Drug and Alcohol Dependence 152 (2015) 123–130

Contents lists available at ScienceDirect

Drug and Alcohol Dependence

journal homepage: www.elsevier.com/locate/drugalcdep

# Investigating dimensionality and measurement bias of DSM-5 alcohol use disorder in a representative sample of the largest metropolitan area in South America

João Mauricio Castaldelli-Maia[a,b,c,*], Yuan-Pang Wang[a], Guilherme Borges[d], Camila M. Silveira[a,b], Erica R. Siu[a], Maria C. Viana[e], Arthur G. Andrade[b,c,c], Silvia S. Martins[f,1], Laura H. Andrade[a,1]

[a] Section of Psychiatric Epidemiology – LIM 23, Department and Institute of Psychiatry, University of São Paulo Medical School, São Paulo 05403, Brazil
[b] Interdisciplinary Group of Studies on Alcohol and Drugs, Department and Institute of Psychiatry, University of São Paulo Medical School, São Paulo 05403, Brazil
[c] Department of Neuroscience, Medical School, Fundação do ABC, Santo André, SP 09060, Brazil
[d] National Institute of Psychiatry and Metropolitan Autonomous University, Mexico City 14370, Mexico
[e] Department of Social Medicine and Post-Graduate Program in Public Health, Federal University of Espírito Santo, Vitória, ES 29040, Brazil
[f] Department of Epidemiology, Columbia University Mailman School of Public Health, New York, NY 10032, USA

ARTICLE INFO

*Article history:*
Received 18 November 2014
Received in revised form 10 April 2015
Accepted 10 April 2015
Available online 9 May 2015

*Keywords:*
DSM-5
Exploratory factor analysis
Item response theory
Differential item functioning
Latin America
Megacities

ABSTRACT

*Background:* Given the recent launch of a new diagnostic classification (DSM-5) for alcohol use disorders (AUD), we aimed to investigate its dimensionality and possible measurement bias in a non-U.S. sample.
*Methods:* The current analyses were restricted to 948 subjects who endorsed drinking at least one drink per week in the past year from a sample of 5037 individuals. Data came from São Paulo Megacity Project (which is part of World Mental Health Surveys) collected between 2005 and 2007. First, exploratory factor analysis (EFA) was carried out to test for the best dimensional structure for DSM-5-AUD criteria. Then, item response theory (IRT) was used to investigate the severity and discrimination properties of each criterion of DSM-5-AUD. Finally, differential criterion functioning (DCF) were investigated by socio-demographics (income, gender, age, employment status, marital status and education). All analyses were performed in Mplus software taking into account complex survey design features.
*Results:* The best EFA model was a one-dimensional model. IRT results showed that the criteria "Time Spent" and "Given Up" have the highest discrimination and severity properties, while the criterion "Larger/Longer" had the lowest value of severity, but an average value of discrimination. Only female gender had DCF both at criterion- and factor-level, rendering measurement bias.
*Conclusion:* This study reinforces the existence of a DSM-5-AUD continuum in the largest metropolitan area of South America, including subgroups that had previously higher rates of alcohol use (lower educational/income levels). Lower DSM-5-AUD scores were found in women.


## 1. Introduction

Despite the Fifth edition of Diagnostic and Statistical Manual of Mental Disorders (DSM-5) being a reality (American Psychiatric Association, 2013; Hasin et al., 2013), there is still the need to explore the stability of this new unidimensional construct of alcohol use disorder (AUD) as well as the influence of socio-cultural aspects of different populations on the indicators of this new construct (Agrawal et al., 2011; Hasin et al., 2013).

