Norms and screening utility of the Dutch version of the Children's Depression Inventory (CDI) in clinical and non-clinical youth

Abstract

This study aimed to (1) assess relationships between the Children's Depression Inventory (CDI) and DSM-oriented depression and anxiety scales of the Youth Self Report (YSR); (2) develop reliable norms for the CDI; and (3) determine CDI cutoff scores for selecting youngsters at risk for depression and anxiety. A total of 3073 non-clinical and 511 clinically referred children and adolescents from The Netherlands and Belgium were included. Results showed that CDI scores were significantly related to both DSM-oriented symptoms of depression and anxiety. CDI scores correlated highly with depression symptoms and moderately with anxiety symptoms. Norms for the CDI were determined by means of multiple regression analysis and depended on sex, age, and country. CDI cutoff scores for selecting individuals at risk for depression and anxiety as measured by the DSM-oriented depression and anxiety scales of the YSR were determined by means of multiple regression analysis and ROC analysis. A CDI score of 16 was found to have the most optimal balance between sensitivity and specificity for depression, whereas a score of 21 provided the best sensitivity and specificity for anxiety in a subsample of children. It can be concluded that the CDI is an effective instrument for screening depression, and to a lesser extent anxiety, in school settings or primary and secondary care centres, before applying further assessment of high risk individuals.

Keywords: CDI; Children's Depression Inventory; Cutoff; Norming

Depressive symptoms are commonly experienced among youth. The epidemiological data suggest that depression in youth is a serious health care problem, which underscores the importance of using reliable and well-validated screening instruments (e.g., Birmaher et al., 1996; Birmaher, Arbelaez, & Brent 2002; Lewinsohn, Rohde, & Seeley, 1998). The measurement of depressive symptoms in youth was advanced by the development of the Children's Depression Inventory (CDI: Kovacs, 1980/1981). The CDI was developed as a downward extension of the adult-oriented Beck Depression Inventory (BDI: Beck, Ward, Mendelson, Mock & Erbaugh, 1961). The CDI is a 27-item self-report inventory assessing depressed mood in children and adolescents. Respondents are asked to choose one of three descriptions that best fits how they have been feeling over the past two weeks (e.g., "I do most things wrong", "I do many things wrong", "I do everything wrong"). Responses are scored on a scale from 0 to 2, with total CDI scores ranging between 0 and 54. Although the CDI is designed to provide information about the presence and severity of depressive symptoms, it cannot by itself yield a psychiatric diagnosis. Self-report measures in the early assessment process have however also the advantage over clinical interviews that they facilitate disclosing personal material. The current study aimed to (1) assess the specificity of the relation between CDI scores and symptoms of depression and anxiety; (2) develop norms for the Dutch version of the CDI, and (3) identify cutoff scores on the CDI that put youngsters at risk for depression and anxiety.

Opmerking [c1]: Dit moet zijn: most things good

Opmerking [c2]: Na de vorige zin, klinkt dit niet vloeiend ik zou however of also schrappen, zelfs clinical interviews kan eruit

Associations between CDI scores and symptoms of depression and anxiety

A great deal of studies has aimed to assess psychometric properties of the CDI including reliability and validity (e.g., Craighead, Smucker, Craighead, & Ilardi, 1998; Fundudis et al., 1991; Kovacs, 1992). This research has shown that the CDI has good internal consistency and moderate test-retest reliability, and correlates positively with levels of depression (Kazdin, 1990). However, there is also some evidence that the CDI does not

adequately discriminate between depressive diagnoses and other diagnostic categories (Kazdin, 1988). More specifically, the CDI typically demonstrates a significant relationship with anxiety symptoms (Finch et al., 1989; Hodges & Craighead, 1990), suggesting that the CDI might be a measure of general distress (Saylor, Finch, Spirito, & Bennett, 1984). High correlations between anxiety and depression can also be taken as evidence for one underlying common factor 'negative affectivity', which suggests that anxiety and depressive states cannot be reliably differentiated and represent a single construct (e.g., Brady & Kendall, 1992; Wolfe et al., 1987). We will test these competing views by comparing the scores on the CDI with those of another well-established screening instrument in youth, the Youth Self Report (YSR: Verhulst, Van der Ende, & Koot, 1996; Verhulst, Van der Ende, & Koot, 1997). The YSR is a general measure of psychopathology of which the DSM-oriented depression and anxiety symptom scales can be used to test differential relationships between the CDI scores and symptoms of depression and anxiety. We hypothesized a stronger association between the CDI and the depression scale than with the anxiety scale.

Norms for the CDI

There have been some studies that have addressed test norms for the CDI. That is, normative data of 1266 children have been described in the CDI manual (Kovacs, 1992). Finch, Saylor, Conway, and Edwards (1985) reported normative data of 1463 public school children in Grades 2-8, and found significant but small gender differences with girls having somewhat lower CDI scores than boys. Twenge and Nolen-Hoeksema (2002) performed a meta-analysis on mean CDI scores of 310 samples of children aged between 8 and 16. Results indicated that girls' depression scores stayed steady form ages 8 to 11 and then increased between ages 12 and 16. Boys' CDI scores were stable from ages 8 to 16 except for a high CDI score at age 12. Girls' scores were slightly lower than boys' during childhood, but girls scored higher beginning at age 13. Since the means and standard deviations in the Twenge and

Nolen-Hoeksema (2002) study do not constitute CDI norms, there is a need for test norms as they can be used for diagnostic purposes, clinical decision making, or the evaluation of treatment effects. Multiple regression analysis is the preferred technique for norming questionnaire data. This approach allows to examine which predictors (e.g., sex, age) are important for calculating norm scores. Importantly, it is possible to test for interactions between predictors. In the case these interactions are significant, norms on the basis of subgroups should be created. In fact, this boils down to the traditional approach to norms scores by splitting a group into subgroups based on the background variable. The strength of a multiple regression approach is that one can examine whether it is necessary to provide norm data separately for various background variables. For example, Van Breukelen and Vlaeyen (2005) found that pain coping and cognitions were not predicted by gender, but by level of education instead, suggesting that norm data do not have to be given for males and females separately. Similarly, Van der Elst, Van Boxtel, Van Breukelen, and Jolles (2006) found that performance on the Concept Shifting Test was affected by age, gender, and level of education, but not by any of their interactions. Consequently, the most stable and simple norming was obtained by applying a regression model with age, gender and education as predictors of test score, and applying that model to the complete sample.

