

A dimensional option for the diagnosis of substance dependence in DSM-V

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Abstract

In this paper we discuss the creation of dimensional equivalents for categorically defined substance use disorders (SUDs) in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V), which now is being created. We begin with a review of the considerable literature that has accumulated on the dimensional properties of the SUDs. These studies have primarily examined the alcohol use disorders, but work relevant to other substances is reviewed as well. The weight of evidence indicates that SUDs fit well into a unidimensional concept.

We next discuss potential advantages, drawbacks, and challenges in developing a dimensional alternative for the SUDs and highlight some issues for an ongoing research agenda to further explore the challenges.

Finally we offer a specific proposal for a SUDs dimensional option for DSM-V. The model we propose is based on, and would relate directly back to, the categorical criteria that will be created for the SUDs by the substance use diagnostic workgroup. It is our contention that offering a dimensional equivalent for the DSM-V categories would be of great value, but that the categorical and dimensional definitions should be based on the same symptoms and closely linked. A dimensional scale that does not related directly to the categorical definition would be counterproductive. Copyright © 2007 John Wiley & Sons, Ltd.

Key words: DSM-V, substance disorders, dimensional diagnosis

This paper offers a model for creating dimensional diagnoses for the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V) substance use disorders (SUDs) in a way that can be related back to their corresponding categorical definitions. For illustration, we use the existing DSM-IV definition for the alcohol use disorders (AUDs) as the prototype, and discuss the application of such a prototype to all of the SUDs. We begin the paper with a review of empirical evidence regarding the dimensionality of SUDs, focusing primarily on diagnoses of dependence. The abuse diagnosis applies to certain substances and not others (e.g. tobacco), and is a more contentious construct, as indicated by the fact that the two major nosological systems, DSM and International Classification of Disease (ICD), do not agree. However there is growing

evidence that the DSM-V symptoms of abuse and dependence may form a single continuum, at least for some substances. Where problems of abuse and dependence have been considered together, we address the evidence accordingly.

Literature review

Alcohol

The rudiments of dimensionality in the AUDs may be seen in Jellinek's (1960) developmental stages of alcoholism, and are firmly embedded in the work of Edwards and Gross (1976; Edwards 1977, 1986), where dimensionality of the Alcohol Dependence Syndrome (ADS) is reflected not only in two proposed axes, dependence and alcohol-related disabilities, but also in the

conceptualization of the syndrome itself as occurring "with graded intensity" (Edwards, 1977). Skinner and colleagues, in a series of empirical analyses largely based on clinical samples, proposed a hybrid conceptualization of the ADS that combined subtypes (categories) that were ordered along a dimension reflecting the "global severity of the symptoms of alcohol dependence" (Morey et al., 1984; Morey & Skinner, 1986).

In 1987, the DSM, long considered a proponent of categorical diagnoses, acknowledged that mental disorders should not be assumed to be sharply bounded discrete entities. The shift in diagnostic criteria from DSM-III, where specific symptoms were required, to DSM-III-R, where a certain number of symptoms were needed, presaged dimensionality, at least with respect to SUDs (APA, 1980, 1987). Options for coding diagnoses as "mild," "moderate," or "severe" were made explicit in SUDs criteria in DSM-III-R. In DSM-IV, more attention was given to dimensionalizing disorders, particularly for "describing phenomena that are distributed continuously and that do not have clear boundaries" (APA, 1994, p. xxii). Still, it was noted that these minor efforts had been "less useful than categorical systems in clinical practice and in stimulating research," although "increasing research on . . . dimensional systems may eventually result in their greater acceptance both as a method of conveying clinical information and as a research tool" (APA, 1994, p. xxii). It is fair to say that, at least with respect to SUDs, we are at that point envisioned in 1994.

