



Factorial structure of the Brief Symptom Inventory (BSI)-18 among Chinese drug users

Jichuan Wang^a, Brian C. Kelly^{b,*}, Tieqiao Liu^{c,**}, Guanbai Zhang^c, Wei Hao^c

^a Children's National Medical Center, George Washington University, United States

^b Purdue University, United States

^c Mental Health Institute of Central South University, China

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ABSTRACT

Background: Although the Brief Symptom Inventory-18 (BSI-18) has been widely used for mental health screenings in both clinical and non-clinical populations, the validation of its application to Chinese populations has been very limited. The objective of this research is to assess the factorial structure of the BSI-18 within a Chinese drug using population.

Methods and results: A total sample of 303 drug users recruited via Respondent Driven Sampling (RDS) from Changsha, China was used for the study. Our results show: (1) The BSI-18 item scores are highly skewed; (2) With dichotomous items measures (1 – problem at least moderately caused respondent discomfort during the past week; 0 – otherwise), our findings support the designed 3 – factor solution of the BSI-18 (somatization, depression, and anxiety); (3) The BSI-18 has a hierarchical factorial structure with 3 first-order factors and an underlying second-order factor (general psychological distress); (4) Tentative support should also be given to a single dimension of general psychological distress in Chinese drug using populations. Our study recommends a useful alternative approach for evaluating the factorial structure of the BSI-18 – i.e. CFA with dichotomous item measures. Both the total BSI-18 score and the three subscales (SOM, DEP, and ANX) can be used in applications of the BSI-18.

Conclusion: Overall, our findings suggest the BSI-18 is useful with Chinese drug users, and shows potential for use with non-Western and substance using populations more generally.

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1. Introduction

Numerous epidemiological studies have demonstrated inter-connections between substance use and mental health (e.g. Kessler et al., 1996; Grant et al., 2004). Considering this, the measurement of mental health within substance using populations remains a key issue. Comprehensive assessments of psychiatric symptoms can be time-consuming and burdensome. In some studies, such assessments also prove more extensive than necessary for study completion. As such, effective, precise, and efficient measures of mental health are of significant interest to substance use researchers throughout the world. Considering global population trends and shifts in global drug markets, it is imperative to identify measures that can be utilized within a variety of nations. While the BSI-18 has been increasingly utilized, its application to populations

outside Western nations is less well validated. Given the increasing use of this measure in substance use research in other regions, it is important to assess its factorial structure in other populations to more fully evaluate its validity.

1.1. Brief Symptom Inventory and substance use

The Brief Symptom Inventory (BSI; Derogatis and Spencer, 1983) has been widely used to assess mental health in both clinical and non-clinical populations, including studies of drug users. These focus on a wide range of substances from methamphetamine (Booth et al., 2006) to cocaine (Magura et al., 1998) to ecstasy (Soar et al., 2006), and also studies of residential therapeutic communities (Metrikina et al., 2003). Additionally, the BSI has been used to assess mental health in varying types of drug use research including therapy for couples in treatment (Li et al., 2007), clinical studies of pharmacotherapy for dependent individuals (Meredith et al., 2007), and studies of anti-retroviral adherence among drug users (Knowlton et al., 2006). It has also been useful for screening substance abuse treatment clients for mental health symptoms (Royce and Drude, 1984). In sum, the BSI is a widely adopted measure that has demonstrated considerable utility in research and clinical

* Corresponding author at: Purdue University, Department of Sociology, 700W State St., West Lafayette, IN 47907, United States. Tel.: +1 765 496 3616; fax: +1 765 496 1476.

** Corresponding author at: Mental Health Institute, The Second Xiangya Hospital, Central South University, 139 Renmin Road, Changsha, Hunan 410011, China.

E-mail addresses: bckelly@purdue.edu (B.C. Kelly), liutiq@gmail.com (T. Liu).

practice related to substance use. The BSI-18 has demonstrated similar potential for drug using populations (Wang et al., 2010).

1.2. Assessments of the BSI and BSI-18

Based upon clinical conceptualizations of psychological disorders, the original BSI has 53 items designed to assess nine distinctive psychological domains: (somatization, obsessive–compulsive disorder, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism (Derogatis, 1993). However, studies have shown inconsistent dimensional structures for the BSI with a varying number of dimensions (Hayes, 1997; Johnson et al., 1996; Kellett et al., 2004; Ruizperez et al., 2001). For example, Piersma and colleagues' study (1994) with a sample size of 217 suggested that the BSI provides only a unidimensional measure of general psychological distress.

While the original BSI has good psychometric properties including high internal consistency and test–retest reliability (Derogatis and Spencer, 1983; Derogatis, 1993), its factorial structure remains difficult to test. A commonly used rule of thumb for structural equation modeling is 10 cases/observations per indicator variable (Nunnally, 1967) or 5–10 cases/observations per free parameter (Hoogland and Boomsma, 1998). With 53 items, a large sample is needed for factor analysis of the BSI. In addition, an instrument with multiple scales and many items often proves difficult with validation of its factorial structure in CFA modeling. Even when Cronbach's alphas are high for the scales under study, the CFA model may not fit the data well unless some cross-factor loadings and error covariances are specified. Theoretically speaking, in CFA modeling, each item should be loaded only on its theoretical underlying factor(s) and items should be independent of each other once they are loaded to their underlying factors. Cross-factor loadings and error covariances are allowable only if they can be appropriately explained.

