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The structure of alcohol dependence in the community

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Abstract

Background:: Although dependence on alcohol appears to be a reliable unitary construct, abuse has not found a similar level of support as a separate construct. This paper describes a confirmatory factor analysis of the DSM-IV alcohol abuse and dependence criteria in a general population sample.
Methods:: Data from alcohol drinkers ($n = 7746$) were obtained from a cross-sectional study of a large, representative sample of the Australian general population. One- and two-factor solutions for the DSM-IV criteria for abuse and dependence (assessed by CIDI-Auto) were compared using confirmatory factor analysis.
Results:: Approximately 74% of Australians had used alcohol 12 or more times in the past year and 19% met at least one DSM-IV alcohol abuse or dependence criterion. Overall 6% met criteria for an alcohol use disorder (1.9% abuse, 4.1% dependence). More men than women met criteria for an alcohol use disorder and the prevalence of alcohol use disorders decreased with increasing age. Both one- and two-factor solutions from the confirmatory factor analyses provided an adequate fit to the data for the overall sample. The correlation between the abuse and dependence factors in the two-factor model was extremely high (0.95).
Conclusion:: Alcohol abuse and dependence criteria were most parsimoniously described by a single continuous construct incorporating all eleven abuse and dependence criteria.

Keywords: Alcohol dependence; Alcohol abuse; DSM-IV; Confirmatory factor analysis; Item response theory

Alcohol dependence was first formulated by Edwards and Gross (1976) and Edwards et al. (1981), as a number of psychological and physiological factors associated with diminished control over alcohol use. In a later publication, Edwards (1986) referred to the 'bi-axial concept' where dependence as described above constitutes one axis of the syndrome and alcohol-related problems formed the other. Although dependence on alcohol has support as a reliable unitary construct (Morgenstern et al., 1994; Bucholz et al., 1995; Feingold and Rounsaville, 1995; Langenbucher et al., 2000), abuse has not found a similar level of support (e.g. Feingold and Rounsaville, 1995; Hasin et al., 1996; Hasin and Paykin, 1999; Langenbucher et al., 2000; Hasin, 2003). Thus, compared with the literature on alcohol dependence, less is known about the validity of alcohol abuse and its implementation in widely used diagnostic schemes.

This paper aims to explore the structure of the DSM-IV criteria for alcohol use disorders by examining the relationship between the abuse and dependence criteria, in order to ascertain the appropriateness of the criteria to alcohol use disorders. The DSM-IV specifies 11 criteria for alcohol use disorders (see Table 2). Dependence is measured by seven criteria, at least three of which must be endorsed for a diagnosis. Abuse is measured by four criteria, and a diagnosis is made if at least one criterion is endorsed (and a diagnosis of dependence is absent).

A limited number of studies have been carried out to clarify the dependence–abuse categorization for alcohol use disorders, although most have focused on clinical populations and employed a range of factor analytic techniques with inconsistent results. Some studies have found evidence for two separate, although related factors (Muthén et al., 1993a;

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Harford and Muthén, 2001), while others have identified single dimensions. In an analysis of the DSM-III-R and DSM-IV criteria for alcohol use disorders, Muthén et al. (1993a) concluded that the observed pattern of symptoms was best accounted for by a two-factor model. Based on factor loadings, the dimensions corresponded approximately to the DSM constructs of abuse and dependence. However, some dependence criteria loaded primarily on the "abuse" factor, and the criterion concerning time spent using or recovering from the effects of alcohol failed to load on either factor. In contrast, Hasin et al. (1994) found that a two-factor model fitted the criteria best but the two factors correlated 0.98, leading the authors to conclude that the one-factor solution was most appropriate. To date no studies have specifically assessed the current DSM-IV criteria in a broad-based population sample.

The WHO cross-national study by Nelson et al. (1999) tested the seven DSM-IV dependence and four abuse criteria for alcohol using confirmatory factor analysis (CFA) with community and treatment center samples. With this sample, they found a two-factor solution no better than the one-factor solution; but when they 'trimmed' the data of extreme respondents (those who responded NO to all criteria or YES to 10 or 11 criteria) they found the two-factor solution superior. Feingold and Rounsaville (1995) also performed a CFA on 10 of the 11 criteria using a mixed, non-random sample, and found that a one-factor solution was as good a fit as a two-factor solution, suggesting that the abuse criteria are assessing the same construct as the dependence criteria.