In the current study, we calculated norm scores of the CDI in non-clinical and clinically referred children and adolescents. Data were collected in Belgium and The Netherlands and some participants were involved in a study in which the CDI was completed through the internet rather than by paper and pencil. Consequently, gender, age, country, and completion form served as predictor variables in the current study. Interaction effects of these predictors were also examined to determine whether norming should take place in the total group of in subgroups. In particular, an interaction between age and sex might be expected, given the age and gender differences found within adolescent depression (Lewinsohn, Clarke,

Opmerking [c3]: Schrap OF-- >Or?

Opmerking [c4]: Beter consequent gender?

Seeley, & Rohde, 1994). Norming of the CDI was done on the total scale scores for two reasons. First, there is a great amount of variability in obtained factor solutions of the CDI as well as in the composition of the factors themselves. The proposed factor models range from one factor (e.g., Kovacs, 1983) to eight factors (e.g., Saylor et al., 1984), depending on the use of clinical versus non-clinical samples (e.g., Hodges, Siegel, Mullins, & Griffin, 1983; Kovacs, 1985) and on developmental differences between children and adolescents (e.g., Craighead et al., 1998; Weiss et al., 1991). Second, the CDI has originally been developed and used as a general screening instrument for depressive symptomatology for which norm data are particularly important.

CDI Cutoff scores

The third aim of the current study was to identify CDI scores at which youngsters might be 'at risk' for depression or anxiety. Previous research has relied on the use of receiver-operator curves (ROC curves). A ROC curve involves a plot of the sensitivity (Y-axis), which is the probability of the CDI to classify an individual as depressed if that individual is indeed depressed, against (1 – specificity) on the X-axis, where the specificity is the probability of the CDI classifying an individual as not depressed if that individual is actually not depressed. Each point of the ROC curve corresponds to a different cutoff for the CDI. A diagonal ROC curve (or rather line) means that sensitivity = 1-specificity for every possible cutoff and so test does not discriminate between depressed and non-depressed. The area under the ROC curve (AUC) is then equal to 0.50, the minimum possible AUC. A perfectly discriminating instrument has perfect sensitivity and specificity at some cutoff, and the area under the ROC curve (AUC) is then 1.0, the maximum possible AUC. For further details on ROC see e.g. Hanley & McNeil, 1982; Woodward, 2005). Thus, the larger the area under the ROC curve the better (Woodward, 2005).

Opmerking [c5]: Schrappen of this test…

Opmerking [c6]: Deze twee zinnen wisselen? Lijkt mij beter…

Research that relied on ROC curves has yielded cutoff scores of 13 (Kovacs, 1992) or 16 (Timbremont, Braet, and Dreessen, 2004) for clinical samples comprising clinically referred children, and 19 for non-clinical samples (Kovacs, 1992; Stark, Humphrey, Laurent, Livingston, & Christopher, 1993). ROC converts raw data into a sensitivity and specificity value per CDI cutoff and leads to a cutoff which balances between sensitivity and specificity, irrespective of the prevalence. ROC thereby gives a high sensitivity and specificity, but this may still lead to many false positives if the prevalence is small. Another approach to obtaining cutoff scores is the use of logistic regression analysis, which allows for adjusting for the effects of gender and age, and for taking the prevalence of depression (or anxiety) into account, which strongly affects the model intercept and thereby the estimated probability of depression (or anxiety) given age, gender, and CDI, which in turn determines the prediction (i.e., prediction is "yes" if probability is at least 50%). Logistic regression analysis also allows for examining the interaction between gender and CDI scores and between age and CDI scores which, if found, would indicate that ROC curves should ideally be created for gender or age groups separately. In the current study, both ROC and logistic regression analysis were used to investigate the sensitivity and specificity of the CDI as a first screening instrument for depression or anxiety, using the YSR with its established cutoffs as gold standard.

Opmerking [c7]: Dit deel schrappen, zal betrer leeesbaar zijn.

Opmerking [c8]: Obtain?

Opmerking [c9]: Golden?

Method

Participants and procedure

A total of 3073 non-clinical and 511 clinically referred Dutch speaking children and adolescents completed the CDI as part of (ongoing) research conducted between the years 2000 and 2008 in Belgium (Ghent University) and The Netherlands (Maastricht University). Comparison of the data obtained in 2000-2002 (N=673 non-referred youngsters) with data obtained in later studies, revealed no differences with respect to the demographic composition of both samples or with respect to total CDI depression scores.

Table 1 presents an overview of the composition of the current samples and subsamples to be used. The non-clinical sample comprised 1726 youngsters from Belgium and 1347 from the Netherlands. Individuals completed the CDI during regular class. A class teacher and a research assistant were available to assist the (especially younger) children and to ensure confidential responding. Note that at the age of seven years, children might experience difficulty using the Likert type scale to report the severity of the symptoms they were experiencing. Research assistants or school teachers were necessary to help them with reading the CDI items aloud. These children were helped outside the class room to ensure confidential responding. Individuals from the Netherlands (age above 10) were also able to fill in the CDI via the internet as this was an aspect of one of the larger studies from which the current sample was drawn. A total of 967 out of 1347 completed the measures through the internet. Those who completed the measures via the internet were sent a login code to their homes with which they could complete the measures. Mean age of the non-clinical sample was 12.7 (SD=2.4) and 53.5% were girls. A Dutch subsample of 340 non-referred adolescents, who were included in the non-clinical sample, completed both the CDI and the Youth Self-Report (YSR; Achenbach & Edelbrock, 1987; Achenbach & Rescorla, 2001). Mean age of the subsample was 12.6 years (SD=.60, range 11-15 years, see for additional information Table 1).

Opmerking [c10]: Involved (in the study)

The clinical sample comprised 511 youngsters who were all in treatment at primary and secondary care settings in Belgium for common childhood psychopathology. The inclusion criterion was a primary diagnosis as determined with the child edition of the Structured Clinical Interview for DSM-IV-Child Edition (KIDSCID: Hien et al., 1998). The KIDSCID is carried out as part of the routine intake procedure within the settings and offers probe questions, which are designed to help the clinician determine whether DSM-IV criteria are present or not (see Table 1 for descriptive information of the clinical sample). More specifically, primary diagnoses were distributed as follows: 39% received a disruptive

Opmerking [c11]: Voeg hir toe: (see Table 1 for descriptive information of the clinical sample).

