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Item Response Theory analyses of DSM-IV and DSM-5 stimulant use disorder criteria in an American Indian community sample

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Abstract

Background—Native Americans experience some of the highest rates of DSM-IV stimulant dependence (SD) of all U.S. ethnic groups. This report compares DSM-IV and DSM-5 stimulant use disorder (SUD) diagnostic criteria in an American Indian community sample.

Methods—Demographic information, stimulant (methamphetamine or cocaine) use, and lifetime DSM-IV and DSM-5 diagnoses were assessed in 858 adult American Indians. Item Response Theory (IRT) analyses were used to assess SUD criteria in both DSM-IV and DSM-5 criteria sets along an underlying latent trait severity continuum and the effect of demographic variables on differential item functioning (DIF) in those criteria.

Results—The overall rate of DSM-IV SD was 33%, of DSM-IV SUD was 38%, and of DSM-5 SUD was 36% with no gender differences. All SUD symptoms in both the DSM-IV and DSM-5 datasets functioned on the moderate portion of the underlying severity continuum. “Craving” discriminated better than any other criterion at its level of severity in indicating the presence or absence of SUD. There was little DIF in groups defined by gender or any other demographic variable in either the DSM-IV or DSM-5 datasets.

Conclusions—These findings indicate that in this American Indian sample, diagnostic criteria for DSM-IV and DSM-5 SUD function similarly in terms of severity and DIF and that the abolition of the DSM-IV distinction between stimulant abuse and dependence in DSM-5 is warranted.

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CONTRIBUTORS

All authors have given intellectual contributions to the study and the paper and have approved the final manuscript. David A. Gilder and Cindy L. Ehlers were responsible for the study design. David A. Gilder was responsible for collecting and coding the clinical data and making all the best final diagnoses. Ian R. Gizer and Philip Lau were responsible for higher level statistical analyses. David A. Gilder, Ian R. Gizer, Philip Lau, and Cindy L. Ehlers were responsible for the preparation of the manuscript. All authors contributed to and have approved the final manuscript. The authors have no commercial affiliation or consultant role that could be construed as a conflict of interest.

CONFLICT OF INTEREST

All authors declare that there are no conflicts of interest.

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Keywords

Stimulant Use Disorders; DSM-IV; DSM-5; American Indians

1. INTRODUCTION

Stimulants (methamphetamine and cocaine) are second only to cannabis as the most commonly used illicit drugs world-wide (Compton et al., 2004; Johnston et al., 2003, 2011; Maxwell and Rutkowski, 2008; SAMHSA, 2002; WHO, 1997). Native Americans are higher than the national average in terms of overall drug use, use disorders, underage use, and associated morbidity and mortality (Huang et al., 2006; Indian Health Services, 2005, 2009; SAMHSA, 2011). National surveys suggest that DSM-IV stimulant dependence (SD) also differs among ethnic groups with Native Americans having among the highest rates among all groups evaluated (Iritani et al., 2007; SAMHSA, 2005a, 2005b). Among Native Americans in drug treatment, the rate of primary amphetamine use has been shown to be higher than that for other illicit drugs (Evans et al., 2006). From 1997 to 2004, the number of Indian Health Service outpatient treatment visits attributed to stimulants increased by 30 times (Indian Health Services, 2005).

It is currently not known how changes in the Diagnostic and Statistical Manual version 5 (DSM-5) will affect rates of stimulant use disorder (SUD) or SUD criterion function in this high risk ethnic group. From a diagnostic standpoint, DSM-IV SUD requires three of seven SD criteria or, failing that, one of four stimulant abuse criteria clustering in the same twelve month period, whereas DSM-5 SUD requires two of eleven criteria clustering in the same twelve month period. DSM-IV and DSM-5 use the same eleven criteria to diagnose SUD with the exception that in DSM-5, one new criterion, craving, has been added and one old criterion, legal problems, has been deleted from the eleven DSM-IV criteria (American Psychiatric Association, 1994, 2013). One effect of the change in DSM diagnostic criteria is to diagnose individuals with SUD who would not have been diagnosed previously and vice versa. For example, individuals who have two DSM-IV SD symptoms and no DSM-IV abuse symptoms will be diagnosed with DSM-5 SUD, whereas they would have no diagnosis in DSM-IV. Individuals with only legal problems arising from stimulant use would be diagnosed with SUD in DSM-IV, but carry no diagnosis in DSM-5. Therefore, at least theoretically, a number of different symptom combinations could emerge over the lifetime trajectory of stimulant use that ultimately leads to the formal diagnosis in either or both diagnostic systems.

