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BRIEF REPORT

Psychometric properties of the short version of the children of alcoholics screening test (CAST-6) among Swedish adolescents

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ABSTRACT

Aims: The Children of Alcoholics Screening Test (CAST-6) is a brief screening instrument developed to identify children with parents having problematic alcohol use. The aim of this study was to evaluate the psychometric properties of the CAST-6 among adolescents aged 15–18 years, and also to identify an optimal cut-off score for this age group.

Methods: A total of 3000 15 to 18-year-olds were randomly selected from a register of postal addresses in Sweden. An invitation letter, including access information to the electronic questionnaire, was sent out by regular mail and 1450 adolescents responded with baseline data. Test-retest reliability within a 2–3-week period was calculated based on the 111 respondents who answered the same questionnaire twice. To determine an optimal cut-off score, a small treatment-seeking sample (n = 22) was recruited from a support group agency to be used as a reference group.

Results: The six items of the CAST-6 screening test loaded onto one latent factor with good internal consistency (alpha = 0.88), and excellent test-retest reliability (ICC = 0.93, 95% CI 0.90–0.95). The optimal cut-off score among adolescents was 2 points with a sensitivity of 55% and specificity of 79% (AUROC = 0.71, 95% CI 0.58–0.83).

Conclusions: The CAST-6 has good to excellent psychometric properties among adolescents. The identified optimal cut-off score of 2 points should be treated with caution due to study limitations. The CAST-6 can be used in various settings to identify a vulnerable at-risk group of children and adolescents that may be in need of support.

Introduction

Estimates on the prevalence of children with parents having problematic alcohol use reveal that this is a widespread problem. For instance, recent estimates from the US show a figure of 23 percent [1], while figures from Denmark and Sweden reveal estimates ranging from 3.9 to 20.1 percent [2–5]. The reason for this variation mainly depends on how alcohol problems among parents have been defined. For instance, studies reporting lower prevalence typically define alcohol problems more on the basis of dependency criteria as opposed to risky use.

Children growing up with parental alcohol problems have an elevated risk for several adverse health outcomes, including early alcohol use [6–11]. It is therefore important to have validated and reliable screening instruments available, in order to identify children at risk so that they can be offered timely support. For this purpose, single questions [12] and more extended questionnaires such as the 13-item short version of the modified Michigan Alcoholism Screening Test (M-F-SMAST) [13] have been utilized. Another available screening questionnaire is the six-item Children of Alcoholics Screening Test (CAST-6, Table 1) [14]. The CAST-6 was developed from the original 30-item CAST instrument using three distinct adult samples: substance use disorder outpatients, psychiatric outpatients and medical students [15]. The CAST-6 has shown high internal consistency (Cronbach’s alpha = 0.86–0.92), and concurrent validity (r = 0.93) when compared to the original CAST among adults [12,14], and good test-retest reliability (r = 0.78), albeit within a large time frame of one year, when rated by 6th and 7th graders (i.e. 11 to 13 year-olds) [16]. Two alternative cut-off scores have been proposed, one a more inclusive cut-off at 2 points and another more conservative one at 3 points [14,16,17].

The CAST-6 has the potential to play an important role for identifying children in need of support. To our knowledge, the psychometric properties of the CAST-6 among adolescents have not been explored to a greater extent. Research is particularly scarce among children in late adolescence (i.e. 15 to 19 year-olds) when cognitive development...
related to decision making, memory, and emotional reactions is at a peak [18]. The overall aim of the current study was to explore the psychometric properties of the CAST-6 among children in their late adolescence aged 15–18 years. More specifically, this study examined the factor structure, internal consistency, test-retest reliability of the CAST-6 up to three weeks, and also identified an optimal cut-off score for adolescents.

Methods

Participants and procedure

A total of 3000 adolescents aged 15–18 years were randomly selected from a register of all persons having a postal address in Sweden. Data was collected in October through December 2015 by a marketing company who invited individuals via regular post. The invitation letter included access information to the electronic questionnaire along with an individual password. Two reminders were sent, with a two-week interval, to those who did not respond, yielding a total of 1450 respondents. Test-retest reliability was calculated based on those 111 respondents who consented and answered the same questionnaire a second time, two to three weeks after their first response. To calculate optimal cut-off scores, a research assistant recruited a small treatment-seeking sample from a support group agency in Stockholm, Sweden, that targets children who have parents with substance use problems. We intended to have 50 individuals in this sample but succeeded in recruiting only 22. Typically, children are referred to this agency by parental request or via referral by social services. The electronic questionnaire contained background questions such as the respondent’s age, sex, and country of birth, along with the CAST-6 (Table 1) and some additional screening instruments for own substance use, of which the results have been presented elsewhere [19]. Each item in the CAST-6 could be answered by a ‘Yes’ (1 point) or a ‘No’ (0 point). The total score of the CAST-6 was achieved by adding the points from each item together. The Regional Ethical Review Board in Stockholm approved this study (2015/391-31/4).