There is now a plethora of studies from which evidence for a unidimensional construct of alcohol dependence has evolved. From early descriptive studies (Rohan, 1976), methodology graduated to factor analysis of 11 symptoms of abuse and dependence and evidence of a single factor solution (Hall et al., 1993; Hasin et al., 1994; Proudfoot et al., 2006). A series of latent class analyses of 37 alcohol abuse and dependence symptoms reported by middle aged male twins in Australia (Heath et al., 1994), 38 alcohol abuse/dependence symptom data reported by relatives of alcoholic probands in the Collaborative Study on the Genetics of Alcoholism (Bucholz et al., 1996), and 11 items of abuse and dependence from young adult male and female twins from the Australian Twin Register (Lynskey et al., 2005) reach the same conclusion: that symptoms were arrayed on a continuum of severity rather than in unique categories. There are also some reports of factor analytic studies resulting in two factor

solutions (e.g. Muthen, 1993a, 1993b, 1995, 1996; Nelson et al., 1999; Harford and Muthen, 2001). However, these findings may be less discrepant than they appear since correlations between the factors in some studies where two-factor solutions were selected are quite high, suggesting a one-factor solution might actually have been preferable.

Other investigators have applied Item Response Theory (IRT) to data on symptoms of alcohol dependence and abuse from a variety of samples. Inferences have been remarkably consistent that alcohol symptoms of DSM-IV dependence and abuse are unidimensional and arrayed along a continuum of severity. This conclusion holds across a variety of samples including fathers of adolescent aged twins (Krueger et al., 2004), college students (Kahler et al., 2004), adult patients in treatment for alcoholism (Kahler et al., 2003; Langenbucher et al., 2004), current (Saha et al., 2006) and lifetime (Kahler and Strong, 2006) drinkers from a national probability sample of adults in the US, and adolescents in treatment for AUD (Martin et al., 2006). Illustrative of this line of research, Saha et al. (2006) analyzed the 11 alcohol abuse and dependence criteria from DSM-IV for the past 12 months from reports of 22,526 current drinkers in the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) study (Grant et al., 2003, 2004). They found that the symptoms (with the exception of legal problems due to drinking) reflected a continuum of severity. No clear distinction between abuse and dependence symptoms was observed. They also suggested that the DSM-IV items captured the severe end of the spectrum, but overlooked the mild to moderate range. However, in a second paper, Saha et al. (2007) found that a standard measure of consumption (five or more drinks in one drinking occasion for men, four or more for women) at least once a week in the past year fit well into the same dimensional continuum described in their previous paper and could be used as a marker for the mild to moderate end of the continuum. Kahler and Strong (2006), using 33 individual lifetime symptoms of alcohol abuse and dependence in the NESARC sample, also reached the conclusion that alcohol abuse and dependence symptoms were unidimensional. Like Saha et al. (2006), they observed some abuse items manifesting greater severity than some dependence symptoms, blurring the distinction between the two. In yet another application of IRT methods to 11 lifetime criteria of DSM-IV alcohol abuse and dependence in a treatment

sample of adolescents, Martin et al. (2006) observed a unidimensional trait of severity of alcohol problems, and greater severity of certain abuse symptoms over some dependence items. Collectively, these studies provide good evidence of the unidimensionality of alcohol items.

Recently, an analysis of two large probability general population samples of adults in the US that avoids making the strong assumptions inherent in IRT or LCA (Latent Class Analysis) provides further support for a dimensional configuration for alcohol dependence (Hasin et al., 2006). Testing five alternatives of DSM-IV alcohol dependence criteria (reflecting categorical, dimensional and hybrid versions of alcohol dependence) with three validating variables (family history, treatment, and early onset), the authors found that a model formulating alcohol dependence criteria as a one-dimensional linear predictor optimally explained the relationships with the three validators. The authors concluded that, while categorical diagnoses serve important clinical purposes, inclusion of a dimensional indicator of alcohol dependence would enhance and promote research objectives.

Substances other than alcohol

In the smaller body of work exploring dependence on substances other than alcohol, samples are less diverse, and statistical techniques less sophisticated. Nevertheless, the available evidence supports the unidimensionality of the dependence construct in other substances as well. Coverage is uneven, with cocaine, opiates and cannabis among those most commonly studied. In clinical and mixed samples, researchers have found evidence for unidimensionality of the dependence construct for: cannabis (Langenbucher et al., 2004; Morgenstern et al., 1994; Feingold and Rounsaville 1995; Martin et al., 2006); opiates (Kosten et al., 1987; Hasin et al., 1988; Morgenstern et al., 1994; Feingold and Rounsaville, 1995; Gossop et al., 1995) cocaine (Hasin et al., 1988; Kosten et al., 1987; Morgenstern et al., 1994; Feingold and Rounsaville, 1995; Gossop et al., 1995; Langenbucher et al., 2004); amphetamines (Hasin et al., 1988; Morgenstern et al., 1994; Feingold and Rounsaville, 1995; Gossop et al., 1995) and sedatives (Hasin et al., 1988; Morgenstern et al., 1994; Feingold and Rounsaville, 1995).

