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Does DSM-5 Nomenclature for Inhalant Use Disorder Improve Upon DSM-IV?

Ty A. Ridenour^{1,2}, Amanda Halliburton³, and Bethany C. Bray⁴

¹Research Triangle Institute, International, 3040 E. Cornwallis Rd, PO Box 12194, Research Triangle Park, NC 27709

²Center for Education and Drug Abuse Research, University of Pittsburgh, 711 Salk Hall, 3501 Terrace Street, Pittsburgh, PA 15621, USA

³Department of Psychology, Virginia Polytechnic Institute and State University, 109 Williams Hall (0436), Blacksburg, VA 24061, USA

⁴The Methodology Center, The Pennsylvania State University, 204 East Calder Way, Suite 400, State College, PA, 16801, USA

Abstract

Among drug classes, substance use disorder (SUD) consequent to using inhalants (SUD-I) has perhaps the smallest evidence base. This study compared SUD-IV vs. SUD-5 nomenclatures, testing whether four traditional categories of inhalants (aerosols, gases, nitrites, solvents) are manifestations of a single pathology, obtaining item parameters of SUD-I criteria, and presenting evidence that SUD can result from using nitrites. An urban, Midwestern, community sample of 162 inhalant users was recruited. Participants were 2/3 male, nearly 85% Caucasian, and had a mean age of 20.3 years ($SD=2.4$ years), spanning the ages of greatest incidence of SUD and slightly older than the primary ages of inhalants use initiation. Analyses consisted of bivariate associations, principle components analysis, and item response theory analysis. Validity was demonstrated for SUD-I consequent to each inhalant type as well as for aggregating all inhalant types into a single drug class. Results supported DSM-5 nomenclature over DSM-IV in multiple ways except that occurrence of diagnostic orphans was not statistically smaller using DSM-5.

Nomenclature for substance use disorder (SUD) consequent to using inhalants (SUD-I) remains obscure for multiple reasons including lacking nosology evidence, parsing inhalants between DSM drug classes, controversy over key diagnostic features, and scant utilization in applied settings. Central goals of DSM-5 revisions were to "...provide the best available description of how [the] disorders are expressed...", "aid in the accurate diagnosis and treatment...", and "alleviate ... misunderstandings" (APA, 2013, p. xli and p. xlii, respectively). This study evaluated how well these goals were accomplished specifically for SUD-I.

DSM-5 and DSM-IV nomenclatures for SUD-I were patterned after diagnostic criteria designed for other drug classes. However, inhalants are distinct among addictive substances in multiple ways. As a drug class, 'inhalants' encompasses thousands of compounds. Most inhalants are legal to possess at any age, inexpensive, easily obtained, and their intense intoxication typically lasts only a few minutes per dose. Their ubiquity for their manufactured uses helps conceal inhalant misuse (Dinwiddie, 1994). All of these features likely contribute to the onset and inhalant use (IU) at younger ages relative to other substances.

Although IU poses manifold serious health risks (e.g., asphyxiation, ataxias, cardiac arrest, cerebral atrophy, chemical burns, reduced immune function, kidney failure, neuropathy), conventional wisdom considers IU to not be dangerous. Consequently, parents, teachers and even health professionals are generally not knowledgeable about or vigilant for signs of IU (Sikes, Walley, McBride, Fusco, Cole & Lauka, 2011). For example, development of prevention and treatment programs for SUD-I has lagged compared to other SUDs and has largely occurred outside the U.S. (Gruenewald, Johnson, Shamblen, Ogilvie, & Collins, 2009; Ridenour & Howard, 2012). Neglect of SUD-I also is evident in rudimentary research. Prevalence of DSM-III-R SUD-I dependence was reported as 0.3% in the early 1990s (Anthony, Warner, & Kessler, 1994) and DSM-IV dependence as < 0.1% and abuse as 0.3% in the early 2000s (Compton, Conway, Stinson, Colliver & Grant, 2005). However, these nomenclatures categorized aerosols, solvents and most gases as SUD-I in aggregate whereas nitrous oxide and nitrites were categorized as "other" substances. Thus, SUD-I prevalence in aggregate and for specific inhalant types remains largely unknown. Moreover, little psychometric evidence is available for SUD-I assessment.