Since a diagnosis in any of the three diagnostic systems may arise from different criteria, SUD may be a heterogeneous disorder that presents with different sets of symptom criteria depending on differences in biological and psychosocial risk factors between groups. If this is the case, one would expect that symptom criterion severity would vary between groups. For example, several characteristics associated with methamphetamine use and use disorder are different in men and women (Dluzen and Liu, 2008). Men have a higher prevalence of DSM-IV SUD than women (Compton et al., 2005), are less likely to have major depression and social anxiety disorder three years following treatment (Glasner-Edwards et al., 2010), and have greater striatal dopamine release in response to amphetamine challenge (Munro et al., 2006), whereas women have a greater tendency to use methamphetamine for its weight reducing effects or to relieve the mental distress related to caregiving (Rawson et al., 2002; Riska and Ettore, 1999). Given these, and probably other (Dluzen and Liu, 2008), gender differences for risk for methamphetamine use and use disorder, symptoms associated with use may differ in severity in men and women. As such, one might expect that differences in individual vulnerability represented by differences in gender and other demographic

variables might be reflected in differences not only in overall rates of SUD but also illness severity as measured by individual diagnostic criteria.

IRT is a technique for evaluating the psychometric properties of assessment criteria or “items” such as the symptom criteria for SUD. IRT, like classical test theory, posits that a latent construct or trait can be measured by a group of items (Embretson and Reise, 2000; Martin et al., 2006). When applied to substance use disorder diagnostic criteria, IRT analysis uses the diagnostic criteria as items and generates a latent trait dimension that is the underlying severity of the substance use disorder. Differential item functioning analysis can then be applied to diagnostic criteria in order to assess if individual criteria are more or less severe in groups defined by dichotomous variables. Applied in the context of this study, IRT is able to assess the severity of the symptom criteria along the underlying latent trait continuum, and differential item functioning is able to assess if the degree of severity indicated by an individual symptom is significantly different between groups defined by gender and other demographic variables.

IRT has been used to study DSM-IV criterion functioning in terms of severity and discrimination in a few studies that included relatively small numbers of stimulant users (Gillespie et al., 2007; Langenbucher et al., 2004; Wu et al., 2009). Recently Hasin and colleagues (2012) and Saha and colleagues (2012) used IRT to assess DSM-5 stimulant use disorder criteria in 483 past year cocaine using patients and a larger dataset from the National Epidemiologic Study on Alcohol and Related Conditions (NESARC), respectively. These studies specifically addressed the change in DSM-5 that legal problems are eliminated from, and craving is added to, the diagnostic criteria. Hasin and colleagues (2012) found that adding craving to the seven DSM-IV dependence criteria did not add information, and Saha and colleagues (2012) reported that legal problems could be eliminated without loss of information of the IRT models of DSM-IV criteria. Thus far, IRT has not been used to study the proposed change in SUD criteria, and, in particular the function of craving as a criterion, in an American Indian community sample. Considering the heavy emphasis on the monitoring and management of craving in evidence-based drug abuse treatment (Monti et al., 2004), it is important to understand the role of craving in the context of the symptomatology of SUD. Such knowledge may be critical to adequately plan suitable interventions and treatments, especially for high risk groups such as American Indians.

The present report is part of a larger study exploring risk factors for substance dependence in an American Indian community in the west (see Ehlers et al., 2001a, 2001b, 2001c, 2001d, 2004, 2008, 2011; Gilder et al., 2004, 2006, 2007, 2009). The aims of the present study were to: (1) assess the prevalence of SUD using DSM-IV and DSM-5 criteria in this population of men and women; (2) employ IRT analysis to: (a) examine the dimensional properties of the 11 SUD symptoms with and without craving and legal problems, and (b) characterize the behavior of SUD symptom criteria along an underlying latent severity continuum; and (3) use DIF analysis to examine the relationship between demographic variables and the severity of lifetime SUD symptoms.