Opmerking [c12]: Verplaatsen, nu krijg je de foute verwachting dat de diagnsoses in de table staan

behaviour disorder diagnosis (i.e., Attention Disorder Hyperactivity Disorder, Oppositional Deviant Disorder, or Conduct Disorder), 22% met the criteria for a mood disorder and 18% for an anxiety disorder. A total of 2% had an adjustment disorder and 19% had any other diagnosis according to the KIDSCID.

Opmerking [c13]: Like eating disorders?

Data of the non-clinical (*N*=3073) and clinical (*N*=511) samples were used for norming of the CDI (aim 2), whereas the subsample (*N*=340) was used for assessing validity relations of the CDI scores (aim 1) and assessing cutoff scores (aim 3). Informed consent was obtained from the parents or the legal guardians and the children gave their assent to participate. The study was approved by the local research ethics committees of both Ghent University and the Academic Hospital of Maastricht/Maastricht University.

Instruments

Children's Depression Inventory

The Dutch version of the Children's Depression Inventory (CDI) is a self-report instrument that assesses symptoms of depression in children and adolescents aged between 7 and 17 years. The CDI comprises 27 items and respondents are asked to choose one of three descriptions that best fits how they have been feeling over the past two weeks (e.g., "I do most things wrong", "I do many things wrong", "I do everything wrong"). Responses are scored on a scale from 0 to 2, with total CDI scores ranging between 0 and 54. The original English version of the CDI was translated in Dutch and subsequently back-translated into English by a native speaker. This version was sent to the original author and was approved. Reliability of the CDI in terms of internal consistency was good (α=.85) in the non-clinical sample and the clinical sample (α=.86). The one month test-retest reliability was assessed in a non-clinical subsample (*N*=643) and was .81 (see Timbremont & Braet, 2002).

Opmerking [c14]: Idem: Dit moet zijn: most things good

Youth Self Report

The Youth Self Report (YSR) assesses several emotional and behavioural problem areas as reported by the child. The Dutch version of the YSR is a reliable and valid instrument for the assessment of psychological symptoms in youth (Verhulst et al., 1996; Verhulst et al., 1997). The DSM-oriented depression scale is generally accepted as valid indicator of clinical diagnosis (see Achenbach & Edelbrock, 1987). In the current study the clinical cutoff score of the DSM-oriented depression and anxiety problems scales were used, categorizing individuals in the clinical range (i.e., *T* score > 69, which corresponds to percentile 98) or not (i.e., *T* score < 69). The internal consistency of the YSR in this study is .93 for the total scale and .76 for the DSM-oriented depression scale and .69 for the DSM-oriented anxiety problems scale, based on the Dutch non-clinical subsample (n = 340) in which the YSR was administered.

The Structured Clinical Interview for DSM-IV-Child Edition

The Structured Clinical Interview for DSM-IV-Child Edition (KIDSCID; Hien et al., 1998) was used in a structured interview in the clinical Belgian sample (n = 511). To assure interrater reliability of diagnoses, we conducted a pilot study on the KID-SCID in 36 youngsters, who were randomly selected for this purpose. Interviews were taped and, besides by the interviewer, scored by two independent raters (108 ratings). Cohen's κ ranged from .79 and 1, suggesting excellent agreement. The κ statistic, to determine the chance-corrected agreement between the first and second interviews, varied between .63 (oppositional-deviant disorder) and .84 (ADHD and conduct disorder) for the disruptive behaviour disorders module. In the anxiety disorders module, the κ statistic varied between .44 (posttraumatic stress disorder) and 1.0 (social phobia). Pilot data also indicated excellent interrater reliability in the disruptive behaviour module (.84 for ODD and CD and 1.0 for ADHD) (Matzner, 1994). Psychometric studies of the KIDSCID show fair to excellent test-retest reliability for the disruptive behaviour disorders and various anxiety disorders (Matzner, Silva, Silvan, Chowdhury, & Nastasi, 1997).

Statistical analyses

The Statistical Package for the Social Sciences (SPSS, version 15.0) was used to carry out the correlational analyses to examine associations between the CDI and DSM-oriented depression and anxiety symptoms on the YSR. Regression analyses were carried out to determine a parsimonious model for obtaining CDI norms (see Van Breukelen & Vlaeyen, 2005, for a detailed description). This was done separately for the non-clinical and clinical samples. Total CDI score was the dependent variable in the regression analyses, and age, sex, and in the non-clinical sample also country, and form of completion (pencil-and-paper versus internet), and all twoway interactions were the predictor variables. Dummy coding was used for the categorical predictors sex, country, and completion form. This means that a regression weight is included in the model to represent the mean scale difference between the reference category and each other category, adjusted for all other predictors in the model. Linear and quadratic terms were included for the quantitative predictor age, which was centered to prevent collinearity between linear and quadratic age terms. The regression model was reduced in a stepwise fashion by eliminating the least significant predictor ($p>.05$). For the final model, residuals were plotted and analyzed to check the assumptions of normality and homogeneity of residual variance across the entire range of predicted scale scores and the absence of outliers. With the final model, a raw scale score of an individual child can be converted into a standardized z-score by computing the predicted score Y (by means of filling in the regression analysis), computing the residual error (subtracting predicted Y from observed Y), and finally, dividing the residual error by the SD(e), which is the square root of the MS(residual). If the residuals are normally distributed with the same variance, then *z* is normally distributed and the standard normal distribution can be used to interpret z-values (e.g., Van Breukelen & Vlaeyen, 2005).

