Diagnosis of depressed young people in primary health care—a validation of HSCL-10

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Background. According to the World Health Organization, depression ranks as a major contributor to the global burden of disease. A large proportion of adult depressions had their first appearance in adolescence.

Aim. Because primary health care professionals lack valid instruments for early identification of depression, we sought to validate HSCL-10. The design of study is a GP multicentre study conducted in Norway and Denmark. The setting of the study is adolescents (14–16 years) responded by answering a questionnaire and later completed a Composite International Diagnostic Interview, which was used as the gold standard. Depression was defined by International Classification of Diseases-10 (ICD-10). Both internal and external validity were examined, the likelihood between pretest and posttest measured and a cut-off point for depression calculated by using the Youden index.

Results. The Hopkins Symptom Checklist-10 test (HSCL-10) met the criteria for external and internal validity. When analysed separately, the criteria were met both in Denmark and in Norway and both for paper and web. The optimal cut-off point for the HSCL-10 test was 16 (HSCL-10 = 16/10 items = 1.6), with no gender differences. For girls and boys, respectively, it yielded a sensitivity of 87.5% and 87.5%, specificity of 72.4% and 87.9% and likelihood of 3.2 and 7.2.

Conclusion. HSCL-10 is a suitable and valid instrument for detecting depression in young people in primary care.

Keywords. Adolescents, depression, diagnosis, HSCL-10, validation, young people.

Introduction

Primary health care professionals face a shortage of suitable instruments for the valid identification of depression in young people. According to the World Health Organization, depression ranks as a major contributor to the global burden of disease, measured in disability-adjusted life years. This lack of detection is of particular significance for young people because early recognition is pivotal in avoiding negative short- and long-term effects on social, mental and academic functioning and is strategic in the prevention of acute and chronic morbidity and mortality. Mauerhofer et al. report that only 13% of 16- to 20-year-olds needing help for psychological problems consulted a health professional; among this 13%, 45% visited a GP, 41% a psychologist or psychiatrist and 14% another health professional. Yet 78% of the age group had seen their GP at least once during the previous year for reasons other than depression, suggesting deficient diagnostic routines in primary care services. Between one in five and one in three, depressed youth is identified and receive any type of treatment before adulthood. Only a few were correctly diagnosed (sensitivity 20% and specificity 96%), probably because young people and their parents rarely recognize the symptoms of underlying psychological difficulties. But it is not only adolescents and their parents who tend to be misinformed about depression in this age group. Two approaches towards young people generally held by health care professionals need to be modified: approach based on the assumption that a depressed mood is normal in teenagers and the approach based on the assumption that it is problematic to treat depression in this age group. Furthermore, professionals must be responsive to the fact that anxiety and depression lead to functional somatic symptoms. A lack of appropriate instruments in first-line services seems to be impediment to early therapeutic
intervention. The phenomenology seems to differ in the populations encountering primary health professionals compared to second-line services. It is crucial, therefore, to draw attention to tools and strategies developed and validated in primary care because almost all depressed youth in the Scandinavian countries will have a primary health care professional as their first contact with the health system.

The situation is clearly improvable, however. Several studies have shown that training enhances detection, treatment and follow-up among GPs and that change for the better is even superior with the use of adolescent symptom recognition scales.

Hopkins Symptom Checklist-10 (HSCL-10) is a prime candidate as a valid clinical instrument for identifying depression in the primary health care. As anxiety is closely linked to depression among young people and as HSCL-10 encompasses anxiety detection, HSCL-10 also add beneficial information to the clinical work. Furthermore, HSCL-10 is a scored instrument used in several epidemiological studies among adolescents, providing a potential link between research and clinical practice.

The aim of this paper was the validation of HSCL-10 for identifying depression on the basis of a primary care multicentre study among young people 14–16 years of age in the areas of Aarhus, Denmark and Oslo, Norway.