2. METHODS

2.1 Participants

American Indian participants were recruited from eight geographically contiguous reservations with a total population of about 3,000 individuals. Participants were recruited using a combination of a venue-based method for sampling hard-to-reach populations (Kalton and Anderson, 1986; Muhib et al., 2001) and a respondent-driven procedure (Heckathorn, 1997) which has been described elsewhere (Gilder et al., 2004). To be included in the study, participants had to be at least 1/16th Native American heritage, be

between the ages of 18 and 85 years, and be mobile enough to be transported from his or her home to The Scripps Research Institute (TSRI). The protocol for the study was approved by the Institutional Review Board (IRB) of TSRI, the Scientific Advisory Committee of the GCRC, and the Indian Health Council, a tribal review group overseeing health issues for the reservations where recruitment was undertaken. Written informed consent was obtained from each participant after the study was fully explained.

2.2 Measures

Each participant completed an interview with the Semi-Structured Assessment for the Genetics of Alcoholism (SSAGA) (Bucholz et al., 1994), which gathers demographic, substance use, and substance use related problem information. The SSAGA is a fully structured, poly-diagnostic psychiatric interview that is able to generate DSM-IV cocaine and methamphetamine use and psychiatric disorder diagnoses as well as data regarding substance-specific craving. The SSAGA has undergone both reliability and validity testing (Bucholz et al., 1994; Hesselbrock et al., 1999), and has been used in another Native American sample (Hesselbrock et al., 2000, 2003). The SSAGA interviews were administered by trained research assistants. All interviews were reviewed and all best final diagnoses were made by a research psychiatrist/addiction specialist (DAG).

Cocaine and methamphetamine use and use related symptoms were used to diagnose the presence or absence of combined DSM-IV SUD and DSM-5 SUD criteria in 858 individuals. For the purposes of the analyses presented here, a participant was considered to have a SUD symptom criterion if he or she had that criterion for either cocaine or methamphetamine or both. A participant with 3 DSM-IV SD criteria which occurred in the same twelve month period was diagnosed as having DSM-IV SD. A participant with 1 DSM-IV stimulant abuse criteria which occurred in the same 12 month period, but did not meet criteria for DSM-IV SD, was diagnosed as having DSM-IV stimulant abuse. A participant with either DSM-IV SD or stimulant abuse was diagnosed as having DSM-IV SUD. A participant with 2 DSM-5 SUD criteria which occurred in the same 12 month period was diagnosed as having DSM-5 SUD. Craving was considered present if the participant answered yes to either question, "Have you ever had such a strong desire for cocaine that it was hard to think of anything else" or "Have you ever had such a strong desire for methamphetamine that it was hard to think of anything else"

2.3 Data analysis

In the entire community sample of 858 individuals, rates of DSM-IV SD and SUD and DSM-5 SUD were determined. Demographic variables were compared in the DSM-IV SD vs. the non-DSM-IV SD group, in the DSM-IV SUD vs. the non-DSM-IV SUD group, and in the DSM-5 SUD vs. the non-DSM-5 SUD groups using the Mann-Whitney test for continuous variables and 2×2 contingency tables and Fisher's Exact Test for dichotomous variables.

IRT Analyses concentrated on the 353 of the 858 participants who reported using cocaine and/or methamphetamine for a total of 11 times in their lives. These analyses were aimed at assessing the factor structure and item response theory function of DSM-IV and DSM-5 diagnostic criteria in this sample. We used Mplus statistical software (Muthén and Muthén, 2008) to investigate one and two factor models of the 11 DSM-IV SUD symptom criteria and the 11 DSM-5 SUD symptom criteria in separate analyses. For each set of analyses, a tetrachoric correlation matrix of the SUD symptoms was analyzed using Mplus. Factor loadings in both the one and two factor models were represented as rotated solutions using GEOMIN rotation in Mplus. Initially, Exploratory Factor Analysis (EFA) was used to model one (1F) and two (2F) factor solutions without predicting which variables would load onto

which factor in the two factor solutions. We subsequently performed Confirmatory Factor Analysis (CFA) to examine how well each one factor and two factor model fit the assumption of one or two underlying latent factors using the Bayesian Information Criterion (BIC) generated by the BILOG-MG statistical program (Scientific Software International, 2003).

