Journal of Substance Abuse Treatment 47 (2014) 239–244

Contents lists available at ScienceDirect

Journal of Substance Abuse Treatment

A confirmatory approach to understanding the four-factor structure of the Adolescent Drinking Index: Evidence for a brief version

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ARTICLE INFO

Article history:
Received 9 January 2014
Revised 2 April 2014
Accepted 15 May 2014

Keywords:
Adolescent Drinking Index
Confirmatory factor analysis
Brief alcohol screening
Emergency departments
Adolescent drinking

ABSTRACT

The purpose of this study was to examine the psychometric properties of the original version of the Adolescent Drinking Index (ADI), and to examine the fit of a series of confirmatory factor analysis models to arrive at an abbreviated version that can be easily administered in settings with limited time for assessment. These aims were examined in a sample of 740 adolescents (M_{age} = 15.26; 58.5% males) who completed the ADI during an emergency department visit. Results suggested that the four-domain design did not fit the data adequately. Results, however, demonstrated good fit for an 8-item adapted version with a four-factor structure: interpersonal, social, psychological, and physical indicators. This abbreviated version was also associated with outcomes such as hangover, alcohol withdrawal, and substance use. Findings from this study provide support for the use of an abbreviated version of the ADI for screening adolescents and referring them to appropriate interventions.

1. Introduction

Adolescence is a developmental period marked by the onset and escalation of alcohol use. Adolescents typically consume their first whole drink during early adolescence and their levels of use escalate with increasing age (Faden, 2006). Nationally representative data of adolescents in the U.S. indicate that approximately 29.5% of adolescents in the 8th grade have experimented with alcohol and that these rates increase to 69.4% by the time adolescents reach the 12th grade (Johnston, O'Malley, Bachman, & Schulenberg, 2013). Data on levels of problematic drinking, from being drunk to binge drinking also demonstrate important age-related patterns. For example, 12.8% of 8th grade adolescents reported ever being drunk, and 5.1% reported binge drinking (defined as 5 or more drinks on one occasion) in the past 2 weeks. By the time these adolescents reach the 12th grade, their rates of ever being drunk increase to 54.2%, and their rates of binge drinking in the past 2 weeks increase to 23.7%. According to these data, alcohol use onset and escalation during adolescence is a developmentally normative behavior and may be related to specific developmental tasks (Masten, Faden, Zucker, & Spear, 2009). Data on developmental drinking trajectories have demonstrated that not all adolescents who drink are at the same level of risk for developing an alcohol-related disorder (Danielsson, Wennberg, Tengström, & Romelsjö, 2010; Jackson, Sher, & Schulenberg, 2005; Windle, Mun, & Windle, 2005). However, research has also demonstrated that the earlier a person initiates alcohol use, the greater their risk for developing alcohol-related disorders and DSM-IV diagnoses later in life (Flory, Lynam, Milich, Leukefeld, & Clayton, 2004; Hawkins et al., 1997; McGue, Iacono, Legrand, Malone, & Elkins, 2001).

There have been recent calls for screening, brief intervention, and referral for alcohol-related problems among adolescents as a form of scaffolding healthy developmental transitions (National Institute on Alcohol Abuse & Alcoholism, 2011; U.S. Department of Health & Human Services, 2007). However, with a demand for appropriate screening procedures comes a demand for appropriate screening tools. Given the heterogeneity in adolescents' drinking patterns, these screening tools need to go beyond drinking frequency and quantity and assess for problems associated with these drinking patterns. Further, these problems need to be assessed in a developmentally sensitive manner given that adolescent drinking occurs within the context of adolescent development and related transitions as well as has consequences on adolescent development. Finally, these instruments should be brief and easy to administer given the time constraints that exist in primary care settings, where screening procedures for adolescents are most likely to occur.

The Adolescent Drinking Index (ADI; Harrell & Wirtz, 1989) was created as an alcohol-screening tool that can be quickly and easily

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http://dx.doi.org/10.1016/j.jsat.2014.05.010
0740-5472/

administered to adolescents. The ADI is based on a conceptual framework that defines problem drinking in terms of alcohol-related dysfunction across key domains of adolescent development (Harrell & Wirtz, 1989). These domains include loss of control of drinking, social indicators reflecting difficulties in interpersonal relationships and role fulfillment as a result of drinking, psychological indicators reflecting drinking to cope with feelings such as loneliness and depression, and physical indicators reflecting memory problems and increased tolerance due to drinking. The ADI contains 24 self-report items assessing severity of drinking problems by measuring frequency of alcohol consumption across these four domains, problems associated with alcohol consumption, and the extent and intensity of problems in these domains. The ADI also includes two research subscales assessing for self-medicated drinking (MED) and aggressive and rebellious behaviors related to drinking (REB). These subscales were created to identify specific adolescent drinking patterns that can be addressed during intervention.