Statistics

Construct validity was examined using exploratory principal axis factor analysis (EFA). Internal reliability was calculated using Cronbach’s alpha and test-retest reliability by intraclass correlation coefficients (ICC), using the recommended value of below 0.50 as poor, 0.50–0.74 as moderate, 0.75–0.90 as good, and above 0.90 as excellent [20]. Concurrent validity and the optimal cut-off score were calculated using receiver operator characteristics (ROC). Youden’s index was used to indicate the optimum cut-off score [21]. All analyses were conducted using SPSS (version 25).

Results

The mean age among the general population and support group samples was 16.7 (SD = 1.2) and 16.2 (SD = 1.2) years, respectively. Using the more conservative cut-off score of 3 points, approximately 17 percent of the girls and 12 percent of the boys in the general population sample had CAST-6 scores indicating that at least one parent had alcohol problems (Table 2; using more inclusive cut-off score, these figures were 25% and 17%). The CAST-6 scores between sexes were significantly different (U = 223824, p < .001). Eight individuals in the support group sample had a CAST-6 score of zero. The mean CAST-6 score among the general population sample was 0.9, while the same value was 2.9 in the support group sample.

Construct validity

All six CAST-6 items loaded into one factor (Table 3) with an eigenvalue of 3.8, explaining 63.6% of the co-variance between items. The six items loaded into one factor for both boys and girls, with similar factor loadings (data not shown). Items 3 and 4, that relate to a particular situation when a parent was drinking or was drunk, had the lowest factor loadings.

Table 1. The six CAST-6 items.

1. Have you ever thought that one of your parents had a drinking problem? Yes/No
2. Did you ever encourage one of your parents to quit drinking? Yes/No
3. Did you ever argue or fight with a parent when he or she was drinking? Yes/No
4. Have you ever heard your parents fight when one of them was drunk? Yes/No
5. Did you ever feel like hiding or emptying a parent’s bottle of liquor? Yes/No
6. Did you ever wish that a parent would stop drinking? Yes/No

Table 2. Descriptive statistics for CAST-6 in the general population and support group samples.

<table>
<thead>
<tr>
<th>CAST-6</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>Median</th>
<th>IQR</th>
<th>Proportion having parents with alcohol problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>General population sample</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>773</td>
<td>1.1</td>
<td>1.8</td>
<td>0</td>
<td>1</td>
<td>17.3 (14.8–20.1)*</td>
</tr>
<tr>
<td>Boys</td>
<td>647</td>
<td>0.7</td>
<td>1.6</td>
<td>0</td>
<td>1</td>
<td>24.5 (21.5–27.6)*</td>
</tr>
<tr>
<td>Support group sample</td>
<td>22</td>
<td>2.9</td>
<td>2.7</td>
<td>2.0</td>
<td>6</td>
<td>54.5 (32.2–75.6)*</td>
</tr>
</tbody>
</table>

Mean, standard deviation (SD), median, inter quartile range (IQR) and the prevalence (95% Confidence Interval) of the perception of ever having a parent with a drinking problem.

*Calculated based on the more conservative CAST-6 cut-off score of 3 points.

bCalculated based on the more inclusive CAST-6 cut-off score of 2 points.

*Data on gender missing for n = 30 respondents.
Internal consistency and test-retest reliability

The Cronbach’s alpha value of the CAST-6 was 0.88 (same for both sexes) indicating a good internal consistency. The ICC used as a measure of test-retest reliability revealed an excellent level (0.93, 95% CI 0.90–0.95) overall and for both boys (0.96, 95% CI 0.93–0.98, n = 48) and girls (0.92, 95% CI 0.86–0.95, n = 61).

