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Mini Review on Systematic Evaluation of Psychometric Characteristics of the Michigan Alcoholism Screening Test 13-Item Short (SMAST) and 10-Item Brief (BMAST) Versions

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Abstract

This brief review summarized the psychometric properties of the Michigan Alcohol Screening Test short (S-MAST) and brief (bMAST) versions based on a recently-published psychometric synthesis. Reported samples were aggregated and synthesized across a total of 40 and 21 studies, respectively. Brief results for reliability, validity, and nonclinical descriptive statistics are reported, along with interpretations that may inform alcohol use disorder screening.

Keywords: S-MAST; bMAST; Alcoholism screening test; Alcohol use disorder

Introduction

Population-based studies suggested that approximately one in three people living in the United States meet the criteria for alcohol use disorder in their lifetime [1]. The DSM-5 [2] identified several environmental, genetic, and physiological risk factors for this disorder, including cultural attitudes toward drinking, a family history of alcoholism, pre-existing schizophrenia or bipolar disorder, and a low level of response to alcohol. Problematic drinking patterns, such as binge drinking, are also implicated in markedly increasing the risk of developing alcohol use disorder, with possible underlying neurobiological factors contributing to the way individuals drink [3] Given the highly prevalent and comorbid nature of alcohol use disorder, early identification and treatment is essential in minimizing the substantial harm this disorder can cause both at the individual and societal levels [1].

The accurate and timely identification of alcohol use disorder is frequently dependent on the quality of the instrument used to measure pertinent symptoms [4]. The Michigan Alcoholism Screening Test (MAST) [5] is a face-valid self-report instrument that has long been regarded as an accurate and practical measurement choice in a variety of clinical settings, making it one of the most commonly-used direct screening measures for detecting problematic alcohol use [4,6]. Supported by numerous empirical studies reporting robust estimates of internal structural and external score validity, including an extensive psychometric synthesis of 103 studies using this instrument [4]. The MAST can be an excellent instrument for gathering data regarding symptoms and negative consequences of alcohol use with a range of client populations.

While not as frequently used, the MAST is also available in brief alternative versions- the 13-item Short MAST (SMAST or SMAST-13) and the 10-item Brief MAST (bMAST or BMAST-10). While shortened versions may present a valid practical choice in alcohol use screening, especially when logistical limitations require the use of brief and concise measures for identification of problematic drinking, these versions are not as frequently examined in the extant literature, rendering their psychometric evaluation of high clinical importance. In this review, we present recent findings from an extensive psychometric synthesis published in the *Journal of Counseling and Development* using the SMAST and bMAST.

Although an extensive overview of these shortened versions is beyond the purpose of this review, we provide a brief orientation here to both the SMAST and bMAST. The abbreviated Short MAST retains items 1, 3, 5, 6, 8, 9, 11, 14, 16, 20, 21, 24, and 25 of the original MAST [7]. Scoring for SMAST does not use the weighted scoring method of the MAST, but instead apportions one point for each item response (i.e., the unit scoring method), with scores ranging from 0-13. A score of 2 is indicative of alcoholism. Alternatively, the even shorter version known as the Brief MAST retains only 10 highly discriminating items, including items 1, 6, 9, 13, 14, 16, 19, 20, 21, and 25 of the original MAST [8]. Unlike the SMAST, the bMAST uses a weighted scoring method (i.e., some items are apportioned more than one point) to give greater emphasis to items considered most discriminating in identifying alcohol dependence. For the bMAST, a cut off score of six is indicative of alcoholism.

Findings

Summary and interpretation of results using the SMAST-13

Reliability of scores on the SMAST-13

Minnich et al. [9] used a combined sample size of 7,622 participants from 13 SMAST-13 studies reporting internal consistency data. The mean internal consistency coefficient was .77, a much lower coefficient than the originally reported 0.93 [7]. The average internal consistency of the SMAST-13 was also lower for clinical populations (0.67, *N=539*) compared to nonclinical populations (0.75, *N=5,923*). It should be noted that these estimates fall below the suggested criterion for screening-level (0.80) and diagnostic-level (0.90) purposes. Out of three test-retest reliability (*rtt*) studies located, two reported data for a two-week timeframe (combined sample size of 355) yielding *rtt*=0.74. In light of these findings, Minnich et al. [9] concluded that the full-length MAST demonstrates better score reliability, with an average KR-20 of 0.84 [4].

Validity of scores on the SMAST-13

Twenty convergent validity studies reported coefficients ranging from 0.01-0.95, with the majority of scores on convergent instruments yielding moderate to large effect sizes. Although no CFA studies were located, Minnich et al. [9] identified two EFA studies of structural validity, with both supporting a 3-factor solution for the SMAST-13. Given the lack of CFA and that decisions using the SMAST-13 are made based solely on the total raw score, the existing structural validity evidence presented was deemed less meaningful than diagnostic validity in reaching validity conclusions.

Minnich et al. [9] identified 19 studies reporting diagnostic validity for the SMAST-13. At the suggested cut off score of 3, the average sensitivity was 0.68, and specificity was .74 (*N=2349*). Unfortunately, there were not enough studies reporting PPV and NPV for a reliable analysis. A cut score of four (4) appeared slightly more parsimonious at a sensitivity of 0.70 and specificity of 0.71, but only involved three studies (combined *N=1,237*). It should be noted that overall decision efficiency for the SMAST-13 is about 10% lower than one can expect using the 25-item MAST total raw score [4].