IRT analyses were used to generate two-parameter logistic IRT models of the 11 DSM-IV SUD symptoms and the 11 DSM-5 SUD criteria and to characterize the behavior of each SUD criterion along an underlying latent trait severity continuum using the BILOG-MG statistical program (Scientific Software International, 2003) in separate analyses. The BILOG-MG program generated marginal maximum likelihood estimates for discrimination (*a*) and severity (*b*) parameters used to describe each criterion in the two-parameter model.

The BILOG-MG program was also used to examine each SUD criterion in the DSM-IV and DSM-5 datasets for DIF (de Ayala, 2009; Embretson and Reise, 2000) of the *b* parameter by comparing subgroups defined by each demographic variable. In the context of the present analysis, DIF occurs when an SUD criterion does not have the same severity value in the two demographic subgroups, which indicates that that criterion measures a more severe level of the SUD latent severity trait in the subgroup with the higher *b* value. Effect sizes for each DIF analysis were calculated by dividing the difference in mean *b* for each SUD symptom by its sample standard deviation. A t-test and Bonferroni correction for six (demographic variable) comparisons was used to assess whether that difference was significant at the $p < 0.05$ level.

3. RESULTS

In this sample of 858 participants, the rate of DSM-IV SD was 33.3% (33.1% in men and 33.5% in women), of DSM-IV SUD 37.5% (38.4% in men and 36.9% in women), and of DSM-5 SUD 36.1% (35.6% in men and 36.5% in women). Demographic characteristics of participants with and without each diagnosis are shown in Table 1. As compared to non-SD or non-SUD participants, SD or SUD participants were older ($p < 0.001$), had fewer years of education ($p < 0.001$), and had lower annual household income ($p < 0.001$); but were not different on the basis of gender, current employment, or marital status.

Three hundred and fifty-three (353) participants had used a stimulant 11 times in their lifetimes. This sample was used in the Item Response Theory analyses in order to characterize the severity of each SUD criterion in the DSM-IV criteria set and separately in the DSM-5 criteria set. The results of these analyses are shown in Tables 2 and 3. The tables show the prevalence of the eleven DSM-IV and DSM-5 SUD symptoms, assess the factor structure of the 11 symptoms using exploratory and confirmatory factor analysis (Table 2), and the severity of each symptom along an underlying severity of use latent trait continuum (Table 3).

As can be seen from Table 2, the most prevalent SUD criteria were: “Withdrawal” (76%), “Social/Interpersonal Problems” (73%), and “Time Spent” (71%). The least prevalent symptoms were: “Cut Down/Control” (59%), “Role Failure” (58%), and “Legal Problems” (28%). Factor loadings in the exploratory factor analyses (EFA) shown in the table represent unstandardized estimates. The one factor was superior to the two factor model in both criteria sets in showing a lower Bayesian Information Criterion by a value >10 (Raftery, 1995). These results are consistent with the conclusion that the criterion data shows sufficient unidimensionality for the subsequent IRT analysis (Raftery, 1995; Sclove, 1987). Of note is that craving, the new criterion added in the DSM-5 dataset, showed the highest loading (0.878 in the one factor model) of all the DSM-5 criteria.