Methods

The project is a collaboration between the Research Unit for General Practice, University of Aarhus and the Institute of General Practice and Community Medicine, University of Oslo. The HSCL-10 (Box 1) is a short version of Symptom Checklist-90. The Composite International Diagnostic Interview (CIDI) is used as the gold standard interview.

The project is a multicentre study conducted in both Norway and Denmark. Inclusion criteria were age (14–16 years) and fluency in either the Norwegian or the Danish language. A number of GPs were recruited from both countries and adolescents were enrolled in the study from the patient lists of GPs in each country, providing a total of 294 adolescent participants.

The study was approved in Denmark by the Danish Data Protection Agency and The Ethical Committee and in Norway by the Norwegian Social Science Services and the National Committees for Research Ethics in Norway. The Danish ethics committee stated that no approval was needed, whereas the Norwegian ethics committee required only consent from the participants and parents of the children <16 years of age.

Every participating GP in Norway and Denmark was asked to complete a sheet including the name and birth number for each participant; a participant code number was added for identification and to serve as a login code for the web questionnaire. The patient’s GP received the complete list, but the research group was not given the participants’ names or birth numbers. When serious mental illness was diagnosed, the GP with the young person on the list was informed and went to the necessary measures according to the protocol.

A standard letter of invitation to participate was sent to adolescents aged 14–16 years; it contained standardized information, a questionnaire and a pre-stamped envelope. In Norway, a similar letter was also sent to parents of the 14- and 15-year-olds in the same envelope, as required by the ethical committees in that country.

The invitation letter contained information about the goal of the study and its procedure. In Denmark, the adolescents’ participation was interpreted as agreement to participate in the study. In Norway, the 14- and 15-year-olds and their parents were required to sign a form to be returned to their GP, indicating their agreement to participate.

The adolescent could respond by using the forms sent by post or by using the website: www.ungdep.au.dk. Responses were recognized by the login code and participation number.

The adolescents in this study provided their questionnaire and the telephone number by which they wished to be contacted (but not their names) and a member of the study group called the adolescent. The date that the returned questionnaire and agreement form were received and the date of the telephone interview were noted.

The CIDI, a well-known clinical instrument for measuring depression based upon Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) and International Classification of Diseases-10 (ICD-10), was used as the gold standard interview. (The interviewers were certified as CIDI interviewers before the study was conducted.

The data collected from the website were recorded directly in a data bank. All the data collected in CIDI interviews and the paper versions of the questionnaire were fed into the same data bank. The data files were analysed by STATA version 11.

External and internal validity were examined—internal validity with the use of Cronbach’s alpha, Mokken Scale Analysis and Feldt’s W for comparison of Cronbach’s alphas and external validity through the receiver operating characteristic (ROC) curve, with specifying measurements for sensitivity and specificity.

Using the Youden Index ($J = \max_c [\text{Sensitivity}(c) + \text{Specificity}(c) - 1]$, we calculated the optimal cut-off point for depression among girls and boys and measured the likelihood between pretest and posttest scores. When calculating the cut-off point, we used the ICD-10 diagnoses for mild depressive episode (F32.0), moderate depressive episode (F32.1), severe
depressive episode without psychotic symptoms (F32.2), recurrent depressive disorder, current episode moderate (F33.1), recurrent depressive disorder, current episode severe without psychotic symptoms (F33.2) and Dysthymia (F34.1).

The approximate number of adolescents needed for the study was calculated using the $2 \times 2$ table, 0.05 probability ratio and $p = \text{approximated sensitivity}$ with the formula $n = p (1-p)/(0.05/1.96)^2$. With $p = 70\%$, the $n$ value is 323.