Finally, to determine CDI scores that would predict whether youngsters are at risk for depression or anxiety, two series of logistic regression analyses were used with YSR depression and anxiety symptoms as dependent and dichotomous variables, and CDI score, gender, age, and the interactions between these variables as independent variables. The logistic regression model was reduced in a stepwise fashion by eliminating the least significant predictor ($p>.05$). The CDI score was calculated at which youngsters were at risk for depression on the established cutoff scores on the YSR DSM-oriented depression and anxiety scales. More specifically, using the final logistic regression model, we computed which CDI score corresponded to a probability of 50% for being depressed or anxious (using the YSR at the established YSR cutoff as criterion), and we used that CDI score to determine sensitivity and specificity of the CDI, again with the YSR cutoffs as gold standard. As this approach takes into account prevalence and thereby leads to more correct diagnoses at the price of a lower sensitivity, Receiver Operating Characteristic (ROC) curve analysis was also performed as this method ignores prevalence, leading to more false positives but higher sensitivity. Individuals were categorized as being at risk according to the screening instrument (YSR depression and anxiety scores dichotomized), with a pair of sensitivity and specificity values at each possible cutoff for the CDI score. An area under the ROC curve is calculated by plotting sensitivity on the Y-axis and "1-specificity" on the X-axis.

Results

Before addressing the main results, some statistical remarks need to be made. First, overall, less than 1% of the CDI data (at the level of individual items) were missing in the present study. Careful analyses showed no significant baseline differences between the subjects who provided complete data and those who did not. Moreover, comparison of means and covariances of all variables using Little's (1988) MCAR test suggested that data were missing completely at random. Therefore, missing values were estimated using maximum likelihood

estimation (Schafer, 1997) and the expectation maximization algorithm available in SPSS. Second, total CDI scores and scores on the DSM oriented depression and anxiety scales of the YSR were not normally distributed in both samples with skewness and kurtosis outside the range of -1 to +1. A square root-transformation of these total scores was successful in 'normalizing' the total scores. These square root-transformed CDI scores were back-transformed into normal CDI scores after the regression analyses in order to obtain norm data and cutoff scores.

Relations between CDI and symptoms of anxiety and depression

The correlation between CDI and the DSM-oriented scale representing depression symptoms was high (r=.71; p<.001), whereas the correlation between the CDI and the DSM-oriented scale representing anxiety symptoms was moderate (r=.49; p<.001). Correcting both correlations for attenuation, using the internal consistencies of all scales as estimated from the present data, increased both correlations to .88 and .64 respectively. Transformation of both variables by means of square root, resulted in somewhat lower correlation coefficients (i.e., .66 for DSM-oriented depression scale and CDI, and .42 for DSM-oriented anxiety scale and CDI. A similar pattern of findings emerged for the non-parametric Spearman rank correlation, with a correlation of .60 between DSM-oriented depression scale and CDI, and .34 for the DSM-oriented anxiety scale and CDI. Thus, although there is overlap between the CDI and symptoms of anxiety, the association with depressive symptoms was more clearly demonstrated.

Predictors of the CDI score

Mean of the square root transformed CDI scores was 2.73 (SD=1.04; range 0 to 6.48) in the non-clinical sample and 3.88 (SD=1.19, range 0 to 6.32) in the clinical sample. The final model containing significant predictors of the CDI score in the non-clinical sample consisted of sex, age (included as a linear and quadratic terms), country, and the interactions between

gender and age and between age and country. The final model in non-clinical youth is presented in Table 2. The final model in the clinical sample predicting CDI scores comprised gender, age (included as linear and quadratic terms), and the interaction between gender and age as significant predictors. The results pertaining to the final regression model in the clinical sample are presented in the lower part of Table 2.

Model checks

To apply the models for norming purposes, the model assumptions need careful checking as prediction of individual scores depends even more on such assumptions than the regression analysis does. More specifically, the use of (standardized) residuals requires a normal distribution with homogeneous variances of the residual. Normality was checked by means of skewness and kurtosis and the Kolmogorov-Smirnov test. Skewness and kurtosis were within the acceptable range of -1 to +1, but the Kolmogorov-Smirnov test revealed violation of normality in the non-clinical sample (z=1.85, p=.002) and the clinical sample (z=2.17, p<.001). However, note that the Kolmogorov-Smirnov test gives significance even with minor violation of normality in large samples like the present one. In fact, the residual distribution looked quite normal in both samples. As a further check, actual percentiles (5, 10, 25, 50, 75, 90, 95) of the standardized residuals were compared to the corresponding percentiles of the standard normal distribution, which revealed no deviation larger than .10 on the z-scale for the standardized residuals. The homogeneity of variances was tested by grouping patients into quartiles of the predicted scale score and applying Levene's test to the residuals. The homogeneity assumption was not violated (p>.05) and the residual standard deviation within each quartile did not deviate more than 10% form the overall residual standard deviation of the scale. Thus, the overall residual standard deviation may be used to compute z-scores.

Computing z-scores for individual children and adolescents

The models in Table 2 can be used to convert raw CDI scores of any individual into a standardized residual or z-score. As it is cumbersome to compute quadratic age effects, an adapted model was estimated in which the quadratic age term and age as linear effect were replaced with dummy indicators by categorizing age into four groups (7-9 years, 10-12 years, 13-15 years, and 16-18 years), with the 10-12 years as reference group in both samples. The results of the reduced model for the non-clinical sample are presented in Table 3, split by gender and country in view of the age by gender and age by country interactions found. The results for the clinical sample are shown in Table 4. To illustrate how Table 3 can be applied, consider a Dutch boy of 14 years old without a known DSM-IV diagnosis and a CDI score of 18. Table 3 (upper part representing non-clinical individuals) gives a predicted square root-transformed CDI score of 2.513 (constant) + .108(age 13-15=1) + .444(age 16-18=0) = 2.62. The residual standard deviation is √1.12=1.058. Thus, the boy's z-score is equal to (√18 – 2.62)/1.058 = 1.53 according to Table 3.

Opmerking [c15]: Beter: Tables 3 and 4

Opmerking [c16]: Beter: Dutch boys?

Finally, to further enhance user-friendliness of the present norming, norm tables were derived from Table 2 for non-clinical individuals (see Table 5) and for clinically referred individuals (see Table 6). Note that the norm scores depicted in Tables 5 and 6 are estimated on the basis of the full sample using the models in Table 2, rather than on subsamples as in Tables 3 and 4, because the full sample gives a more stable estimate of the residual *SD*. The following z-score intervals were chosen: less than -2, between -2 and -1, between -1 and 0, between 0 and 1, between 1 and 2, and more than 2. Raw CDI scores corresponding to the interval boundaries were computed. CDI scores that, in terms of their standardized residual, lie in the interval between -1 and +1 are normal scores. CDI scores above 1 are considered elevated depression scores, whereas scores above 2 are indicative of high depression scores. Scores below -1 are below average depression scores, whereas scores below 2 are low

Opmerking [c17]: Hier schrappen, schept verwarring die in d evolgende zin klaarder wordt

depression scores. Back to the example, the 14 year-old Dutch boy with a CDI score of 18 has elevated depression scores.