Gossop et al. (1995), in a sample of 1312 users of opiates, cocaine, and amphetamines recruited from clinical and non-clinical settings, found strong

evidence for unidimensionality using the Severity of Dependence Scale for all three substances in a principal components factor analyses. All analyses revealed a single-factor solution; validity was supported by high correlations with variables reflecting severity of disorder. Single-factor solutions for cocaine and opiates have been reported by Kosten et al. (1987) in a sample of psychiatric inpatients. Morgenstern et al. (1994) in their factor analysis of data from adults in treatment for alcohol or drug problems, observed that one factor captured dependence criteria for cannabis, cocaine, stimulants, sedatives and opiates. In data from a sample of inpatients in an alcohol rehabilitation unit, Hasin et al. (1988) reported a single factor underlying dependence for cocaine, stimulants, sedatives, opiates and hallucinogens. Feingold and Rounsaville (1995), using data from both clinical and community subjects, applied confirmatory factor analysis and also found a single factor for dependence for cocaine, cannabis, opiates, sedatives, and stimulants. Teesson et al. (2002), applying confirmatory factor analysis to data from the Australian general population, reported that a single factor model was the best-fitting solution.

Applying IRT to data on 11 dependence and abuse items for cocaine, cannabis and alcohol obtained from adults in treatment, Langenbucher et al. (2004) found that a unidimensional model fitted the data for cocaine, but only for alcohol and cannabis when two items were removed (one from abuse, one from dependence). In one of the few studies of adolescents in treatment, Martin et al. (2006) obtained good fit to a model reflecting a single dimension of problem severity for both alcohol and cannabis. Kirisci et al. (2002) also observed a single unidimensional trait in their IRT analysis of men from clinical and volunteer samples, in female spouses of drug dependent men, and in offspring of men with SUD (Kirisci et al., 2006).

Several studies have challenged the interpretation of one-dimension for dependence, including Morgenstern et al. (1994) for hallucinogen dependence, Bryant et al. (1991) for cocaine dependence, and Kosten et al. (1987) for sedatives, cannabis, hallucinogens, and sedatives. Nelson et al. (1999), using data from community and treatment multicultural samples, found that while the evidence supported a single underlying factor for cannabis, cocaine, and opiates overall, this finding did not hold for low to moderate users, which led them to suggest that studies based on homogeneous samples (such as clinical samples) may be biased towards

selecting lesser-order solutions. Clearly additional analysis of the currently available large general population data sets are in order.

Tobacco

Although there is a paucity of studies examining the dimensionality of tobacco dependence criteria, findings from most of them indicate that, unlike other substances, tobacco dependence is not unidimensional. Johnson et al. (1996) found two factors in a sample of young adult daily smokers, Muthen and Asparouhov (2006) in a general population sample selected multiple factor models over a single factor model, Hughes et al. (2004) reached that conclusion, as did Radzius et al. (2004) who identified, in a sample of cigarette-smokers who were volunteers, the same two factors identified by Johnson et al. (1996). A study that has reported unidimensional results (Strong et al., 2003), used a modeling procedure with very strong assumptions, analyzed lifetime symptoms, and did not have all dependence items available. Thus, among the few studies that exist, the weight of evidence does not support unidimensionality. Instead, it suggests that tobacco dependence represents a potential anomaly within the current DSM-IV diagnostic system that poses a challenge both to generic approaches to diagnosis and to attempts to construct a generic dimensional measure of dependence. Many nicotine researchers do not use the DSM/ICD system, choosing instead to use scales that do not encompass DSM/ICD criteria (Hughes et al., 2004). Reconciling this contrast could be a challenge to the DSM-V Substance Disorders Workgroup and thus should be a part of a research agenda in preparation for the revision process.