**Results**

Invitations to participate were sent to 2374 adolescents (1164 boys and 1207 girls). Three hundred and eighty (169 or 15\% of boys and 211 or 18\% of girls) returned the questionnaires, of these 12\% in Norway and 21\% in Denmark. Two hundred and ninety-four (77\% of those who returned the questionnaire)—127 or 11\% of boys and 167 or 14\% of girls—completed the CIDI interview (Table 1). The average time between the adolescent returning the questionnaire and the CIDI interview being conducted was 23.5 days. Among the CIDI-interviewed youth, 9\% met the ICD-10 criteria of major depression—8 boys (5\%) and 22 girls (13\%). All the youth who completed CIDI had also answered the HSCL-10 questions.

**Internal validity and reliability**

The internal validation of HSCL-10 was calculated with both Loevinger’s $H$ and Cronbach’s alpha (Table 2). Loevinger’s $H > 0.50$ is interpreted as a strong scale (Mokken p. 185); we found 0.49 for HSCL-10 (Table 2). Loevinger’s $H$ computes the observed and expected error for each pair of items between (i) a given item and all other items of a scale or (ii) among all possible pairs of items in a scale. Cronbach’s alpha provides an expression of increased consistency; it increases as the correlation between items increases. A psychometric instrument is generally considered reliable if Cronbach’s alpha is $>0.70$, and HSCL-10 in our study complies with this criterion in each of the countries and in the total population (Table 2). Comparison of Cronbach’s alpha values in the Feldt’s $W$-test showed no significant different between Norway and Denmark ($P = 0.94$) or between the young people responding on paper or web ($P = 0.99$).

**External validity**

The diagnostic accuracy of the HSCL-10 test resulted in an area of the ROC curve like 0.88 for the total population.

**Table 1** Participants in the study: GPs, number of invited 14- to 16-year-old youths ($N$), number of Questionnaires returned (%) and CIDI interviews (%)

<table>
<thead>
<tr>
<th></th>
<th>GPs</th>
<th>$N$</th>
<th>Questionnaires returned (%)</th>
<th>CIDI interviews (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>18</td>
<td>1081</td>
<td>224 (21)</td>
<td>145 (63)</td>
</tr>
<tr>
<td>Norway</td>
<td>25</td>
<td>1293</td>
<td>149 (12)</td>
<td>149 (100)</td>
</tr>
<tr>
<td>Total</td>
<td>43</td>
<td>2374</td>
<td>373 (16)</td>
<td>294 (77)</td>
</tr>
</tbody>
</table>

**Table 2** Internal validation of HSCL-10 compared with the CIDI: Mokken scale analysis and Cronbach’s alpha

<table>
<thead>
<tr>
<th></th>
<th>Loevinger $H^a$</th>
<th>Cronbach’s alpha$^b$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>0.49</td>
<td>0.88</td>
</tr>
<tr>
<td>Norway</td>
<td>0.51</td>
<td>0.87</td>
</tr>
<tr>
<td>Total</td>
<td>0.49</td>
<td>0.89</td>
</tr>
<tr>
<td>Paper</td>
<td>0.46</td>
<td>0.87</td>
</tr>
<tr>
<td>Web</td>
<td>0.50</td>
<td>0.87</td>
</tr>
</tbody>
</table>

Good scale: $^a$Loevinger’s $H > 0.50$, ref Mokken RJ. A theory and procedure of scale analysis, 1971. $^b$Cronbach’s alpha $>0.70$, ref Bland JM, Altman DG. Statistics notes: Cronbach’s ifa. BMJ 1997; 572.
population (Figure 1) and corresponding high levels in the two countries (Table 3). The areas of the ROC curve also were high both for answers on paper and web (Table 3).

**Recommended cut-off point**

The optimal cut-off point using \( J \) for the HSCL-10 test was 16 (HSCL-10 = 16/10 items = 1.6) for both genders. With this cut-off point, the sensitivity for girls was 87.5%, specificity was 72.4% and likelihood 3.2 and for boys, they were 87.5%, 87.9% and 7.2, respectively.