CDI Cutoff scores in relation to depression

Logistic regression analysis revealed that depression (according to the DSM-oriented depression scale of the YSR with its established cutoff) was predicted by CDI score only, not by age or gender or any interaction, based on the Dutch subsample in which the YSR had been administered (n = 340). A CDI score of 23 gave an estimated probability of being depressed close to 50% and was used as cutoff point. Of the 13 youngsters depressed according to the YSR, 5 were then correctly predicted as 'at risk' for depression by the CDI, but 8 were missed, resulting in a sensitivity of 38%. Of the 327 youngsters not depressed according to the YSR, a total of 324 were correctly predicted as not at risk, with 3 false positives, resulting in a specificity of 99%. In total, 11 incorrect diagnoses (8 misses and 3 false positives) resulted from using a CDI score of 23 as cutoff (with score 23 or higher leading to the diagnosis "at risk for depression"). ROC analysis showed that using a CDI score of 16 as cutoff gave an estimated sensitivity of 92% (i.e., 12 youngsters correctly predicted at risk and 1 was missed, AUC=.95, p<.001), and a specificity of 95% (i.e., 305 were correctly predicted as not at risk and there were 22 false positives), and a total of 23 incorrect diagnoses.

Opmerking [c18]: (see figure 1)

CDI Cutoff scores in relation to anxiety

For anxiety (according to the DSM-oriented anxiety symptoms scale of YSR with its established cutoff), CDI score was again the sole predictor, and a CDI score of 30 gave a probability of being anxious of at least 50% and was used as cutoff point. Of the 6 youngsters who were anxious according to the YSR, 1 was then correctly predicted as 'at risk' for anxiety by the CDI, but 5 were missed, resulting in a sensitivity of 17%. Of the 334 who were not anxious, all were correctly predicted as not at risk with no false positives, resulting in a specificity of 100%, and a total of 5 incorrect diagnoses (5 misses, 0 false positives). ROC

analyses showed that a CDI score of 21 yielded a sensitivity of 83% (i.e., 5 out of 6 youngsters were correctly classified as at risk and there was 1 missing, AUC=.86, p=.002) and specificity of 98% (i.e., 324 youngsters were correctly classified as not at risk and there were 10 false positives), giving a total of 11 incorrect diagnoses (1 miss, 10 false positives).

Opmerking [c19]: (see figure 2)

Discussion

The present study sought to (1) assess relationships between the CDI and DSM-oriented symptoms of depression and anxiety as measured with the YSR; (2) develop reliable norms for the CDI in non-clinical and clinically referred youngsters, and (3) determine cutoff scores to identify youngsters being at risk for depression or anxiety. Results can be summarized as follows. First, correlations between the CDI and the DSM-oriented depression and anxiety scales of the YSR were satisfying since, as expected, the CDI correlated highly with depression symptoms and moderately with anxiety symptoms. Second, using multiple regression, reliable norms for the CDI were derived for non-clinical individuals and clinically referred individuals in two European Dutch speaking samples from The Netherlands and Belgium. Finally, CDI cutoff scores were identified by means of logistic regression analysis and ROC analysis in order to categorize individuals at risk for depression and anxiety, with the cutoff depending on whether prevalence of the disorder was taken into account or whether sensitivity and specificity were equally important irrespective the prevalence.

Opmerking [c20]: Wat mij hier opviel: Nergens komt in de tabellen Netherlands voor, is verwarrend. →tabellen aanpassen?

Associations between CDI scores and symptoms of depression and anxiety

With respect to the relation between CDI depression scores and symptoms of depression and anxiety as measured by the DSM oriented depression and anxiety subscales of the YSR, CDI scores were found to correlate more substantively with the depression scale of the YSR than with the anxiety scale of the YSR. In line with the hypothesis, the associations between CDI and the YSR depression and anxiety scales may reflect the comorbidity between anxiety and depression, but do not add to the view that depression and anxiety should be seen

as a single common general distress or negative affect dimension (e.g., Clark & Watson, 1991; Ollendick & Yule, 1990). The findings that the CDI was more clearly associated with depression symptoms supports the discriminant validity of the scale and favors the CDI as an instrument of depressive symptomatology, rather than general distress or negative affect.

Norms for the CDI

With respect to the norming of the CDI, the interaction between age and gender was significant in both the clinical and non-clinical sample. This finding concurs with prevalence rates of depression that increase with age, particularly in girls (e.g., Birmaher et al., 1996; Kessler, McGonagle, Swartz, Blazer, & Nelson, 1993; Lewinsohn et al., 1994). Surprisingly, and not well-studied yet, a significant interaction between age and country was also found in this study. We did not have a priori hypotheses about an interaction between age and country. It is possible that subtle cultural differences may explain differences between both countries, specifically in the age group 16-18 years. Alternatively, differences in social economic status, which were not assessed in the current study, may also explain differences between both countries. However, the presence of these interactions suggests that norming should be done in subgroups based on country and gender, which parallels the approach of traditional norming. In general, girls had higher CDI scores than boys in both countries and samples. Further, in the non-clinical sample Dutch boys and girls had slightly lower CDI scores than Belgian children at the age 10 to 12 years, but slightly higher CDI scores at the age 16 to 18 years, due to an increase of CDI score over age groups in the Dutch sample and near-stability in the Belgian sample (Tables 3 and 5). In the clinical sample (Belgian children only), there is no consistent age effect either for boys or for girls. The findings pertaining to the near-stable CDI scores in Belgian boys and the increase of CDI scores over age groups in girls of both countries concur with the findings from Twenge and Nolen-Hoeksema (2002). Interestingly, norms for the CDI were not dependent on the way the CDI was completed (internet versus pencil-and-paper

Opmerking [c21]: 'nearly significant' in clinical sample? (see table 2)

Opmerking [c22]: Subtile (?) beide samples zijn op grond van een grote range aan scholen, vooral white and middle class SES denk ik ? Elitescholen en allochtone scholen zijn er bij ons niet echt …

versions). Past research has shown mixed results with respect to differences between completing via internet and paper-and pencil (see Van de Looij-Jansen & De Wilde, 2008). In our study, no differences were found between both types of data collection and suggest that the same norms can be applied which is promising given the growing interest in electronic administration of questionnaires.