DSM-IV versus DSM-5

A prerequisite to researching SUD-I epidemiology, etiology, treatment and prevention is establishing a diagnostic nomenclature, which was the focus of the present study. Extant nosology research on SUD-I is largely grounded in DSM-IV nomenclature, as most SUD-I studies have occurred during the last decade. Considerable revisions to SUD-I occurred in DSM-5. For example, DSM-IV dependence and abuse diagnoses were combined into a single disorder that is graded in terms of severity. Item response theory studies of DSM-IV SUD criteria using mostly clinical samples support this revision across many drug classes and for adolescents (e.g., Gelhorn et al. 2008; Hartman et al., 2008; Hasin, Fenton, Beseler, Park, & Wall, 2012; Martin, Chung, Kirisci, & Langenbucher, 2006; Saha et al., 2012). Studies of SUD-I also support this revision (Ridenour, Bray & Cottler, 2007); extant IRT studies of SUD-I criteria were of juveniles involved with the criminal justice system (Perron et al., 2010) or general population adults (Kerridge et al., 2011).

DSM-5 revisions also eliminated the DSM-IV criterion of substance use causing legal problems and added a "craving" criterion (APA, 2013). Recent studies demonstrated that legal problems correlate highly with SUD-I (Kerridge et al., 2011; Perron et al., 2010); however, this finding has not always been replicated (Ridenour et al., 2007) and in samples recruited outside of the justice system, the prevalence of the legal problems criterion is 2.0% or less (Kerridge et al., 2011; Ridenour et al., 2007). Thus, the utility of legal problems as a

diagnostic criterion for SUD-I remains unclear. The craving criterion is included in International Classification of Diseases (10th Edition; WHO, 1990); however, to our knowledge, no nosology evidence exists pertaining to a craving criterion for SUD-I.

An additional debate focusses on whether SUD-I withdrawal exists (which DSM-IV and -5 both exclude). Symptoms which typify withdrawal from substances other than inhalants highly discriminated general-population adults with DSM-IV SUD-I dependence from adults with abuse or only IU (Perron et al., 2011). However, no cluster of a distinct set of withdrawal symptoms has been found to comprise a syndrome per se (Perron et al., 2011; Ridenour et al., 2007).

A final deliberation involves parsing of putative types of inhalants into different drug classes. DSM-IV and -5 exclude from SUD-I the nitrite inhalants (amyl, butyl, and isobutyl nitrites) and nitrous oxide (a gas), which are assigned to the “other (or unknown)” class. The “other” class consists of drugs for which “the extent and range of induced disorders are uncertain” (p. 584; APA, 2013).

Present Study

Toward finalizing SUD-I nomenclature, study aims were to quantify differences between DSM-IV and DSM-5 nomenclatures; test the hypothesis that (a) different putative types of inhalants and (b) SUD-I criteria of DSM-IV and DSM-5 manifest a single construct; and contribute to the literature evidence from a community-recruited sample of older adolescents and young adults, the age range of greatest SUD incidence (Chen, O’Brien, & Anthony, 2005; Grant, Dawson, Stinson, Chou, Dufour & Pickering, 2004). Moreover, it was hypothesized that kappa of .6 (good reliability) or greater occurs between ‘gold standard’ structured and unstructured clinical interviews of SUD-I. Finally, DSM-IV and DSM-5 nomenclatures were compared in terms of the number persons each renders who meet at least one criterion, but not a diagnosis (so-called diagnostic orphans) (Degenhardt, Coffey, Carlin, Swift, & Patton, 2008; Harford, Yi, & Grant, 2010).

Method

Study methods were detailed previously (Ridenour et al., 2007); following is a summation of methods relevant to the present investigation.