Summary of the literature

Overall our review of the literature indicates that for both AUDs and for most substances other than alcohol, dimensionality of the dependence construct is well established. Tobacco dependence is a possible exception to this generalization. Future research should focus on applying the rigorous statistical techniques observed for AUDs to substances other than alcohol, including tobacco.

Potential advantages, drawbacks, and challenges for a dimensional approach

A dimensional option for the assessment of the SUDs is consistent both with current knowledge and practice.

A good deal of evidence specifically regards the dependence syndrome as a dimensional construct. A standardized rating system for individual symptoms would contribute to knowledge of the nature and severity of the symptomatic components of the dependence syndrome. Clinicians and researchers would benefit from a quantitative assessment of severity in addition to presence/absence of a diagnostic entity; the use of quantitative measurements avoids the loss of information associated with a categorical assessment.

Clinical decisions often require categorical judgments. However, different categorical cut-off points may lead to differing or even opposite clinical conclusions. In clinical practice, a dimensional measure of dependence would not replace but would supplement the categorical diagnosis. A quantitative measure avoids the problems that arise with any strict categorical cut-off (e.g. borderline cases). Most studies that have supported the dimensional construct of dependence have not found evidence of a specific categorical cut-off that clearly differentiates cases from non-cases.

A dimensional measure of severity can serve as a moderator variable that affects treatment outcome. For example dimensional measures of opiate dependence and alcohol dependence act independently as moderators of substance use outcomes in the treatment of illicit drug misusers (Gossop et al., 2006). A trial comparing naltrexone and acamprosate in the treatment of alcohol dependence showed no overall difference between the two treatments (Morley et al., 2006). However, the inclusion of a dimensional measure of dependence showed differential outcomes for patients with low levels of alcohol dependence versus patients with higher levels.

A dimensional approach is also consistent with recent neurobiological research into the cellular activity and neural circuitry of addiction. The concept of addiction as a developmental process which may be found in varying degrees of severity is supported by the findings that cellular changes in prefrontal glutamatergic activity of the accumbens play an important role in determining the compulsive behaviors of the addictions by reducing the impact of natural rewards, diminishing cognitive control, and increasing responsiveness to drug-related stimuli (Kalivas and Volkow, 2005).

Few drug takers use only a single substance, and polysubstance use complicates the assessment and diagnostic process. A dimensional assessment can provide separate scores across substances to identify those most

in need of treatment. Adding dimensional scores across substances offers a single measure for total substance involvement and could provide a basis for further research investigation into the additive, interactive, or other relationship that may exist in relation to dependence upon more than one substance. Obviously for dimensions to be additive across substances, the scales must be created for each substance in the same way. The methodology we propose later for scale creation is indeed applicable for all substances, with the possible exception of tobacco.

A similar problem arises with co-occurring psychiatric and SUDs. A dimensional system of assessment permits separate severity scores to be allocated to each syndrome and provides patient-specific quantitative profiles. Dimensional assessments can be used whether or not each syndrome meets the threshold for a categorical diagnosis. A dimensional system may, therefore, provide a more complete assessment of the patient's comorbidity thus facilitating appropriate treatment.

A dimensional assessment within the DSM system would encourage the wider use of quantitative measurement of dependence in the broader field of addiction studies. A quantitative dimensional measure would also support a more uniform approach. Rather than the inconsistency associated with choosing among the several dimensional scales that are already available, a standardized DSM dimensional approach would promote consistency and improve cross-study comparability. Although the utility of a categorical diagnosis within clinical contexts is a priority, a dimensional approach would be more useful than a categorical system for research with non-clinical samples. For example, a dimensional assessment of dependence would have greater relevance and applicability in public health and epidemiological studies where categorical diagnoses can be problematic. Most positive cases cluster at the categorical diagnostic threshold (Helzer et al., 1985), thus even a slight degree of error variance can result in considerable diagnostic instability.