CDI Cutoff scores

Optimal CDI cutoff scores at which a youngster can be categorized as at risk for depression or anxiety (as measured with DSM-oriented depression and anxiety scales of the YSR) were also established. A logistic regression approach was used as well as ROC curves to determine cutoff points. Generally, logistic regression yielded cutoff points with excellent specificity, but with the disadvantage of missing individuals at risk due to the low prevalence which translates into low predicted probability of depression. The logistic regression may also have low power in detecting an interaction between gender and CDI scores due to the very small number of youngsters at risk for depression in our sample according to the YSR depression cutoff score. With respect to the ROC analysis, the finding of a cutoff score of 16 obtained for YSR depression is lower than the score of 19 found by Kovacs (1992) in her non-clinical sample. Applying a cutoff score of 19 to our data yields a sensitivity of 69% and a specificity of 96%. Thus, a cutoff score of 19 greatly reduces the sensitivity of the CDI. Although the current study suggests a cutoff score of 16 gives a good to very good sensitivity and good specificity, it must be kept in mind that the small number of individuals at risk for depression identified with the YSR yields unstable estimates of sensitivity as well as the choice for the best cutoff score.

In interpreting the different cutoff scores, we believe that it is essential not to miss cases at risk when screening for depression, suggesting that the cutoff points obtained by means of ROC curves should be used. One should be aware that these cutoff scores imply a

number of false positives if prevalence is low. For instance, using a CDI score of 16 to detect depression gave a false alarm for 6% of the total sample, and for 65% of all 34 children diagnosed as "at risk" by the CDI (i.e. with CDI score of 16 or above). A score of 16 on the CDI lies in the z-interval of 1 and 2 for all non-clinical subsamples, except girls aged 16-18 years where it lies in the interval 0-1. For the DSM-oriented anxiety symptoms scale of the YSR, an optimal cutoff score of 21 was found for both boys and girls, with a false alarm of 3% of the total sample, and of 67% of all 15 children with CDI score of 21 or above. A CDI score of 21 lies in the z-interval of 1 and 2 or around 2, depending on gender and age. In short, the price for a high sensitivity in the presence of a low prevalence is that the majority (in our sample two-third) of all children diagnosed as "at risk" according to the CDI are not at risk according to the YSR. Fortunately, this will become clear upon further screening of all children who are at risk according to the CDI.

Opmerking [c23]: Labeled?

It is also illustrative to compare the CDI scores of those youngsters from the non-clinical sample who are at risk according to the YSR, with the norms from the non-clinical and clinical samples. A total of 13 youngsters scored above the clinical cutoff of the YSR depression scale. Although these 13 kids varied in CDI score, their mean CDI score was 22.3, which translates into a *z*–score between of 0 and 1 or around 1, depending on gender, according to the norms from our clinical sample (Table 6) and into a *z*-score of about 2 in the non-clinical sample (Table 5). So their mean CDI score is within the normal range of the clinical sample and well above the normal range of the non-clinical sample. A similar result holds for the YSR anxiety scale, on which 6 individuals scored above the clinical cutoff. Their mean CDI score was 23.5 which is again normal for the clinical, and abnormal for the non-clinical sample.

Opmerking [c24]: Elevated or high? Was het niet raadzaam voor z-scores van 1 en 2 altijd op dezelfde wijze te labelen?

Opmerking [c25]: Elevated or high?

A final note pertaining to cutoff scores is that the ROC analyses were based on a subsample of youngsters aged 10 to 15 years from the total Dutch non-clinical sample because

the YSR had been administered through the internet to the subsample only (Table 1). However, the norming results showed no effect of form of completion (i.e., internet versus pencil-and-paper. Further, we checked comparability between the subsample (n=340) and the remainder of the Dutch non-clinical sample by an ancillary regression analysis, with square root CDI scores as dependent variable, and gender, age (as linear and quadratic terms), the interactions between the age terms and gender, and sample as dummy variable (1 = member of the subsample, 0 = non-member). This analysis showed no significant effect of sample, indicating that selection bias was less likely in the subsample relative to the complete Dutch non-clinical sample. However, it remains to be determined to what extent the obtained cutoff scores can be generalized to other samples. It should also be noted that the absence of a significant age effect in the logistic regression of YSR on CDI in the current study might be due to a restriction of range effect of age and therefore cutoffs should be used within this age range as it may be relatively normal score for older girls (see Table 5).

Opmerking [c26]: A normal score?

Clinical and practical implications

With respect to the norm data, the interpretation of CDI-raw scores depends on age, gender, and country. *Z*-scores computed from the residuals of the present regression of (square root) scores of CDI on sex, age and country, can provide a more objective picture of the meaningfulness of depressive symptoms of youngsters from different subgroups. Moreover, when adopted in clinical practice, *z*-scores can be helpful to identify the severity of the problems of the youngsters and also to evaluate treatment success. Individuals with low or very low scores on the CDI might experience no sign of depressive symptoms. However, it may be the case that those with extreme low scores on the CDI may in some way deny these symptoms. For clinical use, we advise to interpret low scores on the CDI in the light of scores of other questionnaires or information obtained from structured interviews.

For the results pertaining to CDI cutoff scores, we believe that the cutoff scores obtained by means of ROC analysis might be used by clinicians to gain more information about the presence and severity of depressive symptoms. From the viewpoint of prevention, it is obvious that individuals with elevated CDI scores should be invited for further assessment. A second assessment period could involve the use of a clinical interview that carefully checks the diagnostic criteria (e.g., a "multiple gate" assessment strategy (see Reynolds, 1986; Kendall, Holon, Beck, Hammen, & Ingram, 1987)). A disadvantage of cutoff score obtained by means of ROC is the relatively high rate of false positives. If there is no time for second assessments of these individuals in the form of a clinical interview, one may consider having the CDI administered twice and having a second assessment only for those who have elevated CDI scores on both occasions as this is less time-consuming than a clinical interview and may lead to lower rates of false positives.