Procedures

Consistent with two university IRB approvals, all potential participants were informed of the confidentiality issues and safeguards including a NIDA Certificate of Confidentiality. Participants were recruited from the St. Louis, Missouri region using three techniques: community flyers (n=131), friend referrals (n=27), and from addiction treatment settings (n=4). Inclusion criteria were: (a) more than 5 lifetime uses of any inhalant, (b) 15 - 25 years of age, (c) signed parental permission for non-emancipated respondents younger than 18 years old, (d) English speaking, and (e) willingness to participate in two to three interviews within a 10-day period. The full study investigated test-retest reliability of the Substance

Abuse Module Inhalants Section (Ridenour et al., 2007) and then concurrent validity (reported herein) using the third interview.

Interviews were conducted by telephone from the Epidemiology and Prevention Research Group offices of Washington University in St. Louis for the convenience of study participants. Participants were told they could not be using substances during the interview. Nevertheless, it is possible that substance use or even intoxication went undetected by interviewers. Remunerations were \$10 and \$20 for the first and third interviews, respectively.

Participants

The sample (N=162) was 2/3 male, nearly 85% Caucasian, and a mean 20.3 years old (SD=2.4 years) (Table 1). Over ¾ had a high school or GED education and 69.6% earned less than \$11,000 annually. Large lifetime prevalence of DSM-IV abuse or dependence was observed consequent to using tobacco (67.3%), alcohol (82.7%), and cannabis (84.0%). Illegal drug use and SUD treatment were highly prevalent. The third interview was completed by 75 of the 78 participants (96.2%) who were invited to take it.

Instrumentation

Substance Abuse Module (SAM)—Demographics, SUD diagnoses and criteria data were from SAM interviews. For testing concurrent validity, SAM data were compared to Schedules for Clinical Assessment in Neuropsychiatry interviews. The SAM is a well-established and widely-used structured interview to assess SUD criteria and diagnoses based on DSM-III-R, DSM-IV and ICD-10 nomenclatures (Cottler & Compton, 1993; Cottler, Robins, & Helzer, 1989); it also can be used to assess DSM-5 nomenclature. Diagnosis variables were derived using SAM computer algorithms. SAM provides excellent reliabilities for DSM-IV SUD criteria, good to excellent reliabilities for DSM-IV dependence diagnosis, and fair to excellent reliabilities for ICD-10 dependence diagnoses, including SUD-I, and has been used in numerous SUD nosology studies (Compton, Cottler, Dorsey, Spitznagel, & Mager, 1996a, b; Cottler et al., 1989; Horton et al., 2000; Langenbucher, et al., 2000; Ridenour, Bray, Scott & Cottler, 2008; Ridenour et al., 2007). SAM is the only structured assessment of separate SUD-Is consequent to using aerosols, gases, nitrites, and solvents.

Data were originally collected to investigate DSM-IV nomenclature and thus interviewers queried craving within the withdrawal criterion. For analyses of DSM-5 SUD-I in the present study, craving was analyzed separately and excluded from SUD-I withdrawal symptoms. Comparing withdrawal criterion results between DSM-IV dependence to DSM-5 thus shows the effect that the craving symptom has on a potential withdrawal criterion. The other 18 withdrawal symptoms consisted of those known to characterize withdrawal from other substances (anxiety, appetite changes, depressed mood, diarrhea or stomachache, fatigue, fever, hallucinations, headaches, muscle aches, nausea or vomiting, rapid pulse, runny eyes or nose, seizures, trembling or twitching, trouble concentrating, trouble sleeping, vivid dreams or nightmares, weakness or sleepiness, yawning). To meet the withdrawal criterion required experiencing 2 or more symptoms.

Schedules for Clinical Assessment in Neuropsychiatry (SCAN)—The SCAN utilizes a semi-structured interview format; was designed for experienced clinicians to diagnose and evaluate psychiatric disorders; requires certified training to administer; and assesses DSM-III-R, DSM-IV and ICD-10 systems. Computer algorithms were used to derive SUD diagnoses. Craving was not assessed by clinical interviewers as a specific withdrawal symptom, precluding DSM-5 SUD-I from being derived. Reliabilities of DSM-IV dependence diagnoses ranged from good to excellent but abuse diagnoses ranged from very poor to good (Usten et al., 1997). Good diagnostic agreement was reported between SCAN and SAM SUD diagnoses in clinical samples and general population drug users (Compton et al., 1996a, 1996b).