Remaining questions for a research agenda

There could be concern about how a standardized dimensional assessment of dependence would be affected by its application in languages other than English or in cultures other than North America. However, instruments that provide dimensional measures of dependence have been successfully used across languages and cultures. The Severity of Dependence

Scale, for example, has been used in many other languages including Russian, Chinese, Spanish, Portuguese, Polish, Czech, Farsi, Indonesian, and Thai (WHO, 2006). In another WHO project (Hall et al., 1993), AUDIT data from six different countries were analyzed by principal-component analyses. The results showed a strong general factor, supporting the suggestion that the alcohol dependence syndrome has cross-cultural generalizability. However, there were differences between countries with some respondents (in India) appearing to have difficulty understanding the constructs underlying the questions. Further study is required of sociocultural and linguistic differences upon dimensional measures of dependence. Given the international impact of the DSM, a consistent approach within the classification would encourage such exploration. It is also straightforward to norm a dimensional scale for each population.

Another topic for a research agenda is the optimum design of a SUDs dimensional scale. A consideration of advantages and disadvantages cannot be accomplished simply by means of a list; many options will be both advantageous in some respects but disadvantageous in others. A complex scale may confer benefits in terms of mathematical properties and consequent statistical power. But this may be achieved at the cost of greater difficulties for the respondent and scale administrator in terms of user-friendliness, comprehension, or response burden. Whatever dimensional system is adopted, it should be easily understood and readily usable in a clinical setting. Its relationship to the categorical criteria should be understandable. Its use should also be optional for clinicians and investigators, not a requirement for a DSM diagnosis. In the next section we propose a model for a dimensional scale that meets these criteria.

Despite many similarities between different dependence disorders, further consideration must be given to the pros and cons of generic versus drug-specific criteria for dependence. In particular, issues need to be resolved regarding item weighting. It cannot be assumed that all items have equal significance, nor that they have the same significance for different substances. Some symptoms may be more important than others in quantifying the diagnosis. For instance, there is broad agreement that a primary behavioral pathology in drug addiction is the overpowering motivational strength and decreased ability to control the desire to obtain drugs (Kalivas and Volkow, 2005). However, the construction of

appropriately weighted dependence items is a complex task. This is further complicated when these are applied to different substances and across a variety of countries. Dimensional assessments of dependence may have different diagnostic implications for different substances. Dependence upon some substances is associated with a clinically important withdrawal syndrome. For other substances, the presence of a withdrawal syndrome is less clear and may be of less clinical significance.

As noted earlier, nicotine dependence represents a potential anomaly within the current DSM-IV diagnostic system. Nicotine dependence poses a challenge to generic approaches to diagnosis and to attempts to construct a generic dimensional measure of dependence. Most nicotine dependence scales do not include DSM/ICD criteria. Many nicotine researchers do not make use of the current DSM or ICD systems.

Specific proposal for a SUDs dimensional option for DSM-V

It is clear from the earlier review and discussion that incorporating a dimensional approach could enhance both clinical and research utility of the DSM-V SUDs. However, any such addition must be done in a way that preserves the traditional, categorical approach of the DSM. Categorical and dimensional approaches offer differing but equally important taxonomic functions (Kraemer, 2007). In this section we propose a model for adding dimensional components that are based upon the categorical illness definitions in DSM-V.

Step one: defining categories

Our proposal for adding dimensions to the DSM begins with the DSM-V Diagnostic Workgroups creating categorical illness definitions, just as they have in the previous revisions of the DSM. As before, this includes deciding what signs and symptoms to include in each category and what the categorical threshold should be for each diagnosis. If a dimensional option is based on that categorical definition, it will ensure concordance between the two approaches, which is far preferable to two independent sets of criteria.

The substance category could include definitions for both abuse and dependence if the workgroup so chooses, but it would be highly advantageous if the workgroup was cognizant of findings from the published literature cited earlier on the dimensional pattern of symptoms so that symptoms at the mild end of the substance

continuum be designated in the abuse category and symptoms that fall at the more severe end be included in dependence. Further, if the weekly 5+/4+ consumption criterion proposed by Saha et al. (2007) were added to the categorical definition, it would appear to strengthen the mild to moderate range of the dimensional definition. These considerations would help to ensure a single, broadly encompassing dimension for the SUDs even if there are separate categorical distinctions for abuse and dependence.