Table 3 shows the prevalence and item response parameters for the eleven DSM-IV SUD criteria and the eleven DSM-5 criteria separately. In the two-parameter (a and b) IRT model of DSM-IV criteria, criteria ranged in severity from the least severe, “Withdrawal” ($b = -0.96$), “Social/Interpersonal Problems” ($b = -0.82$), and “Time Spent” ($b = -0.64$) to the most severe, Cut Down/Control” ($b = -0.36$), “Role Failure” ($b = -0.23$), and “Legal Problems” ($b = 0.97$). The eleven SUD criteria occupied the moderate severity (b from -1.0 to 1.0) portion of the continuum. None of the SUD criteria occupied the mild ($b < -1.0$) or severe ($b > 1.0$) portions of the continuum. “Legal Problems” and “Role Failure,” DSM-IV criteria of stimulant abuse, were more severe than all seven DSM-IV criteria of stimulant dependence. In the two-parameter (a and b) IRT model of DSM-5 criteria, criterion severity was virtually the same as in the DSM-IV dataset. Craving ($b = -0.34$), the new criterion in the DSM-5 dataset, fell in the moderate portion of the severity continuum.

Figures 1 and 2 graphically display the criterion response curves for the 11 SUD criteria in DSM-IV (Figure 1) and DSM-5 (Figure 2). In both diagnostic systems, the severity of the criteria lie in the moderate ($b = -1.0$ to 1.0) portion of the underlying latent trait severity continuum.

Individual SUD criteria in both DSM-IV and DSM-5 datasets were examined for DIF on the basis of groups defined by the following dichotomous variables: gender; age $<$ vs. 30 years; annual household income $<$ vs. \$20 K; years of education $<$ vs. 12 years, and currently employed vs. unemployed. “Tolerance” measured greater severity in older than younger participants in DSM-IV ($p = 0.003$), but not in DSM-5. “Withdrawal measured greater severity in men than women in DSM-IV ($p = 0.005$), but not in DSM-5. “Hazardous Use” indicated greater severity in women than in men in both DSM-IV ($p = 0.012$) and DSM-5 ($p = 0.002$). No other criterion demonstrated differential item function in groups defined by any of the variables in either the DSM-IV or DSM-5 datasets.

4. DISCUSSION

The lifetime rate of DSM-IV SD of 33.0%, DSM-IV SUD of 37.5%, and of DSM-5 SUD of 36.1% in this American Indian community sample is higher than the combined cocaine and amphetamine DSM-IV SD rate of 1.6% and DSM-IV SUD rate of 4.8%, in Compton and colleagues’ (2005) analysis of the NESARC dataset, a large, multiethnic U.S. epidemiologic sample. The higher rate in this sample is consistent with data from epidemiologic and survey sources indicating that methamphetamine use has impacted American Indian, western U.S., and rural dwelling peoples at rates higher than most other ethnicities, U.S. locations, and metropolitan areas of the country (Forcehimes et al., 2011; Indian Health Services, 2009; Johnston et al., 2011; SAMHSA, 2005b, 2011).

In this study, the rates of DSM-IV SD, DSM-IV SUD, and DSM-5 SUD were the same in men and women. These results are inconsistent with Compton and colleagues (2005) findings from the NESARC that DSM-IV amphetamine and cocaine use disorders are more common in men than women. In that study, DSM-IV amphetamine (though not cocaine) dependence is equally common in men and women as is DSM-IV SD in this study. Differences in biological and/or psychosocial factors could explain these different gender effects in different populations. A strong female specific risk factor in a specific population would tend to increase rates of SUD in women in that population above what they would be in the general population. For example, a gender specific risk factor for American Indian women developing SUD may be that they are more likely to use methamphetamine more often and/or in greater amounts to control weight than are men in their own population and are women of other ethnicities.

That all stimulant diagnoses were significantly associated with older age at interview in this community sample is consistent with the notion that the height of the methamphetamine epidemic affecting the population occurred in the early to mid-1990's, and as such, a somewhat older cohort was exposed to more methamphetamine at an earlier age and therefore more likely to have developed a stimulant use disorder. Alternatively, or in addition, older study participants have had more years than younger participants to meet criteria for a stimulant diagnosis and may show higher frequencies of diagnoses for that reason. Fewer years of education was also significantly associated with all stimulant diagnoses suggesting that earlier onset of stimulant use and greater stimulant use at an earlier age are likely to lead to both a higher likelihood of dropping out of school and of developing a stimulant use disorder.