Analysis

Analyses were conducted using SAS Version 9.3 except item response theory analyses which were conducted using Mplus Version 6.11. Diagnostic agreement is quantified using kappa (which can be biased when prevalence is high or low) as well as polychoric correlations. Item response theory analyses included all potential criteria (i.e., legal problems, withdrawal and craving), then replicated for DSM-IV criteria, and again using only DSM-5 criteria to compare the three alternatives. For all analyses, results differed little among the three sets of criteria and among inhalant types. Thus, only results for aggregate SUD-I and with all criteria included are usually presented. (The additional results are available from the first author.)

Results

SAM and SCAN diagnostic concordance and criterion count correlations appear in Table 2. Kappas for all DSM-IV SUD-Is are low to moderate, whereas corresponding polychoric correlations are sizably larger, suggesting SUD-I assessment is improved using a continuous measure. Moreover, considerably larger agreement occurs between counts of criteria than diagnoses (i.e., results favor DSM-5 over DSM-IV). Table 2 results (with Ridenour et al., 2007) demonstrate the existence, reliability and validity of SUD-I consequent to using nitrites.

Principle components analysis of criterion counts suggests a single factor well-summarizes all four SUD-I types, based on the scree plot, eigenvalue-greater-than-one rule (only the first factor qualified with an eigenvalue=1.68), the first factor accounted for 42% of inter-type covariance, and factor loadings were all large: 0.70 for aerosols, 0.69 for gases, 0.50 for nitrites and 0.69 for solvents. Moreover, all SUD-I criteria loaded onto a single latent dimension (Table 3). Item response theory analyses (Table 4) showed that item severities of criteria are intermixed among DSM-IV abuse and dependence criteria. High item severities were observed for the three criteria of focus in this study: legal problems, withdrawal, and craving.

Frequencies of diagnostic orphans were 35.8% with DSM-IV, 29.0% for DSM-5, and were not statistically different ($p>.05$ using McNemar's χ^2). Of interest to individual patients, 4.9% of participants qualified for a DSM-IV SUD-I but not for DSM-5 diagnosis. Another 11.7% of participants qualified for DSM-5 SUD-I but not a DSM-IV diagnosis.

Discussion

Results supported combining all inhalant types into the SUD-I drug class. Statistically, the SUD-I nomenclature of DSM-5 improves upon DSM-IV in two ways. Concordance and validity are more consistent with, and better for, the DSM-5 configuration. All criteria (including craving, legal problems, and withdrawal) fall upon a single latent dimension of SUD-I. Importantly, the prevalence of the legal problems and withdrawal criteria were so small and accompanying item severities so large, that they are unlikely to factor into whether someone meets SUD-I diagnosis. DSM-5 failed to improve upon DSM-IV in terms of statistically reducing the frequency of diagnostic orphans. This study (with Ridenour et al., 2007) appears to be the first to document that SUD-I can result from using nitrites, although no participants qualified for DSM-IV nitrite dependence.

IRT Results

Diagnostic concordance between the SAM and SCAN using DSM-IV nomenclature was less than traditional standards. The SAM's test-retest reliability was acceptable or better for both SUD-Is and criteria in the present sample (Ridenour et al., 2007). In other samples, SAM/SCAN agreement was good or better for other SUDs (Compton, et al., 1996a, b). Hence, the poorer agreement for SUD-I appears to result from differences between structured and clinical interview types rather than SAM producing invalid data. This result may be due in part to the aforementioned low awareness of IU-related problems, such that clinical interviewers are not as accustomed or motivated to thoroughly evaluate SUD-I compared to other drugs. Collectively, these results imply that clinical assessment of SUD-I may be improved using structured interviews until a clinician becomes familiar with the range and clinical features of SUD-Is.