Harrell and Wirtz (1989) examined the ADI's reliability and validity across three independent samples of adolescents between the ages of 12–17 years. The first sample included 261 adolescents referred for evaluation of psychological, emotional, or behavioral problems. This sample yielded reliability coefficients of .87 for the MED subscale, .88 for the REB subscale, and .95 for the total ADI scale. The second sample included 583 adolescents recruited from schools, and yielded reliability coefficients of .80, .80, and. 93, respectively. The third sample included 233 adolescents in treatment for substance abuse. This sample yielded reliability coefficients of .85 for the MED subscale, .88 for the REB subscale, and .94 for the total ADI scale. Further, the intercorrelations across these three samples ranged between .63 and .74 for the total ADI and MED subscale, .74 and .84 for the total ADI and REB subscale, and .53 and .63 for the MED and REB subscales. Further, Harrell and Wirtz (1989) assessed the utility of the ADI by comparing ADI results from a sample of 264 adolescents to ratings from clinicians with training in adolescent assessment across the four domains (e.g., loss of control, social and interpersonal, psychological, and physical indicators) of the ADI. Correlations on each of the four domains were between .75 and .79 ($p < .0001$), and all the domains showed significant positive correlations with the clinician severity rating, which ranged between .64 and .71 ($p < .0001$).

The ADI has been used in studies assessing alcohol severity across adolescent populations. However, most of these studies have used the ADI to categorize adolescents as having an alcohol-related problem by using its clinical cut-off score (>16) or using a cumulative sum score rather than the original four factor framework examining dysfunction across adolescent developmental domains. For instance, in a study examining alcohol problem severity between depressed African-American and non-Hispanic White adolescents, Maag and Irvin (2005) found that non-Hispanic Whites had overall significantly higher scores on the ADI than their African-American counterparts. They also found that older adolescents had a greater likelihood of having higher scores on the ADI (above the clinical cutoff, >16) than younger adolescents. Further, Striegel-Moore and Huydic (1993) used the ADI to divide a sample of female high school students into two groups, problem drinkers (scores > 16) and non-problem drinkers (scores < 16), in order to examine associations between alcohol abuse and eating disorders. Adolescent girls with eating disorders were twice more likely to be problem drinkers than those who were not diagnosed with an eating disorder.

With the exception of the early studies conducted Harrell and Wirtz (1989), the ADI's four-domain conceptual framework has not been examined further. Therefore, the primary objective of this study was to examine the ADI's original four-domain conceptual framework using confirmatory factor analysis (CFA) among a sample of adolescents. Further, in response to recent calls for the development and implementation of brief alcohol screening and assessment, our second objective was to seek evidence for an adapted version of the ADI that could be administered in settings with time constraints by conducting a series of confirmatory factor models. Our final objective was to compare the validity of the 24-item ADI with the adapted version of the ADI among a sample of adolescents with varying degrees of alcohol abuse risk.

2. Materials and methods

2.1. Participants

The sample consisted of 740 adolescents (433 males) between the ages of 13 and 17 years ($M = 15.26$, $SD = 1.3$) recruited between 1997 and 2008 to be part of one of three studies. Two of the studies recruited participants for clinical trials evaluating the efficacy of a brief individual motivational intervention for adolescents with an alcohol-related event that resulted in an ED visit (Spirito et al., 2004, 2011). All participants in these two studies reported consuming alcohol within 6 hours of their ED admission; had a positive blood alcohol test or breathalyzer reading; and/or scored four or above on the Alcohol Use Disorders Identification Test (AUDIT; Babor, Higgins-Biddle, Saunders, & Monteiro, 1992). Adolescents who were suicidal, were in police custody, or had serious injuries requiring hospitalization were not approached for participation in the study, and those with incomplete recruitment, i.e., those participants whose consenting and/or screening for eligibility were interrupted by medical care and who then later declined to continue the enrollment process, were also excluded from this study. Incomplete recruitment occurred in 31 cases in the first study and 32 cases in the second study for a total of 63 cases.

The third study recruited adolescents treated in the ED for an injury or illness to serve as a comparison group on baseline characteristics to the adolescents in the two clinical trials described above. Data were collected during the time period of the first clinical trial described above. A score of four or above on the AUDIT was used to classify this last group as alcohol positive, and a score of three or below was used to classify adolescents as alcohol negative (Fairlie, Sindelar, Eaton, & Spirito, 2006).

The majority of the sample identified as being White non-Hispanic (68.9%), 18.4% identified as being Hispanic, 7.0% identified as being Black/African American, and 5.7% identified as being part of another racial/ethnic group. Further, 476 adolescents were identified as being alcohol negative, while a total of 264 were identified as being alcohol positive.

2.2. Procedures

Adolescents recruited to be part of the two randomized clinical trials were referred to the studies by the ED or biochemistry lab staff, who were instructed to send an electronic page to research staff when an adolescent was identified in the ED either as having consumed any alcohol within 6 hours of their admission (in the case of ED staff) or as having tested positive (i.e., BAC > 0.0) for alcohol via medical staff-drawn blood test (in the case of the biochemistry lab). All alcohol-positive participants were required to pass a brief mental status exam before completing the assessments. The mental status exam assessed temporal orientation, spatial orientation, memory, attention, and immediate and delayed recall. Adolescents were not approached until their BAC was less than 0.1% (g/ml) and/or they could pass the mental status exam. If participants were unable to complete the baseline assessment at the time of their ED visit, a follow-up visit was scheduled within a few days.

The data reported here were collected as part of the baseline adolescent assessments, which occurred before adolescents were randomized to either a control or experimental condition in the clinical trials. Adolescents in the third study were approached during their ED visit and asked if they wanted to participate in a comparison group for a study examining the characteristics of alcohol-positive adolescents being treated in an ED.