The cutoff scores obtained for depression and anxiety can be interpreted in the light of *z*-scores (see Table 5). That is, a CDI cutoff score for depression of 16 corresponds to a *z*-score of 1, whereas a CDI cutoff core of 21 for anxiety corresponds to a *z*-score of around 2. Thus, using a *z*-score of 2 (or larger) on the CDI is alright for detection anxiety, but a *z*-score of 1 rather than 2 should be considered for detecting depression.

Strengths and limitations of the current study

The results of the current study advance the CDI as screening instrument for depression and provide reliable and valid norms for clinical and non-clinical youth. We noticed no major problems in any subgroup to fill in the questionnaire and missing items were scarce. It is a strength of the CDI that it takes only 10 minutes to fill in and its reliability is good. Another strength of the study is that a large sample of both clinical and non-clinical youngsters was involved, deriving from two different countries, witch enhances the generalization. A number of limitations of the present study need to be addressed. First, norm

data and cutoff scores obtained in the current study were found for the Dutch version of the CDI and therefore it remains to be determined whether these findings can be generalized to other versions of the CDI. Second, a limitation of our CDI cutoffs is that they were obtained on a a subsample of children (i.e., within age range of 10 – 15 years) and that it remains to be determined whether the obtained cutoff scores generalise to a broader age range. Third, social economic status was not assessed in the current study. Although previous research has indicated that social economic status was not related to mean CDI scores (e.g., Twenge & Nolen-Hoeksema, 2002) it cannot be ruled out that this variable is related to CDI norming or assessing cutoff scores. Future research should include this variable to see whether it is an important variable to take into account. Despite these limitations, the current study provides support for the usefulness of the CDI as a screening tool for selecting potential cases for further assessment.

Opmerking [c27]: eruit

References

Achenbach, T. M., & Edelbrock, C. (1987). *Manual for the Youth Self Report and Profile*. Burlington, VT: Department of Psychiatry, University of Vermont.

Achenbach, T. M., & Rescorla, C. (2001). *Manual for the ASEBA school-age forms and profiles.* Burlington, VT: University of Vermont, Research Center for Children, Youth, and Families.

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry, 4,* 561-571.

Birmaher, B., Ryan, N. D., Williamson, D. E., Brent, D. A., Kaufman, J., Dahl, R. E., et al. (1996). Childhood and adolescent depression: a review of the past 10 years. Part I. *Journal of American Academy of Child and Adolescent Psychiatry,* 35(11), 1427-1439.

Birmaher, B., Arbelaez, C., & Brent, D. (2002). Course and outcome of child and adolescent major depressive disorder. *Child and Adolescent Psychiatric Clinics North America,* 11, 619-637.

Brady, E. U., & Kendall, P. C. (1992). Comorbidity of anxiety and depression in children and adolescents. *Psychological Bulletin, 111,* 244-255.

Clark, L. A., & Watson, D. (1991). Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. *Journal of Abnormal Psychology, 97,* 346-353.

Craighead, E. W., Smucker, M. R., Craighead, L. W., Ilardi, S. S. (1998). Factor analysis of the Children's Depression Inventory. *Psychological Assessment, 10,* 156-166.

Finch, A. J., Saylor, C. F., Conway, F., & Edwards, G. L. (1985). Children's Depression Inventory: Sex and grade norms for normal children. *Journal of Consulting and Clinical Psychology, 53,* 424-425.

Finch, A. J., Jr., Lipovsky, J. A., & Casat, C. D. (1989). Anxiety and depression in children and adolescents: Negative affectivity or separate constructs? In P. C. Kendall & D. Watson

(Eds.), *Anxiety and depression: Distinctive and overlapping features* (pp. 1771-1202). New York: Academic Press.

Fundudis, T., Berney, T. P., Kolvin, I., Famuyiwa, O. O., Barrett, L., Bhate, S., et al. (1991). Reliability and validity of two self-rating scales in the assessment of childhood depression. *British Journal of Psychiatry, 159,* 36-40.

Hanley, J. A., & McNeil, B. J. The meaning and use of the area under a receiver operating characteristic (ROC) curve. *Radiology, 143,* 29-36.

Hien, D., Matzner, F. J., First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. W. (1998). *Structured Clinical Interview for DSM-IV-Child Edition.* New York: Columbia University.

Hodges, K. K., & Craighead, W. E. (1990). Relationships of the Children's Depression Inventory factors to diagnosed depression. *Psychological Assessment: A Journal of Consulting and Clinical Psychology, 2,* 489-492.

Hodges, K. K., Siegel, L. J., Mullins, L., & Griffin, N. (1983). Factor analysis of the Children's Depression Inventory. *Psychological Reports, 53,* 759-763.

Kazdin, A. E. (1988). Childhood depression. In E. J. Mash & L. G. Terdal (Eds.), *Behavioral assessment of childhood disorders (*2nd ed., pp. 157-195). New York: Guilford Press.

Kazdin, A. E. (1990). Assessment of childhood depression. In A. M. La Greca (Ed.), *Through the eyes of the child: Obtaining self-reports from children and adolescents* (pp.189-233). Boston, MA: Allyn and Bacon.

Kendall, P. C., Hollon, S. D., Beck, A. T., Hammen, C. L., & Ingram, R. E. (1987). Issues and recommendations regarding use of the Beck Depression Inventory. *Cognitive Therapy and Research, 11,* 289-299.

Kessler, R. C., McGonagle, K. A., Swartz, M., Blazer, D. G., & Nelson, C. B. (1993). Sex and depression in the National Comorbidity Survey. I: Lifetime prevalence, chronicity and recurrence. *Journal of Affective Disorders,* 29(2-3), 85-96.

Kovacs, M. (1980/1981). Rating scales to assess depression in school-aged children. *Acta Paedopsychiatrica, 46,* 305-315.

Kovacs, M. (1983). The Children's Depression Inventory: A self-rated depression scale for school-aged youngsters. Unpublished manuscript, University of Pittsburgh.

Kovacs, M. (1985). The Children's Depression Inventory (CDI). *Psychopharmacology Bulletin, 21,* 995-998.

Kovacs, M. (1992). *Children's Depression Inventory.* New York: Multi-Health Systems.