In the subsample of participants who had used a stimulant 11 times in their lives ($n = 353$), lifetime DSM-IV and DSM-5 SUD symptoms varied in prevalence from "Withdrawal" (76%) and "Social and Interpersonal Problems" (73%) to "Role Failure" (58%) and "Legal Problems" (28%). The frequency of "Craving" was 61%. Compared to frequencies of the DSM-IV cocaine and amphetamine use disorder criteria analyzed in the NESARC sample (Saha et al., 2012), DSM-IV criteria in this American Indian sample were more frequent. One reason for this may be that this sample was limited to those who had used 11 times in their lives as compared to 1 times in their lives in the Saha and colleagues (2012) analysis. "Legal Problems" was the least frequent criterion in both this sample (28%) and the NESARC, where the frequency of Legal Problems was 5% in amphetamine users and 7% in cocaine users. Hasin and colleagues (2012) found that the frequency of past year craving was 66% in a sample of 483 past year cocaine users recruited from substance abuse treatment programs, a frequency similar to the frequency of craving of 61% in this community sample.

The IRT analysis of both the DSM-IV and DSM-5 SUD criteria indicate that criteria of SD and abuse are intermixed in terms of severity and occur on the moderate portion of the underlying SUD severity continuum. These findings are consistent with the findings of Saha and colleagues (2012), in indicating that the distinction between stimulant abuse and SD in DSM-IV is not supported by the data in terms of severity of the individual criteria. Thus, the abolition of that distinction in DSM-5 is warranted.

Our results suggest the DSM-5 criteria function well in this population of American Indians in measuring the moderate portion of the underlying severity of use continuum, but do not measure the mild or more severe portions of the continuum. These findings suggest that additional criteria which measure the mild and severe portions of the continuum should be considered. Useful candidates may be quantity $\times$ frequency of use criteria which could be calibrated, if necessary, to the IRT severity findings of any ethnicity, gender, age, etc. Such quantity $\times$ frequency criteria would be useful in screening, diagnosis, and assessment of treatment interventions, as well as research studies. As currently formulated, DSM-5 SUD diagnostic criteria measure the same disorder in both American Indians and in the U.S. population as a whole, that is, a disorder in both groups whose symptoms occur on a single underlying severity continuum.

When individual DSM-IV and DSM-5 SUD criteria were examined for DIF, little evidence for DIF was found. The finding that "Tolerance" measures greater severity in participants age 30 years old may mean that as individuals get older they use less stimulants and are less likely to experience (or remember having experienced) tolerance. "Withdrawal" measured greater severity in men than women, perhaps due to gender differences in quantity and frequency of use, which may in turn be based in part on gender differences in brain responsivity to stimulants. Men, who are more sensitive to amphetamine in showing greater

striatal dopamine release in response to amphetamine challenge (Munro et al., 2006), may as a consequence use less drug and as a result be less likely to develop withdrawal symptoms. “Hazardous Use” indicated greater severity in women than men in both DSM-IV and DSM-5, perhaps because women are less likely than men to engage in hazardous activities, such as driving motor vehicles, when using stimulants. That there is little DIF in both DSM-IV and DSM-5 on the basis of demographic criteria indicates that both diagnostic criteria sets function in an essentially unbiased manner in diagnosing stimulant dependence in this sample of American Indians.

“Craving” is the new criterion for substance use disorder added to the DSM-IV criteria set minus “Legal Problems” to generate the new DSM-5 criteria set. Notably in this sample of American Indians, “Craving” loads more strongly (0.878 in the one factor and 0.920 in the two factor model) and discriminates in IRT analyses ($a = 1.74$, S.E. 0.26) better than any other diagnostic criterion. As such, “Craving” discriminates better than any other criterion at its level of severity in indicating the presence or absence of SUD. Thus, it is a valuable addition to the DSM-5 SUD criteria set.

