



Full length article

Reproducibility and differential item functioning of the alcohol dependence syndrome construct across four alcohol treatment studies: An integrative data analysis



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ABSTRACT

Background: The validity of the alcohol dependence syndrome has been supported. The question of whether different measures of the construct are comparable across studies and patient subgroups has not been examined. This study examined the alcohol dependence construct across four diverse large-scale treatment samples using integrative data analysis (IDA).

Method: We utilized existing data ($n = 4393$) from the COMBINE Study, Project MATCH, the Relapse Replication and Extension Project (RREP), and the United Kingdom Alcohol Treatment Trial (UKATT). We focused on four measures of alcohol dependence: the Alcohol Dependence Scale (COMBINE and RREP), Alcohol Use Inventory (MATCH), the Leeds Dependence Questionnaire (UKATT), and the Diagnostic and Statistical Manual of Mental Disorders (COMBINE and MATCH). Moderated nonlinear factor analysis was used to create a measure of alcohol dependence severity that was moderated by study membership, gender, age, and marital status.

Results: A commensurate measure of alcohol dependence severity was successfully created using 20 items available in four studies. We identified differential item functioning by study membership, age, gender, and/or marital status for 12 of the 20 items, indicating specific patient subgroups who responded differently to items based on their underlying dependence severity.

Conclusions: Alcohol dependence severity is a single unidimensional construct that is comparable across studies. The use of IDA provided a strong test of the validity of the alcohol dependence syndrome and clues as to how some items used to measure dependence severity may be more or less central to the construct for some patients.

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1. Introduction

The alcohol dependence construct is central to theories of problem alcohol use (Stockwell, 2015). However, the reproducibility of the alcohol dependence construct across studies and settings is not well known. There have been numerous psychometric studies of individual measures of alcohol dependence (Doyle and Donovan, 2009; Kahler et al., 2003a), but no studies have attempted to examine the construct of alcohol dependence across measures, studies, and patient subgroups. The goal of this study was to use integrative

data analysis to test the construct of alcohol dependence severity among 4393 patients presenting for alcohol use disorder (AUD) treatment.

1.1. Alcohol dependence syndrome

Edwards and Gross (1976) hypothesized that alcohol dependence syndrome was a collection of symptoms including narrowing of the drinking repertoire, salience of drink-seeking behavior, tolerance, drinking to relieve withdrawal symptoms, awareness of compulsion to drink, and return to drinking following abstinence. The dependence syndrome is primarily focused on physiological, psychological and behavioral symptoms that result in a core “drive to consume alcohol” (p. 79; Stockwell et al., 1979) and is therefore

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distinct from alcohol consumption, in and of itself, or negative consequences that result from alcohol use (Li et al., 2007). Almost 40 years of research on the dependence syndrome (Marshall, 2015; Stockwell, 2015) has supported the importance of the concept for the clinical formulation of AUD. Yet, the degree to which certain elements of the syndrome are central to the construct or subgroups (e.g., females) has received little attention (Kahler et al., 2003b), and no study has examined whether different measures of dependence are measuring the same construct across AUD samples.

1.2. Integrative data analysis (IDA)

IDA is a framework for merging, analyzing, and comparing information from multiple studies (Curran and Hussong, 2009). Numerous methods associated with IDA exist, including moderated nonlinear factor analysis (MNLFA; Bauer and Hussong, 2009), individual participant data meta-analysis (Cooper and Patall, 2009; Huh et al., 2015), and item response theory (McArdle et al., 2009). The primary requirements for IDA are to have multiple studies with common measures that reflect similar constructs (Bauer and Hussong, 2009).

In the current study we utilized MNLFA (Bauer and Hussong, 2009; Curran et al., 2014), which allowed for the empirical testing of whether items are measuring the same construct across sub-populations, including individuals from different studies and with different demographic characteristics. Tests of differential item functioning (DIF; e.g., items not measuring the same construct the same way across groups) can yield insights about the clinical value of certain items and item responses that may differentially reflect the construct in different groups.

1.3. Goals of current study

The goal of this study was to examine whether the construct of alcohol dependence, as measured by different measures of alcohol dependence severity, was reproducible across studies. The pooling of data across studies provided greater statistical power and greater study heterogeneity to test for DIF. We had no *a priori* hypotheses regarding DIF given lack of prior research in this area among patients with AUD.

2. Material and methods

2.1. Source of data

The data for this study were drawn from four adult alcohol treatment studies ($n=4414$). Exclusion criteria and participant demographics are provided in Table 1.

2.1.1. COMBINE study. The COMBINE study (COMB Study Group, 2003), conducted between 2001 and 2004, randomized participants ($n=1383$) from eleven research sites across the United States into nine treatment groups consisting of medical management or combined behavioral intervention and medications (acamprosate, naltrexone, or placebo).

2.1.2. Project MATCH. Project MATCH (Project MATCH Research Group, 1997), conducted between 1991 and 1993, randomized outpatients ($n=952$) and aftercare patients (recruited from inpatient treatment; $n=774$) from nine research sites across the United States into three treatment groups: Cognitive Behavioral Therapy, Motivational Enhancement Therapy, or Twelve-Step Facilitation.

2.1.3. Relapse replication and extension project (RREP). RREP (Lowman et al., 1996), conducted in the early 1990s, was a longitudinal observational study of individuals ($n=563$) from community treatment programs associated with three research sites in the United States.

2.1.4. United Kingdom Alcohol Treatment Trial (UKATT). UKATT (UKATT Research Team, 2001), conducted between 1998 and 2001, recruited participants ($n=742$) across seven treatment sites in the United Kingdom and randomized them into Motivation Enhancement Therapy or Social Behavior and Network Therapy (UKATT Research Team, 2005).

2.2. Measures

The four studies administered a variety of measures that were used to develop a commensurate measure of baseline alcohol dependence severity (Table 1). The following demographic

Table 1
Demographic characteristics, exclusion criteria, and alcohol dependence measures for COMBINE, MATCH, RREP, and UKATT.

Demographic characteristic	COMBINE	MATCH	RREP	UKATT
Sample size	1383	1726	563	742
Gender—% male	69.1%	75.7%	58.8%	74.1%
Age—mean (SD)	44.4 (10.2)	40.2 (10.9)	34.3 (8.7)	41.6 (10.1)
Ethnicity—% white	76.8%	80.0%	67.3%	95.6%
Marital status—% married/cohabitating	46.3%	41.4%	17.9%	54.1%
Exclusion criteria	COMBINE	MATCH	RREP	UKATT
Age	18+	18+	18+	16+
Meet criteria for abuse/dependence	Past year	Past year	6 months	NA
Reading level	Literate	6th grade	8th grade	Literate
Comorbid psychiatric diagnoses	×	×	×	×
Unable to identify collateral informant	×	×	×	×
Severe cognitive impairment	×	×	×	×
Residential instability	×	×	×	×
Other illicit drug dependence	×	×	×	×
Alcohol dependence measures	COMBINE	MATCH	RREP	UKATT
Alcohol dependence scale ^{a,b}	×	×	×	×
Alcohol use inventory ^{a,b}	×	×	×	×
Leeds dependence questionnaire ^b	×	×	×	×
DSM-III-R physiological dependence	×	×	×	×
DSM-IV physiological dependence	×	×	×	×

Note. DSM = Diagnostic and statistical manual for mental disorders.

^a =Share 23 items.

^b Share two linking items.

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