**Discussion**

There is a lack of validated tools for the detection of depression among 14- to 16-year-olds, convenient for use in primary care. This study has confirmed that the HSCL-10 is a valid instrument for the identification of depression in this age group. The validity was equal in Denmark and Norway and there was no difference in validity between answers given on paper or on web. HSCL-10 has therefore been shown to be suitable for the detection of depression in 14- to 16-year-olds in primary health care and appropriate for use in epidemiological studies.

We have found a somewhat lower cut-off point for depression in 14- to 16-year-olds than the corresponding cut-off point that Strand et al.\(^{33}\) found for adolescents aged \( \geq 16 \) years. With HSCL-10, therefore, primary health care professionals have an opportunity to improve the detection of depressed youth. The use of questionnaires, however, should not replace a direct interview by a clinician.

This study has some limitations. There may have been a selection bias as only teens speaking Danish or Norwegian with fluency were included. The low participation rate raises questions about the representativeness of the population used in this validation and thus raises questions about the validity of HSCL-10 in a general population. And the high refusal to participate may have produced a skewed sample. The study population has the same prevalence of mild and moderately depressed boys and girls as found in the general youth population in this geographical area,\(^{34}\) however, suggesting greater generalizability than these shortcomings may suggest. Participation was higher in Denmark (21%) than in Norway (12%), presumably because parental consent was required from 14- and 15-year-olds in Norway; yet despite these different participation rates, results were similar. Moreover, the participants in our validation study were their own reference persons, and thus, each test was independent of the population. Another possible limitation of this study is a slightly lower number of participants than required in the protocol calculation.\(^{27}\) During the study, the sensitivity of the questionnaire proved to be higher than approximated (a finding supported by Rutman et al.\(^{26}\)), and the recruitment of participants through GPs could therefore stop at a lower number. A further objection could be that the study was not conducted with a clinical interview since the young people gave their answers from home without a face-to-face interaction. However, Hermens et al.\(^{35}\) found an acceptable agreement between the telephone and the face-to-face assessment using an observer-rated depression scale. CIDI is a fully structured interview that can be administered by trained lay interviewers.\(^{30}\) Thus, the argument could be mitigated by the fact that the CIDI interviewers were not only trained and certified for CIDI; they were two experienced GPs, and the participants were recruited from the patient populations of physicians from primary care.

In summary, we conclude that HSCL-10 is a suitable and valid instrument for detecting mild, moderate and major depression in adolescents in primary care and that HSCL-10 provides a valid instrument in epidemiological research within this age group. As HSCL-10 also encompasses questions about anxiety, these answers will add beneficial information to the clinician. Although young people have difficulty talking about mental health issues, GPs could improve the situation by systematically inquiring about this issue. There is clearly a need for more research to develop and validate instruments based on the phenomenology of depressed young people encountering primary health professionals.

**Declaration**

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Ethical approval: Ethical Committee in Denmark (2006-2.0/44); The National Committees for Research Ethics in Norway (S-06293a).

Conflict of interest: none.

**Table 3**

<table>
<thead>
<tr>
<th></th>
<th>ROC</th>
<th>Observed Area</th>
<th>Standard error</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>139</td>
<td>0.90</td>
<td>0.03</td>
<td>0.83–0.96</td>
</tr>
<tr>
<td>Norway</td>
<td>134</td>
<td>0.92</td>
<td>0.03</td>
<td>0.86–0.98</td>
</tr>
<tr>
<td>Total</td>
<td>273</td>
<td>0.89</td>
<td>0.03</td>
<td>0.84–0.94</td>
</tr>
<tr>
<td>Paper</td>
<td>245</td>
<td>0.90</td>
<td>0.02</td>
<td>0.85–0.95</td>
</tr>
<tr>
<td>Web</td>
<td>28</td>
<td>0.79</td>
<td>0.12</td>
<td>0.56–1.00</td>
</tr>
</tbody>
</table>
References


4 Satyanand T.