The DSM-III substance abuse committee (Rounsaville et al., 1986) viewed abuse as a diagnosis that should be reserved for individuals referred to treatment because of episodic drug use who had not yet developed a pattern of behaviors indicative of dependence. In contrast, the DSM-IV conceptualizes abuse as the negative social consequences and role impairment associated with substance use. According to a recent review by Hasin (2003) many of the psychometric problems found with the abuse diagnosis are because it is a residual factor and only occurs where dependence has been excluded.

A recent US population-based study (Hasin and Grant, 2004) found that a third of those diagnosed as dependent did not meet criteria for abuse. In particular, 46% of women and 29% of men who met dependence criteria did not meet any abuse criterion. Thus, the abuse criteria may reflect a different underlying construct than dependence.

A further aim of this paper is to examine where each criterion discriminates best on the dimensions which underlie the criteria. If a single factor fits all eleven criteria it is hypothesized that the abuse criteria should discriminate at a lower (or less severe) level, while the dependence criteria should discriminate at a higher level. A priority of the DSM-IV criteria is to assist clinicians to differentiate between people who have a disorder and those who do not. The relative discriminatory power of each of the criteria for alcohol use disorders at the diagnostic threshold is therefore examined.

The present paper applies the methods of Muthén (1996) to examine the factor structure of DSM-IV alcohol use disorders in the Australian National Survey of Mental Health and Wellbeing (NSMHWB, Teesson et al., 2000).

1. Methods

The NSMHWB was carried out in 1997 on a random stratified multistage sample of approximately 13,600 private dwellings in Australia where one resident over the age of 18 was asked to participate in an interview (Henderson et al., 2000). A modified version of the Composite International Diagnostic Interview (CIDI, World Health Organization, 1996; Teesson et al., 2000) was developed for the survey and administered by trained staff. The CIDI has been used in a range of epidemiological studies, and has been shown to be a reliable and valid survey instrument (Wittchen, 1994; Peters and Andrews, 1995). A total of 10,641 respondents were interviewed giving a 78% response rate.

Questioning was restricted to symptoms in the last 12 months. Alcohol abuse and dependence were assessed in all persons who had consumed at least 12 alcoholic drinks in the past 12 months (the 11 criteria are listed in Table 2). Population and sub-group prevalence estimates were adjusted for sampling through the use of balanced repeated replications (BRR) weightings using SUDAAN (Shah et al., 1997). These weightings adjusted the data to conform to independent population estimates by state, part of state, age and sex.

Two confirmatory factor analyses of the 11 DSM-IV diagnostic criteria were carried out using M*plus* version 3.12 (Muthén and Muthén, 1998). The fit of both models was then examined using WLSMV (weighted least-squares means and variance adjusted) estimation. WLSMV uses weighted least-square parameter estimates from the diagonal of the weight matrix. These methods are recommended for categorical variables by Muthén and Muthén (2001) on the basis of simulation studies (Muthén et al., in press) and follow a long line of research on the structure of alcohol symptoms (Muthén et al., 1993a,b; Muthén, 1995, 1996; Harford and Muthén, 2001).

Although NSMHWB data have been obtained by complex sampling procedures, the factor analysis methods used in this paper assumed simple random sampling. Muthén et al. (1993a) argue that M*plus* is applicable for use with complex samples because it uses multivariate analyses, which are less sensitive to complex sampling than univariate methods.

A further issue to consider is selection of appropriate tests of model fit. The chi-squared statistic is a common measure of goodness of fit but has been found to be over-sensitive to trivial differences in large samples, where unique variances tend to be small (Browne et al., 2002). For binary data such as that used in this study, Yu (2002) recommends use of the comparative fit index (CFI), the root mean square error of approximation (RMSEA) and the weighted root-mean-square residual (WRMR). Recommended cutoff points for these measures are: CFI > 0.96, RMSEA < 0.05