Concurrent validity and optimal screening threshold

To evaluate the optimal screening threshold for the CAST-6, a ROC analysis was conducted (Table 4, Figure 1A). Results showed that the ability of the CAST-6 to discriminate between those with and without a parent having problematic alcohol use was fair (AUROC = 0.71, 95% CI 0.58–0.83). With the aim of achieving a balance between sensitivity and specificity, the optimal cut-off score was 2 points with a sensitivity of 55% and a specificity of 79%. The same analysis was conducted excluding the eight individuals who scored zero on the CAST-6, resulting in the same optimal cut-off score of two, but with a sensitivity of 86% and a specificity of 79% (AUROC = 0.91, 95% CI 0.86–0.96).

Discussion

The aim of the study was to evaluate the factor structure, internal consistency, test-retest reliability of the CAST-6, and to also identify an optimal cut-off score for the instrument among adolescents. Results demonstrate good psychometric properties for the instrument. The CAST-6 loaded on one latent factor and had good internal consistency and excellent test-retest reliability, corroborating earlier findings among both adults [12,14] and adolescents [16]. These results demonstrate that the CAST-6 performs well among the adolescent population.

We found the more inclusive cut-off score of 2 points to be optimal among 15–18-year-olds, as opposed to the originally recommended conservative score of 3 points for adults [14,17]. This result was also confirmed in an analysis where the eight individuals in the reference group who scored zero on the CAST-6 were excluded, thus showing additional evidence for the stability of our suggested cut-off score. The conservative cut-off score of 3 points has been recommended among the younger population of 6th and 7th graders [16]. However, the inclusive cut-off score of 2 points has been identified as optimal within an adult psychiatric patient group [17], and has also been found to perform better than the conservative cut-off score in a group of adults in substance abuse treatment [12]. Despite lacking consensus at this point between the different studies and between different populations, an inclusive cut-off score of 2 shows utility in the adolescent population.

We also found that more girls compared to boys had scores indicating that a parent had alcohol problems. This has been observed in previous studies [16] and suggests that it may be relevant to propose differing sex-specific cut-off scores. However, our reference group sample included only four boys and we could therefore not determine sex-specific cut-off scores. Future studies should investigate if there are differences between genders with regard to optimal cut-off scores.

A major limitation with this study is the small reference group from the support group facility offering an extensive program for adolescents having parents with substance use problems. The sample comprised only 22 individuals of which eight had a CAST-6 score of zero. Given the setting, it is unlikely that these adolescents did not have a parent with substance use problems. Possible explanations for the zero score might be that the adolescent no longer lives with the problem parent, or has never lived with them; this may have

Table 4. Sensitivity, specificity and Youden’s index for CAST-6 among adolescents (n = 1450) using an adolescent support group sample as criterion (n = 22).

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Youden’s index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.64</td>
<td>0.69</td>
</tr>
<tr>
<td>2</td>
<td>0.55</td>
<td>0.79</td>
</tr>
<tr>
<td>3</td>
<td>0.46</td>
<td>0.85</td>
</tr>
<tr>
<td>4</td>
<td>0.46</td>
<td>0.88</td>
</tr>
<tr>
<td>5</td>
<td>0.46</td>
<td>0.92</td>
</tr>
<tr>
<td>6</td>
<td>0.32</td>
<td>0.95</td>
</tr>
</tbody>
</table>

Figure 1. Receiver operator characteristic (ROC) curve of CAST-6 to determine discriminatory ability among adolescents in the general population (n = 1450). The discriminatory ability was determined using an adolescent support group sample as the reference criterion (n = 22).
created a distance to the parent and the problem, such that it was difficult to even relate to the CAST-6 items. Another possible explanation might be that since the CAST-6 items explicitly ask about alcohol and related problems, it could be that the parent has substance use problems other than alcohol, that were not referred to in the CAST-6 items. However, this is merely a speculation since we have no information about this. The parent might also have a poly-drug use problem where alcohol is a less pronounced problem compared to the other substances. A final limitation of this study is the rather modest response rate, which implies a possible selection bias in the general population sample.

Conclusion

Our study demonstrates good to excellent psychometric properties of the CAST-6 and identifies an optimal cut-off score of 2 points among adolescents. The suggested cut-off score should be treated with caution due to study limitations. The CAST-6 can potentially play an important role in various settings, such as the school, social services, the child and adolescent psychiatric care and clinics for substance use-related problems, to identify this vulnerable at-risk group of children that may be in need of support.

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Author contributions

THE, CJ, AHB, and HK planned the study, applied for funding and contributed to the collection of data. All authors contributed to the planning of statistical analyses. HK and THE conducted the statistical analyses. All authors contributed to the interpretation of results. THE wrote the first draft of the manuscript. All authors contributed significantly to drafting the manuscript and responses to reviewers.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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References