Similar concerns regarding these issues pertain less to the BSI-18, a shorter version used to screen for the most common psychiatric problems: somatization (SOM), depression (DEP), and anxiety (ANX), as the instrument has less heterogeneity (Derogatis, 2001). Indeed, the reduction to its 18-item format was also intended to improve structural validity through an instrument with fewer domains (Derogatis, 2001). Because of its simplicity, the BSI-18 is a useful measure to screen for psychiatric symptoms in a wide range of populations. Three theoretically defined dimensions of the BSI-18 were confirmed by Derogatis (2001) using principal components analysis. Importantly, the BSI-18 also permits considerations of a hierarchical structure, a matter of increasing interest for the assessment of mental health (Watson, 2005), and health outcomes more generally (Reise et al., 2007). This permits the consideration of generalized distress underlying the three specified psychiatric symptoms.

The three dimensions of the BSI-18 focus on the most commonly experienced mental health concerns (DEP, SOM, and ANX), thus making it useful for mental health assessments in community samples. Given its efficiency, this streamlined instrument is particularly useful for assessments in which mental health is not the primary outcome of interest, such as those in which common psychiatric symptoms may be associated with substance use. Several investigations of the BSI-18 have validated the originally designed three-dimensional structure (Durá et al., 2006; Andreu et al., 2008; Franke et al., 2011; Petkus et al., 2010; Wang et al., 2010; Wiesner et al., 2010). However, an alternative 4-factor model with factors DEP, SOM, Agitation (AGI), and Panic (PAN) has been suggested, as well as a 4-factor model that considers the original 3 dimensions plus suicidal ideation (Zabora et al., 2001). Yet, some have indicated that support for this 4-factor model is weak, particularly one with suicidal ideation given that it is based upon a single item, and

thus the 3-factor model is preferable (Recklitis et al., 2006). Others have suggested that the BSI-18 is best used to measure a single dimension of general psychological distress (GPD; Asner-self et al., 2006; Prellow et al., 2005). Many of these studies have focused on clinical samples (e.g., Andreu et al., 2008; Durá et al., 2006; Franke et al., 2011; Petkus et al., 2010; Recklitis et al., 2006; Zabora et al., 2001); thus, further studies within community samples are warranted. Given these considerations, it remains important to further investigate whether the BSI-18 provides a hierarchical measure of both general psychological distress and individual dimensions of mental health, particularly in community samples.

1.3. Current study

To further strengthen efforts to address the methodological challenges related to the measurement of mental health symptoms among substance users, the present study addresses the properties of the BSI-18 within a Chinese drug using population. Specifically, we report the details of an assessment of the factorial structure of this instrument in order to evaluate the extent to which the BSI-18 provides a precise and robust means to measure mental health among Chinese drug users in accordance with a hierarchical conceptualization of mental health. Testing the measure within this population also allows us to assess the validity of the BSI-18 within non-English speaking and non-Western populations.

2. Methods

2.1. Sample

A total of 303 drug users were recruited in Changsha, China during 2010 and 2011. Study eligibility included: being 18 or older; methamphetamine use during the past 30 days; residence in Changsha; and the capacity to consent to research participation. Respondent-driven sampling (RDS), widely applied to hidden populations, was used for sample recruitment (Heckathorn, 1997, 2002; Wang et al., 2005, 2007). To initiate the RDS process, ethnographic methods were used to recruit 20 "seeds" within community settings. After having finished the survey, each seed was provided three confidentially linkable referral coupons in addition to the incentive received for their own participation (150 Yuan [~\$23 USD]). Each time a network member enrolled and presented a numerically coded coupon, the "seed" received an incentive (50 Yuan [~\$8 USD]) for facilitating participation. The enrolled recruit then also received three referral coupons and was offered the same incentives as the "seed" to stimulate enrollment among network members. Peer recruitment with referral coupons and the dual incentives were employed to help reduce volunteerism and masking effects during the recruitment process (Heckathorn, 1997, 2002). The process continued through successive waves to build momentum within the networks to foster participation. Assessments of sample composition indicate that the sample extended through numerous waves and converged to equilibrium during the course of recruitment. All consent procedures conformed to IRB approval.

2.2. Measures

The BSI-18 items were designed to measure three dimensions of psychiatric disorders: somatization (SOM), depression (DEP), and anxiety (ANX). Each subscale included six items. BSI-18 items are rated on a 5-point, Likert scale: 0 – not at all; 1 – a little bit; 2 – moderately; 3 – quite a bit; 4 – extremely. The items were translated from English to Chinese by using the back translation method by bilingual research team members. In applications of the BSI-18, item scores are usually treated as continuous measures to generate subscale scores or conduct factor analysis. The BSI-18 items scores in the present study are highly skewed with very few cases having responses 3 (quite a bit) or 4 (extremely; see Fig. 1), and our preliminary analyses show that no CFA models fit the data even though robust ML estimator (e.g., MLR) was used to handle multivariate data non-normality in modeling. As such, we recoded all items as dichotomous measures: item responses were coded 1 if the problem at least moderately caused the respondent discomfort during the past week, otherwise coded 0. The dichotomous measures are meaningful indicators of whether symptoms caused at least moderate discomfort.

2.3. Analytical methods

Having recoded the BSI-18 items as dichotomous measures, the Kuder–Richardson Formula 20 (KR-20), a non-parametric equivalent to Cronbach's α , was used to evaluate their internal consistency (Fleming et al., 1976; Ghiselli et al., 1981; Cortina, 1993). A KR-20 coefficient ≥ 0.60 is considered to indicate that the measure is internally consistent (Allen et al., 2000).

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