The results of this study should be interpreted in light of several limitations. First, our findings may not generalize to other American Indians in the population from which the sample was drawn or be representative of other American Indian tribes. Rates of SUD, patterns of stimulant consumption, and severity of SUD criteria are likely to vary among tribes as they do in different ethnic groups in the general population. Additionally, SUD symptoms probably vary by region and over time as such factors as proximity to large scale drug trafficking networks and purity of cocaine and methamphetamine vary (Cunningham et al., 2009, 2010, 2012, 2013). Second, we used cross-sectional and retrospective data. Cross sectional data includes individuals who will develop additional SUD symptoms and/or will consume higher amounts of stimulants during their lifetimes but have not yet done so, and thus, SUD criteria may be associated with more severe portions of the SUD severity continuum in this study than they would be if those data were included in this analysis. Retrospective data also suffers from recall bias, which may include a reporting bias for stimulant use, SUD criteria, and psychiatric disorders that is affected by having developed SUD symptoms. If this bias exists, it could lead to different results for CFA and IRT analysis in this study than would be found in a prospective study. Third, comparisons to other samples may be limited by differences in sampling techniques, conditioning of the sample, how diagnostic criteria are operationalized, and how lifetime consumption is assessed.

With these caveats in mind, we believe that this study of SUD and SUD diagnostic criteria in an American Indian community sample adds important information of the appropriateness of applying the DSM-5 construct to non-EuroAmerican populations.

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Figure 1.

Criterion response curves for 11 lifetime DSM-IV SUD criteria. The probability of endorsement of each SUD criterion (Y-axis) is plotted as a function of increasing severity of the underlying SUD latent trait severity (X-axis). Each SUD criterion is labeled with its name and its discrimination (a) and severity (b) parameters.

Criterion Response Curves for DSM-IV SUD ($n = 353$)

Figure 2.

Criterion response curves for 11 lifetime DSM-5 SUD criteria. The probability of endorsement of each SUD criterion (Y-axis) is plotted as a function of increasing severity of the underlying SUD latent trait severity (X-axis). Each SUD criterion is labeled with its name and its discrimination (a) and severity (b) parameters.

Criterion Response Curves for DSM-5 SUD ($n = 353$)

Demographic variables in an American Indian community sample (n = 858) comparing those with and those without DSM-IV stimulant dependence (SD), DSM-IV stimulant use disorder (SUD), and DSM-5 stimulant use disorder (SUD).

Table 1

Demographic or Clinical Variable	Total Sample n = 858		DSM IV SD Positive n = 286		DSM IV SD Negative n = 572		p ^d	DSM IV SUD Positive n = 322		DSM IV SUD Negative n = 536		p ^d	DSM-5 SUD Positive n = 310		DSM-5 SUD Negative n = 548		p ^a
	Mean	S.D.	Mean	Mean Rank ^c	Mean	Mean Rank ^c		Mean	Mean Rank ^c	Mean	Mean Rank ^c		Mean	Mean Rank ^c	Mean	Mean Rank ^c	
Age range: 18–82 years (n = 858)	31.2	13.2	32.2	481.44	30.7	403.53	<0.001	32.7	489.55	30.7	393.42	<0.001	32.3	481.69	30.6	399.97	<0.001
Years of education range: 3–17 years (n = 857)	11.6	1.6	11.2	368.97	11.8	458.91	<0.001	11.3	382.05	11.8	457.12	<0.001	11.3	377.01	11.8	458.32	<0.001
	n	%	n	%	n	%	p ^b	n	%	n	%	p ^b	n	%	n	%	p ^b
Gender (n = 858)																	
Male	357	41.6	118	41	239	42	0.941	137	43	220	41	0.669	127	41	230	42	0.829
Female	501	58.4	168	59	333	58		185	57	316	59		183	59	318	58	
Annual income (n = 795) ^f																	
< \$20,000	362	45.5	147	55	215	41	<0.001	165	54	197	40	<0.001	156	53	208	41	0.001
\$20,000	433	54.5	122	45	311	59		139	46	294	60		136	57	297	59	
Any employment (n = 832) ²																	
No	513	61.7	175	65	338	60	0.147	194	64	319	60	0.337	188	64	326	60	0.263
Yes	319	38.3	93	35	226	40		110	36	209	40		104	36	215	40	
Married (n = 856)																	
No	715	83.5	229	80	486	85	0.079	258	80	457	85	0.057	251	81	464	85	0.180
Yes	141	16.5	56	20	85	15		63	20	78	15		58	19	83	15	

Notes:

^a - p-values from the Mann-Whitney U test;

^b - p-values from Fishers exact test;

^c - in the Mann-Whitney U test for a given variable, a ranking was assigned to each individual; rankings were then separated into the two groups being compared and the mean ranking for each group calculated; these mean (average) ranks were then compared to test the null hypothesis that the rankings were not significantly different;

^f - for analysis of DSM-5 SUD, data was available for two additional participants reporting annual incomes < \$20,000,

² - for analysis of DSM-5 SUD, data was available for one additional participant who was not currently employed.