This was the third item response theory study of SUD-I criteria (Kerridge et al., 2011; Perron et al., 2010). Varying discrepant item severities may be due to differences among the study populations, instrumentation or how SUD-I is experienced by adolescents vs adults and juvenile delinquents vs others. The fact that criteria severities vary in rank order among the studies supports using the number of criteria to determine both diagnosis and level of severity (rather than grounding severity levels or diagnostic categories on specific criteria). Even so, some criteria had relative consistency across studies in rank order of severity: reduced activities (severe), legal problems (severe), unsuccessful reduction of use (moderate), time spent on using (moderate), hazardous use (low) and experiencing physical/psychological problems (low). Criteria that have consistent item severities might serve as markers by which SUD-I development and severity could be gauged (Ridenour, 2013).

Withdrawal Criterion

In addition to loading highly onto the SUD-I dimension, the loosely defined withdrawal criterion had medium to high severity ($b = 2.02$) and moderately high discrimination ($a = .85$), suggesting that withdrawal symptoms may reflect biophysiological effects of sustained regular inhalants use. However, the lack of distinct symptoms to characterize a syndrome per se precludes identification of physiological withdrawal specifically resulting from discontinued IU. To illustrate, the most prevalent withdrawal symptom was headaches

(5.6%) (Ridenour et al., 2007) which probably results from tissue damage consequent to inhalant exposure. The most frequent symptoms reported in Perron et al.'s (2011) sample were hypersomnia and fatigue, which often occur after binge use of any substance. Post hoc analyses indicated that if withdrawal was a diagnostic criterion, the additional number of cases in the present sample qualifying for diagnosis would be 6 (3.7%) for dependence and 4 (2.5%) for DSM-5 SUD-I. It remains possible that symptoms which characterize a SUD-I withdrawal syndrome do not resemble other substances or only result from discontinuing use of certain inhalants.

Legal Problems Criterion

The legal problems criterion loaded highly onto the SUD-I continuum (.82) but was endorsed by only 2% of participants and 1.5% of inhalant users in the Kerridge et al. (2011) study (by design, all the Perron et al. 2010 participants had legal problems). This result likely reflects the facts that inhalants are legal to possess even by minors, provide a brief high (i.e., short-lasting impairment), and are typically not consumed in public, which limit the illegality of IU, illegal behavior during intoxication, and police involvement at least in the U.S. Omitting the legal problems criterion from item response theory analyses resulted in negligible change in item severities, item discriminations or even factor loadings of the other criteria. In sum, the legal problems criterion is clearly a correlate of SUD-I but does not offer utility for making SUD-I diagnosis.

Craving Criterion

In contrast to legal problems, craving only moderately discriminated levels of SUD-I severity. Because it can occur at any SUD-I severity level, craving may not only help to diagnose SUD-I but also discern severity levels. Given its status as a new criterion for DSM-5, results merit further research to fully understand how a craving criterion adds to SUD diagnosis. The bulk of research on ICD-10 craving, studies cited earlier, and results herein demonstrate that craving is at least highly associated with SUD-I.

Study Limitations and Strengths

Results ought to be considered in light of study limitations. Participants predominantly used aerosols and gases, were mostly Caucasian, and 2/3 male. Given that the U.S. population of inhalant users is more diverse than this sample, especially in terms of types of inhalants used and ethnicity (Beauvais et al., 2002; Edwards et al., 2007), and the prevalence of IU is much greater in other nations, replication in other populations is needed. Like extant research on IU, this study was limited to concurrent data.

This study offered several strengths. It represents the first quantitative comparison between DSM-IV and DSM-5 SUD-I nomenclatures. Diagnostic criteria for SUD-Is of DSM-IV and DSM-5 were thoroughly assessed using "gold standard" instruments and analyses were conducted on specific inhalant types. The community sample of inhalant users spanned the typical age range for development of SUD-Is.

Future Directions

As mentioned earlier, replication is needed to determine the merits (or lack thereof) of type-specific SUD-Is. Several questions raised herein could be better addressed using adequate subsamples of each of the putative four types of inhalants. Nosology research is needed for populations with a greater prevalence of IU, particularly for U.S. subpopulations of Native Americans, Latinos, and middle school-aged youth. A critical gap in the literature is longitudinal studies of younger inhalant users to illuminate SUD-I etiology, order of onset of diagnostic criteria, and identification of risk factors and prevention programs targeting propensity for SUD-I (Deng, Chang, & Southerland, 2009; Gruenewald et al., 2009; Warner, Krebs & Fishbein, 2008).

