the same is true in the case of prescription drug use disorders). However, their degree of association can be examined by looking at their tetrachoric correlations. Furthermore, the differential association between each predictor and non-medical use of each drug (and each prescription drug use disorder) can be examined using a Multiple Indicator Multiple Causes (MIMIC) approach, as explained below.

To examine the latent structure of non-medical use of prescription drugs and prescription drug use disorders, two separate exploratory factor analyses (EFA) using geomin oblique rotation were fit in the full sample, one using the four types of the past-year non-medical prescription drugs use as the indicators, and the other one using as indicators the four types of the past-year prescription drug use disorder. We decided to use factor analysis rather than other latent variable techniques such as latent class analysis based on current conceptualizations of psychiatric disorders as continuous rather than discrete entities (Blanco et al., 2013b; Krueger, 1999), as well as empirical results indicating that externalizing disorders, including substance use disorders, are best described by models that assume continuous underlying latent variable (Markon and Krueger, 2005). The number of underlying factors in each analysis was determined based on the eigenvalues of the tetrachoric correlation matrices, and the goodness of fit measures, including by the likelihood chi-square test, comparative fit index (CFI), Tucker–Lewis index (TLI), root mean squared error of approximation (RMSEA) and standardized root mean square residual (SRMR). Hu and Bentler recommended CFI and TLI values above 0.95, and RMSEA values below 0.06, as representing good model fit (Hu et al., 1992). Factor analysis with dichotomous outcomes is a well-developed technique (Joreskog and Moustaki, 2001; Wirth and Edwards, 2007) utilizing probit regression of outcomes on the latent factor estimated with weighted least squares such that standardized factor loadings represent increases on the probit scale of each outcome associated with one standard deviation increases in the continuous latent factor. After the number of factors were determined for non-medical prescription drug use and prescription drug use disorder, a Multiple Indicators Multiple Causes (MIMIC) approach (Kim et al., 2011) was used to assess effects of covariates on the latent factors. Age, sex, race, level of pain, anxiety disorders, mood disorders, AUD, DUD, and clusters A, B and C personality disorders were used as covariates. The MIMIC approach allows simultaneous examination of several covariates. It provides an alternative to multiple group testing, which requires the creation of mutually exclusive groups (e.g., males versus females) and can be cumbersome when multiple covariates are examined. Standardized estimates of the direct relationship between covariates and the latent factors indicate how many standard deviations higher (or lower) the mean of the latent factor is expected to be for each level of the categorical covariates or for a one standard deviation increase in the continuous covariate (age) while holding all other covariates constant. A critical value of 0.05 was used to determine statistical significance of these covariate effects on factors.

The MIMIC model was further used to identify whether there was any additional association between covariates and specific prescription drugs (or disorders) that were not captured by the latent factor (Muthen and Muthen, 2006). Following conventions for testing these additional direct paths leading from the covariate to the specific drugs (Kim et al., 2011; Stark et al., 2006), we used a conventional modification index cutoff of 10 corresponding to a chi-square difference test with 1 degree of freedom and a p-value of <0.01 for a large sample size.

All analyses where conducted in Mplus Version 7.1 (Muthen and Muthen, 2006), which takes into account the NESARC sampling weights and design effects in all