Table 2

Prevalence and factor loadings for exploratory factor analytic models of eleven lifetime DSM-IV and DSM-5 SUD criteria in participants who had used stimulants eleven (11) times (n = 353).

Lifetime DSM-IV MUD symptoms and model indices	(n=353)	EFA Model DSM-IV SUD Criteria (n=353)		EFA Model DSM-5 SUD Criteria (n=353)	
		One Factor	Two Factors	One Factor	Two Factors
Tolerance	66	0.768	1.003	0.777	0.887
Withdrawal	76	0.752	0.740	0.770	0.763
Larger/Longer	68	0.757	0.774	0.763	0.648
Cut Down/Control	59	0.646	0.697	0.664	0.683
Time Spent	71	0.857	0.862	0.868	0.760
Activities given up	62	0.850	0.544	0.844	0.036
Physical/Psychological Problems	66	0.821	0.494	0.819	0.378
Role Failure	58	0.844	0.506	0.834	0.262
Hazardous Use	61	0.607	0.421	0.605	0.422
Legal Problems	28	0.586	0.142	0.533	
Social/Interpersonal Problems	73	0.749	0.000	0.711	-0.008
Craving	61			0.878	0.920
Factor Correlation			0.695		0.711
Bayesian Information Criterion		4023.59	4035.85	3945.420	3957.265

Table 3

Prevalence (%) and discrimination (*a*) and severity (*b*) parameters of eleven DSM-IV and DSM-5 SUD criteria (n = 353).

Lifetime DSM-IV and DSM-5 SUD Criteria	Prevalence %	Two Parameter Model of DSM-IV Stimulant Use Disorder Criteria			Two Parameter Model of DSM-5 Stimulant Use Disorder Criteria		
		Discrimination, <i>a</i> estimate <i>a</i> (S.E.)	Severity, <i>b</i> estimate <i>b</i> (S.E.)	Discrimination, <i>a</i> estimate <i>a</i> (S.E.)	Severity, <i>b</i> estimate <i>b</i> (S.E.)	Discrimination, <i>a</i> estimate <i>a</i> (S.E.)	Severity, <i>b</i> estimate <i>b</i> (S.E.)
Tolerance	66	1.17 (0.17)	-0.54 (0.10)	1.20 (0.17)	-0.53 (0.10)		
Withdrawal	76	1.14 (0.18)	-0.96 (0.13)	1.19 (0.18)	-0.94 (0.12)		
Larger/Longer	68	1.19 (0.16)	-0.63 (0.10)	1.20 (0.17)	-0.62 (0.10)		
Cut Down/Control	59	0.83 (0.12)	-0.36 (0.11)	0.87 (0.12)	-0.35 (0.11)		
Time Spent	71	1.62 (0.29)	-0.64 (0.09)	1.68 (0.27)	-0.63 (0.09)		
Activities given up	62	1.60 (0.24)	-0.36 (0.08)	1.53 (0.23)	-0.36 (0.08)		
Physical/Psychological Problem	66	1.43 (0.23)	-0.52 (0.09)	1.39 (0.21)	-0.52 (0.09)		
Role Failure	58	1.51 (0.22)	-0.23 (0.09)	1.40 (0.20)	-0.23 (0.09)		
Hazardous Use	61	0.80 (0.12)	-0.47 (0.12)	0.77 (0.11)	-0.47 (0.02)		
Legal Problems	28	0.75 (0.12)	0.97 (0.16)				
Social/Interpersonal Problems	73	1.08 (0.16)	-0.82 (0.12)	0.96 (0.14)	-0.87 (0.13)		
Craving	61			1.74 (0.26)	-0.34 (0.08)		