In sum, results suggest that DSM-5 nomenclature improves upon DSM-IV for SUD-Is in terms of using a single continuum and inclusion of craving. Greater training appears to be needed to facilitate the thoroughness and reliability of SUD-I diagnoses in clinical settings. Given IU's health-compromising consequences, its initiation at younger ages compared to many other drugs, and widespread unfamiliarity with SUD-I, data reported herein provide important evidence documenting properties and validity of the DSM-IV and DSM-5 diagnostic nomenclatures.

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Table 1

Demographics and Prevalence of Substance Use Characteristics

		Percent or Mean (SD)		Percent or Mean (SD)
Gender (males)		66.7%	DSM-IV Tobacco use disorder	67.3%
Age in years		20.3 (2.38)	DSM-IV Alcohol use disorder	82.7%
Ethnicity	Caucasian	83.3%	DSM-IV Cannabis use disorder	84.0%
	African-American	1.2%	Drug-related arrest	25.3%
	Other or mixed	15.5%	Marijuana used 5+ times	96.3%
Annual household income	\$ 0 - 10,999	69.6%	Stimulants used Illegally 5+ times	51.9%
	11,000 - 24,999	21.1%	Sedatives used Illegally 5+ times	51.9%
	25,000 +	9.3%	Ecstasy / MDMA used 5+ times	45.7%
Highest educational degree	GED/HS diploma	75.3%	Cocaine or crack used 5+ times	56.8%
	2-year degree	16.1%	Heroin used 5+ times	12.3%
	Bachelor or more	8.6%	Other opioids used 5+ times	64.2%
Age of 1 st inhalant consumption		15.8 (2.79)	PCP used 5+ times	1.9%
Inhalant use disorder (aggregated)		37.7%, 45.7%	Hallucinogens used 5+ times	68.5%
(DSM-IV, DSM-5)	Aerosols	16.1%, 14.2%	Prescription Drugs used 5+ times	68.5%
	Gases	22.2%, 32.1%	Outpatient treatment for SUD	18.0%
	Nitrites	3.1%, 3.1%	Inpatient treatment for SUD	10.6%
	Solvents	10.5%, 11.1%		

Note. N=162. Percentages within a demographic characteristic may not sum to 100% due to rounding error. Percentage of sample with a DSM-IV substance use disorder includes abuse, dependence, or both. *SD* = standard deviation. Substance use characteristics were derived from SAM interviews.

Table 2

Agreement between SAM and SCAN DSM-IV Diagnoses and Criteria Counts

	Any Inhalant (n=162)		Aerosols (n=75)		Gases (n=142)		Nitrites (n=19)		Solvents (n=59)	
	κ	ρ	κ	ρ	κ	ρ	κ	ρ	κ	ρ
Abuse	.55	.88	.58	.89	.35	.75	.49	.84	.58	.86
Abuse count	--	.79	--	.83	--	.77	--	.76	--	.82
Dependence	.32	.65	*	*	.66	.99	**	**	.31	.66
Dependence count	--	.65	--	.81	--	.67	--	.62	--	.84
Abuse or dependence	.54	.88	.47	.79	.35	.75	.49	.84	.58	.86
Count of all criteria	--	.67	--	.86	--	.65	--	.76	--	.82

Note. SAM=Substance Abuse Module. SCAN=Schedules for Clinical Assessment in Neuropsychiatry. κ = weighted kappa coefficient (.20 or less = poor, .21-.4=fair; .41-.6=moderate; .61-.8=good; .81-1.0=excellent), ρ = polychoric correlation. -- = κ was not computed for count variables.

* There were no agreements re diagnosis; 4 cases detected by SCAN, 2 cases by SAM.

** There were no cases of nitrite dependence identified by either instrument.

All coefficients $p < .05$.