Descriptive characteristics of scores on the SMAST-13

A total of 11 SMAST-13 studies reported nonclinical participant descriptive data (combined *N=3,792, M=1.48, SD=1.80*). Although only two studies reported descriptive statistics for male participants (*N=302*), Minnich et al. [9] noted men had a slightly higher combined mean and standard deviation of 1.78(1.69) compared to women participants [*N=388*, 1.36(1.21)]. Minnich et al. applied a z-score analysis to these means, with the recommended cut off score of three (3) on the SMAST-13 yielding a z-score of 0.72 for men, which would identify about 23% of men, and a z-score of 1.36 for women, which would identify about 8% of women as problem drinkers. This result is much larger than the 8.5% reported overall prevalence in the DSM-5 [2]. Although these results may be skewed due to prevalence of conducting substance use studies with university student populations, which may experience higher drinking rates, Minnich et al. noted that the SMAST likely identifies twice the societal base rate of men with alcohol problems. This, along with other results pertaining to reliability and validity, led the authors to conclude that the full-length MAST appears to be a superior instrument to the SMAST.

Summary and Interpretation of Results Using the b-MAST-10

Reliability of scores on the b-MAST-10

Minnich et al. [9] used a combined sample size of 1,856 participants from five b-MAST-10 studies reporting internal consistency data. The mean internal consistency coefficient was 0.73, a much lower coefficient than the combined results of the MAST studies (0.84) [4] and the SMAST-13 studies (0.77; above). Unlike the SMAST-13, the average internal consistency of the bMAST was higher for clinical populations (0.82, combined *N=252*) compared to nonclinical populations (0.71, combined *N=1,526*). It should be noted that as with the SMAST, these estimates fall below the suggested criterion for screening-level (0.80) and diagnostic-level (0.90) purposes.

A single test-retest reliability (*rtt*) study was located, reporting data for a five-day timeframe (combined sample size of 371) yielding *rtt*=0.71. Although, as with the SMAST, the full-length MAST appears superior regarding test-retest reliability, Minnich et al. [9] called for additional studies that examine the temporal stability of the b-MAST-10 for more conclusive interpretations of its score reliability.

Validity of scores on the b-MAST-10

Five convergent validity studies reported coefficients ranging from 0.21 to 0.74, with the majority of scores on convergent instruments yielding moderate to large effect sizes. Minnich et al. [9] identified two studies of structural validity, one reporting EFA evidence, and the other one reporting both EFA and CFA. Both EFA studies supported a two-factor solution that accounted for 56% of item variance, consisting of the dimensions pertaining to perception of current drinking and drinking consequences [10]. This model was further supported by CFA evidence, with data fitting the 2-factor model well, equivalent to the fit of the original unidimensional model. As with the SMAST, interpretation of the b-MAST-10 rests solely on the total score, so the existing structural validity evidence presented was deemed less meaningful than diagnostic validity in reaching validity conclusions.

Minnich et al. [9] identified 13 studies reporting diagnostic validity for the b-MAST-10. At the suggested cut off score of 6, the average sensitivity was 0.48, specificity 0.90, PPV0 0.54, NPV0.90, and percent of correct classification 0.80 (*N=1,073*). Minnich et al. [9] recommended a cut off score of 6 as the optimal cut off score, despite less than adequate sensitivity and PPV values, and concluded that an 80% correct classification rate for the bMAST is comparable to the full-length MAST results [4].

Descriptive characteristics of scores on the b-MAST-10

A total of five b-MAST studies reported nonclinical participant descriptive data (combined *N=2,612, M=1.70, SD=3.31*). Unfortunately, no studies reported descriptive statistics based on gender. Based on this data, Minnich et al. [9] concluded that a cut off score of 6 yields a z-score of 1.3, which is likely to identify approximately 10% of the overall U.S. population. Unlike the S-MAST, this result is more congruent with the 8.5% reported overall prevalence in the DSM-5[2].

Limitations and implications for alcohol use disorder screening

While this review is intended to give a brief overview of some of the psychometric results published by Minnich et al. [9], for an extensive methodological context and results, we recommend accessing the original article. However, the authors would also like to note some limitations on some of the reported results, the main one being the lack of extensive studies of the SMAST or bMAST for which psychometric data was available. While the reported combined sample sizes were adequate for reaching internal consistency, nonclinical descriptive, and diagnostic validity analyses and interpretations, most of the convergent instrument comparisons involved few studies and smaller combined samples. In comparison, a similar study conducted by Minnich et al. [4] with the MAST generated 103 accepted studies, lending greater confidence to results.

Conclusion

Minnich et al. [9] noted the additional advantage of the SMAST over the bMAST due to its use of the unit scoring method. The unit scoring method is considerably simpler (each item is scored 0 or 1) and likely yields more precise and relevant interpretations for screening and treatment. Based on the Minnich et al. [4] review of the MAST, and the Minnich et al. [9] published psychometric synthesis of the shorter versions of the MAST, it appears that the MAST is a screening inventory that yields more reliable and valid scores, and when practical limitations of time and brevity are not present, relying on the original versions would be optimal. Nevertheless, when practical reasons indicate the use of the SMAST or bMAST, substance abuse clinicians should be cautious when using these shortened versions given their less than optimal reliability scores. Although results and interpretations for both the SMAST and bMAST are included in this review to generally inform substance use specialists using the MAST and its briefer versions regarding their psychometric properties and utility, a more conclusive and detailed comparison necessitates accessing some of the original content reviewed here. Therefore, for a more detailed overview of the MAST, as well as SMAST and bMAST, we recommend that readers refer to the original published studies.

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