Most of the available studies have been carried out in the U.S. (Borges et al., 2010; Keyes et al., 2011; Kuerbis et al., 2013) using exploratory factor analysis (EFA) to validate the DSM-5 AUD unidimensional structure. Evidence from other cultures are much more limited (McBride et al., 2011; Mewton et al., 2011; Shmulewitz et al., 2010) and fewer included the full set of 11 criteria (since some lacked Craving, as defined by DSM-5 alcohol use disorder criteria: Tolerance – as defined by either of the following: (a) a need

* Corresponding author at: Núcleo de Epidemiologia Psiquiátrica (NEP-LIM 23) – Rua Dr Ovídio Pires de Campos, 785, 05403-903 São Paulo, SP, Brazil. Tel.: +55 11 26616976.
*E-mail address:* jmcmaia2@gmail.com (J.M. Castaldelli-Maia).
[1] These authors share senior authorship of this manuscript.

http://dx.doi.org/10.1016/j.drugalcdep.2015.04.024
0376-8716/

for markedly increased amounts of alcohol to achieve intoxication or desired effect; (b) markedly diminished effect with continued use of the same amount of alcohol; Withdrawal – as manifested by either of the following: (a) the characteristic withdrawal syndrome for alcohol (refer to Criteria A and B of the criteria sets for withdrawal from alcohol); (b) alcohol (or a closely related drug such as benzodiazepines) is used to relieve or avoid withdrawal criteria; Larger/Longer – alcohol is often used in larger amounts or over a longer period than was intended; Quit/Control – there is a persistent desire or unsuccessful efforts to cut down or control alcohol use; Time Spent – a great deal of time is spent in activities necessary to obtain alcohol, use alcohol, or recover from its effects; Activities Given Up – important social, occupational, or recreational activities are given up or reduced because of alcohol use; Physical/Psychological – alcohol use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by alcohol (e.g. continued drinking despite recognition that an ulcer was made worse by alcohol consumption); Neglect Roles – recurrent alcohol use resulting in a failure to fulfill major role obligations at work, school, or home (e.g., repeated absences or poor work performance elated to alcohol use; alcohol-related absences, suspensions, or expulsions from school; neglect of children or household); Social/Interpersonal – continued alcohol use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of the alcohol (e.g., arguments with spouse about consequences of Intoxication, physical fights); Hazardous Use – recurrent alcohol use in situations in which it is physically hazardous (e.g., driving an automobile or operating a machine when impaired by alcohol use); Craving – a strong *desire or sense of compulsion to take alcohol*). In addition to the EFA studies, several authors have called for verification of the distribution of the individual criterion within the unidimensional structure across studies and populations (Borges et al., 2010; Saha et al., 2006; Casey et al., 2012; Edwards et al., 2013). Item response theory (IRT) was used to explore the role of each of the criterion within this dimensional structure (Saha et al., 2006; Casey et al., 2012; Edwards et al., 2013). For instance, Saha et al. (2007) found that the DSM-IV criteria for alcohol abuse and dependence were disposed in a continuum, which contradicted the proposed hierarchy between the two diagnoses in DSM-IV. This opened a new strand of studies that have shown that the criteria may behave differently in different cultures and populations with different usage pattern (Saha et al., 2006; Casey et al., 2012; Edwards et al., 2013).

Also important is the use of differential criterion functioning (DCF) techniques to measure the direct effects of external factors (i.e., socio-demographic variables) that could potentially show evidence for measurement bias, a type of error in which a given variable can systematically generate false outcomes, in certain subgroups (Kuerbis et al., 2013; Casey et al., 2012; Rose et al., 2012; Srisurapanont et al., 2012). Current research has not been consistent in finding DCF and most of them were restricted to gender/age DCF (Casey et al., 2012; Rose et al., 2012; Srisurapanont et al., 2012). With the exception of Saha et al.'s (2007) study, no other study has examined DCF at both criterion- and factor-level. Saha et al. (2007) state that DCF actually reflects invariance across subgroups just when observed criterion-level DCFs generate bias at the factor-level (scale).

In the present study, we aim to investigate the dimensionality and possible measurement bias of the new diagnostic classification (DSM-5) for alcohol use disorders (AUD) in a population-based sample of the largest metropolitan area in South America (São Paulo Metropolitan Area – SPMA). SPMA is a unique setting for this type of study for its socio-economic diversity, with extremes of poverty existing side by side with wealth, resulting in social tension and high rates of urban violence (Viana et al., 2009), despite being the major financial and economic center of Brazil, with a gross domestic product (GDP) corresponding to 16.7% of total Brazilian GDP.