Table 3

Factor Loadings and Fit Criteria from Confirmatory Factor Analysis with One Factor Underlying All Inhalant Use Disorder Criteria

Criterion	Factor Loading	R^2
<i>Abuse</i>		
Failure to fulfill obligations at work/school/home	.79	.62
Use in physically hazardous situations	.56	.32
Legal problems related to use	.82	.68
Use despite persistent social/interpersonal problems	.86	.73
<i>Dependence</i>		
Tolerance	.39	.15
Withdrawal (omitting craving symptoms)	.63	.40
Larger amounts/Longer period of use than intended	.81	.66
Persistent desire for substance/Unsuccessful use reduction	.70	.49
Great deal of time spent obtaining/using/recovering	.79	.62
Important activities are reduced due to use	.70	.49
Use despite persistent physical/psychological problems	.39	.15
<i>Craving</i>	.55	.31

Note. $\chi^2 = 55.5$, $df = 54$, p -value = .42; RMSEA = .01, CI = (.00, .05); CFI = .99; TLI = .99; WRMR = .76. SUD-I criteria were assessed using SAM interviews.

Table 4

Item Parameters for SUD-I Criteria Aggregated Across Inhalant Types

Criterion	All Criteria			DSM-IV		DSM-5	
	Severity <i>b</i> (<i>SE</i>)	Discrimination <i>a</i> (<i>SE</i>)	Severity <i>b</i> (<i>SE</i>)	Discrimination <i>a</i> (<i>SE</i>)	Severity <i>b</i> (<i>SE</i>)	Discrimination <i>a</i> (<i>SE</i>)	
Abuse	Failure to fulfill obligations at work/school/home	1.80 (.32)	1.44 (.60)	1.78 (.31)	1.48 (.62)	1.84 (.36)	1.34 (.55)
	Use in physically hazardous situations	1.06 (.30)	.60 (.18)	1.04 (.29)	.62 (.19)	1.04 (.29)	.62 (.19)
	Legal problems related to use	2.32 (.49)	2.07 (1.12)	2.45 (.54)	1.69 (.69)	---	---
	Use despite persistent social/interpersonal problems	1.65 (.24)	1.57 (.50)	1.65 (.24)	1.59 (.51)	1.66 (.26)	1.53 (.51)
Dependence	Tolerance	2.89 (1.05)	.49 (.21)	2.93 (1.06)	.48 (.20)	2.97 (1.08)	.47 (.20)
	Withdrawal ^a	2.02 (.49)	.85 (.32)	1.87 (.42)	.89 (.32)	2.08 (.54)	.81 (.31)
	Larger amounts/Longer period of use than intended	.66 (.16)	1.32 (.47)	.64 (.15)	1.41 (.49)	.64 (.15)	1.44 (.50)
	Persistent desire for substance/ Unsuccessful use reduction	2.08 (.42)	1.08 (.38)	2.08 (.41)	1.08 (.37)	2.09 (.43)	1.07 (.37)
Dependence	Great deal of time spent obtaining/ using/recovering	1.36 (.23)	1.18 (.33)	1.34 (.23)	1.22 (.34)	1.30 (.21)	1.31 (.37)
	Important activities are reduced due to use	2.47 (.56)	1.64 (.85)	2.53 (.60)	1.52 (.73)	2.72 (.68)	1.28 (.55)
	Use despite persistent physical/ psychological problems	-.49	.48	-.50	.47	-.48	.49

Criterion	All Criteria			DSM-IV			DSM-5		
	Severity <i>b</i> (SE)	Discrimination <i>a</i> (SE)		Severity <i>b</i> (SE)	Discrimination <i>a</i> (SE)		Severity <i>b</i> (SE)	Discrimination <i>a</i> (SE)	
Craving	(.26)	(.17)		(.27)	(.17)		(.25)	(.17)	
	2.74 (.99)	.64 (.30)		---	---		2.98 (1.13)	.57 (.27)	

Note. *n* = 162.

^aWhere craving is analyzed as an individual criterion (All Criteria and DSM-5 analyses), it is not included as a symptom of the withdrawal criterion. SUD-I criteria were assessed using SAM interviews.