Step two: dimensionalizing symptoms

After the symptoms for a particular diagnosis have been defined by the diagnostic workgroup(s), the next step would be to create a dimensional scale for each symptom. This could be done using a simple scale that is uniform across symptoms and across the substance diagnoses, or by using a more complex scale that is symptom and/or diagnostic specific. A simple, uniform method might be to score each symptom on a three-point scale logically based on symptom severity or frequency, whichever is more appropriate. For example, substance withdrawal might logically be scored in terms of severity: none (never occurred), mild (has occurred but never severe), or severe. However, a symptom such as sacrificing other activities in order to use a substance might be more logically scored in terms of its frequency of occurrence: never, sometimes, frequent. In either case, these three levels could correspond to a simple numerical score of 0, 1, or 2. Dimensionalization of individual symptoms could also be done using more complex scales that allow more latitude in the scoring and/or accommodate biological or laboratory measures should they become relevant.

For DSM-V, we would advocate for a simple scoring method. The major disadvantage of a more complex method of dimensionalizing individual symptoms is that it might rapidly become cumbersome, with symptoms across substances, or even within a single substance, being dimensionalized differently. Such an approach might capture more of the relevant dimensional variability, but it would also be much harder to remember, apply, and communicate. The dimensional scale for a diagnosis could in effect become a black box rather than a more transparent and memorable coding applied uniformly across all symptoms and diagnoses. Any final decision about this rests in the hands of the DSM-V Task Force and the individual Diagnostic Workgroups. But the recommendation of the authors

of this paper would be to opt for a simple, transparent, and easily comprehensible approach at this point in time.

Step three: creating dimensional scales

Next we propose that the scores for individual symptoms be used collectively to create a quantitative measure for the specific diagnosis. There are a variety of statistical methods available to accomplish this step such as factor analysis (Muthen et al., 1993a), latent trait modeling (Krueger et al., 2004), IRT (Saha et al., 2006), latent transition analysis (Lanza et al., 2003) or newer methods such as latent class factor analysis proposed by Muthen and Asparouhov (2006) as appropriate for both categories and dimensions. The relationship between the categorical and the dimensional approaches would depend in large measure on the statistical method chosen for this step. Recommendation of a particular method requires statistical consultation and is beyond the scope of this chapter. This question should be part of the ongoing research agenda and expert discussion in the preparation of DSM-V.

Any of the earlier statistical methods are more appropriate for creating a quantitative diagnostic scale than simply summing the symptom scores. However, no statistical method would result in an interval scale at either the symptom or the diagnostic level. There is no guarantee, for example, that a diagnostic scale score of 6 would represent twice the level of severity as a score of 3. But any of the earlier approaches can be used to create an ordinal scale, the statistical and clinical advantages of which are superior to those of the purely nominal system that the DSM has exemplified up to this point in its history.

Step four: relating scales to categories

Once a scale based on dimensionalized symptoms has been created, ROC (Receiver Operating Characteristic) curve analysis (Kraemer et al., 2004) can be used to identify the quantitative score that most closely correlates with the categorical diagnostic threshold originally established by the diagnostic workgroup. This is a particularly important step. As we discussed in the opening section, diagnostic quantification of the SUDs has advantages for both clinical and research uses. An estimate of the score that best relates to the categorical diagnosis helps orient clinicians and investigators, and helps ensure concordance between the categorical and dimensional options. If the workgroup decides that two

categorical levels are necessary (e.g. abuse and dependence), it may still be desirable that there be a single dimensional scale. Separate dimensional scales for abuse and dependence would be awkward. However, ROC can be used to identify the quantitative score that most closely correlates with each of these categories.

Structural recommendations

We recommend that a dimensional component for the DSM-V SUDs be based upon the categorical substance definitions that will be created by the DSM-V Substance Use Diagnostic Workgroup. We consider it vital that the categorical and dimensional diagnostic definitions be closely linked. It would serve no one's interest to create separate sets of categorical and dimensional criteria that are independent of one another. The final product of such an approach might conceivably be more psychometrically cohesive than a dimension that is tied to a previously defined categorical definition. But unless the categorical and dimensional are clearly related, it seems likely that diagnostic cacophony would result.