We used data from the São Paulo Megacity Mental Health Survey (SPMHS), a cross-sectional population-based study, designed to evaluate psychiatric morbidity in a representative sample in the general population, aged 18 years or more, living in this metropolitan area. In this dataset, the full set of the 11 DSM-5 AUD criteria has been collected, what allows us to use two-parameter item response theory (IRT) model to examination the threshold and discrimination parameter of each criterion of the DSM-5 latent alcohol use disorder construct. We also examined differential item functioning of each criterion and the latent construct of DSM-5 AUD across demographic subgroups.

## 2. Methods

### 2.1. Ethics Committee approval

The research and Ethics Committee of the University of São Paulo Medical School (Project number 792/03) approved the procedures for recruitment, obtaining informed consent and protection of human subjects involved during field procedures of São Paulo Megacity Health Survey (SPMHS).

### 2.2. Sample

Respondents were selected through a multistage probabilistic process covering the 39 municipalities of São Paulo Metropolitan Area, without replacement. This survey is a cross-sectional population-based study, designed to evaluate psychiatric morbidity in a representative sample in the general population, aged 18 years or more, living in the São Paulo Metropolitan Area (SPMA). The World Mental Health Study (WMHS) Composite International Diagnostic Interview (WMH-CIDI) of the World Health Organization, translated and adapted to Brazilian Portuguese (Viana et al., 2009), was used to assess the respondents. Data were collected between May 2005 and April 2007, by trained interviewers. The final sample had 5037 individuals (response rate of 81.3%). The current analyses were restricted to 948 subjects who endorsed drinking at least one drink per week in the past year. This sub-sample was chosen because of the low drinking levels in South America (Rehm et al., 2003; Castaldelli-Maia et al., 2014). If we have chosen the past-year drinking sub-sample, we would find a very low prevalence of DSM-5 AUD criteria endorsement.

### 2.3. Interview

The WMH-CIDI is comprised of clinical and non-clinical sections, which generate diagnoses based on DSM-IV and ICD-10. All respondents answered a socio-demographic module and the assessment modules of mood, anxiety and impulse control disorders, along with substance abuse and suicidal behavior, considered nuclear disorders. When a blind clinical re-appraisal of the Structured Clinical Interview for DSM-IV Axis I disorder (SCID-I) for last 12-month DSM-IV Disorders was performed in a probabilistic sub-sample of WMH respondents there was generally a good agreement between WMH-CIDI diagnoses and SCID diagnoses (Haro et al., 2006). Regarding specifically the SPMHS, there was good total classification accuracy (range: 76–99%) and an area under the ROC curve around 0.7 for any disorder in the preliminary results of the clinical reappraisal study in the SPMHS with a probability sub-sample of 775 respondents, not included in the previous validation study (data available from the authors).

### 2.4. Measures

A series of questions derived from DSM-IV/ICD-10 alcohol abuse-harmful use/dependence criteria embedded in the WMH-CIDI were asked to the 948 subjects who endorsed drinking at least one drink per week in the past year (please see Supplementary File 1).

Twelve individuals who did not answer these questions were excluded from the statistical analysis ($n = 936$). Eleven dichotomous variables matching the DSM-5 criteria were generated from these questions. The abbreviation of the names of the DSM-5 11 criteria was based upon previously published studies (Hasin and Beseler, 2009; Shmulewitz et al., 2010; Saha et al., 2006; Castaldelli-Maia et al., 2014) as follows: Tolerance, Withdrawal, Larger/Longer, Quit/Control, Time Spent, Activities Given Up, Physical/Psychological, Neglect Roles, Social/Interpersonal, Hazardous Use and Craving.

### 2.5. Statistical analysis

All analyses were performed with Mplus version 7.3, using sampling weights and the complex survey design measures. Descriptive statistics were used to describe the sample. Specifically, counts and percentages were used to describe categorical variables.