We also strongly recommend that the dimensional approach be an integral part of the DSM rather than included as a supplement or an appendix, neither of which is likely to have status or visibility equal to that of the categorical criteria. It seems unequivocal that DSM dimensional criteria would serve the needs of both clinicians and investigators, just as the categorical criteria have since the advent of DSM-III. Once a categorical diagnosis has been made, as clinicians we think in dimensional terms about severity, treatment and outcome. For the investigator, a dimensional approach adds considerably to the statistical power, permitting for a stronger test of scientific hypotheses with smaller sample sizes. In addition, a dimensional scale permits creation of population norms that are sensitive to gender, ethnicity, developmental stage and culture. For example, in the SUDs, what is deviant in a restrictive culture may not be so in a more permissive one, what is normal for middle aged males may not be so for young adolescents. A dimensional scale offers the opportunity of denoting norms and standard deviations for whatever group is being examined in a way that is much more specific than is the case with a categorical definition that must be applied equally to all population groups. Equal status for the categorical and dimensional approaches within the taxonomy helps ensure that full advantage will be taken of the strengths they each have to offer.

Conclusions

The evidence for offering a dimensional diagnostic option for the diagnosis of substance dependence in DSM-V seems irrefutable. The supportive literature for AUDs is extensive and nearly uniform in suggesting that the signs and symptoms typically considered salient to a categorical diagnosis form a single severity dimension and one that is strongly predictive of outcome. While less extensive and varied, the literature for most other substances included in prior versions of the DSM is similarly supportive of a quantitative construct that is likely unidimensional. The conclusion of the authors of this paper is that the body of empirical evidence cannot be ignored in revising the DSM.

In addition to the consistent evidence of a severity continuum detailed earlier there are other reasons to support the addition of a dimensional diagnostic option for the SUDs. A dimensional approach captures more of the known phenotypic variability which is the key rationale for a taxonomy in the first place. Dimensions help resolve problems of threshold cases, and are of greater relevance to studies of longitudinal course, treatment predictions, and comorbidity. Finally, a dimensional option added to categorical diagnoses represents a major taxonomic advance, not a repetition.

Any change in so basic a scientific tool as a diagnostic taxonomy is disruptive. Even revising categorical definitions, as will be done in DSM-V, means that clinical thinking has to be readjusted and that research using prior definitions must be reinterpreted in light of new definitions. Thus it is important that changes in the taxonomy be gradual and evolutionary rather than revolutionary. Regardless of what might evolve in terms of dimensional diagnoses in DSM-V, there is an ongoing need for categorical illness definitions for both clinical and research purposes. Categorical diagnoses are a verbal shorthand facilitating communication between clinicians, between investigators, and between psychiatric professionals and patients. Potential difficulty occurs when we reify the definitions and assume, as we often do, that because two patients fall into the same diagnostic category they are alike in all important respects *vis-à-vis* that psychiatric illness. But many, if not most, disorders are on a continuum: those falling above a categorical diagnostic threshold differ in severity; those below the threshold vary in how close to the threshold they are. Thus when we design a treatment study of alcohol dependence and analyze the data as if the diagnosis defines a homogeneous group, we sacrifice

considerable statistical power by failing to recognize the substantial clinical variability imbedded within that categorical label. Nevertheless, the convention of a single diagnostic label for those who share the requisite clinical characteristics in common is both parsimonious and utilitarian and should be preserved.

However, once a categorical diagnosis has been made a series of quantitative questions arise: Is the illness severe enough that treatment is warranted? How aggressively should I treat? Should immediate hospitalization be considered? As clinicians we grapple with these issues by consulting our own prior experience; but we all tend to do it differently. A defined quantitative scale offers greater consistency in grappling with these quantitative issues, better enabling us to benefit from our own experience, that of our colleagues, and from the accumulated research evidence. On the investigative side, scientific progress in psychiatric genetics, genetic epidemiology, imaging and multiple other areas requiring refinement of diagnostic phenotypes is accelerating. Our taxonomy must keep pace if it is to remain relevant.

Adding a dimensional option to DSM-V while retaining traditional categorical definitions is an evolutionary change that has advantages for clinicians, investigators, and ultimately the entire field of psychiatry. Basing the addition of a dimensional option on the categorical definitions created by the SUDs Diagnostic Workgroup, as we propose here, minimizes any disruption to diagnostic traditions that have proven value.

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