Lewinsohn, P. M., Clarke, G. N., Seeley, J. R., & Rohde, P. (1994). Major depression in community adolescents: age at onset, episode duration, and time to recurrence. *Journal of the American Academy of Child & Adolescent Psychiatry, 33,* 809-818.

Lewinsohn, P. M., Rohde, P., & Seeley, J. (1998). Major depressive disorder in older adolescents: prevalence, risk factors, and clinical implications. *Clinical Psychology Review,* 18(7), 765-794.

Little, R. J. A. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American Statistical Association, 83,* 1198-1102.

Matthey, S., & Petrovsky, P. (2002). *The Children's Depression Inventory*. New York: Multi-Health Systems.

Matzner, F., (1994.) "*Videotapes as Training Tools for the Development of the KID-SCID*", Scientific Proceedings, American Academy of Child and Adolescent Psychiatry 42nd Annual Meeting.

Matzner, F., Silva, R., Silvan, M., Chowdhury, M., & Nastasi, L. (1997, May). *Preliminary test-retest reliability of the KID-SCID.* Paper presented at the 150th annual meeting of the American Psychiatric Association. Washington, DC.

Ollendick, T. H., & Yule, W. (1990). Depression in British and American children and its relationship to anxiety and fear. *Journal of Consulting and Clinical Psychology, 58,* 126-129.

Reynolds, W. M. (1986). A model for screening and identification of depressed children and adolescents in school settings. *Professional School Psychology, 1,* 117-129.

Saylor, C. F., Finch, A. J., Jr., Spirito, A., & Bennett, B. (1984). The Children's Depression Inventory: A systematic evaluation of psychometric properties. *Journal of Consulting and Clinical Psychology, 52,* 955-967.

Schafer, J. L. (1997). *Analysis of incomplete multivariate data.* Chapman & Hall, London.

Stark, K. D., Humphrey, L. L., Laurent, J., Livingston, R., & Christopher, J. (1993). Cognitive, behavioural, and family factors in the differentiation of depressive and anxiety disorders during childhood. *Journal of Consulting and Clinical Psychology, 61,* 878-886.

Timbremont, B., & Braet, C. (2002). Children's Depression Inventory: Nederlandstalige versie [Children's Depression Inventory: Dutch version]. Lisse: Swets & Zeitlinger.

Timbremont, B., Braet, C., Dreessen, L. (2004). Assessing depression in youth: Relation between the Children's Depression Inventory and a structured interview. *Journal of Clinical Child and Adolescent Psychology, 33,* 149-157.

Twenge, J. M., & Nolen-Hoeksema, S. (2002). Age, gender, race, socioeconomic status, and birth cohort differences on the Children's Depression Inventory: A meta-analysis. *Journal of Abnormal Psychology, 111,* 578-588.

Van Breukelen, G. J. P., & Vlaeyen, J. W. S. (2005). Norming clinical questionnaires with multiple regression: The pain cognitions list. *Psychological Assessment, 17,* 336-344.

Van der Elst, W., Van Boxtel, M. P. J., Van Breukelen, G. J. P., & Jolles, J. (2006). The concept shifting test: Adult normative data. *Psychological Assessment, 18,* 424-432.

Van de Looij-Jansen, P. M., & de Wilde E. J. (2008). Comparison of web-based versus paper-and-pencil self-administered questionnaires: effects on health indicators in Dutch adolescents. *Health Services Research, 43,* 1708-1721.

Verhulst, F. C., Ende, van der, J., & Koot, H. M. (1996). *Manual for the Child Behavior Checklist (CBCL/4-18).* Afdeling Kinder- en Jeugdpsychiatrie, Sophia Kinderziekenhuis/Academisch Ziekenhuis Rotterdam/Erasmus Universiteit Rotterdam.

Verhulst, F. C., Ende, van der J., & Koot, H. M. (1997). *Manual for the Youth Self Report (YSR).* Afdeling Kinder- en Jeugdpsychiatrie, Sophia Kinderziekenhuis/Academisch Ziekenhuis Rotterdam/Erasmus Universiteit Rotterdam.

Weiss, B., Weisz, J. R., Politano, M., Carey, M., Nelson, W. M., & Finch, A. J. (1991). Developmental differences in the factor structure of the Children's Depression Inventory. *Psychological Assessment, 3,* 38-45.

Wolfe, V. V., Finch, A. J., Saylor, C. F., Blount, R. L., Pallmeyer, T. P., & Carek, D. J. (1987). Negative affectivity in children: a multitraitmultimethod investigation. *Journal of Consulting and Clinical Psychology, 55,* 245-250.

Woodward, M. (2005). Epidemiology. Study design and data analysis. New York: Chapman & Hall.

Table 1: Sample Descriptive Statistics.

Non-clinical samples (N=3073)				
		Dutch sample (*N*=1347)	Dutch subsample (*N*=340)	Belgian sample (*N*=1726)
Male gender		595	189	834
Female gender		752	151	892
Age	7-9 years	-	-	201
	10-12 years	635	161	663
	13-15 years	574	179	561
	16-18 years	138	-	301
Completion	Paper and pencil	380	0	-
	Internet	967	340	-
CDI: M (SD)		8.58 (6.15)	7.72 (5.67)	8.74 (6.01)
YSR depression scale: M (SD)		-	3.70 (3.47)	-
YSR anxiety scale: M (SD)		-	1.69 (1.86)	-
sqrt CDI: M (SD)		2.67 (1.11)	2.59 (1.01)	2.78 (1.01)
sqrt YSR depression scale: M (SD)			1.67 (.95)	
sqrt YSR anxiety scale: M (SD)			1.01 (.82)	
Clinical sample (N=511)				
		Belgian (*N*=511)		
Male gender		268		
Female gender		243		
Age	7-9 years	49		
	10-12 years	185		
	13-15 years	213		
	16-18 years	64		
CDI: M (SD)		16.44 (8.54)		
sqrt CDI: M (SD)		3.88 (1.19)		

Note. CDI=Children's Depression Inventory; YSR=Youth Self-Report, sqrt = square root transformed.

Table 2: Regression Models for Predictors of the (Square Root) CDI Scores in the Non-clinical and Clinical Samples.

Non-clinical sample (N=3073, R^2=.03, MSresidual=1.08)			
Predictor	B	SE of B	p (two-tailed)
Constant	2.606	.064	<.001
Country (Netherlands=0, Belgium=1)	.097	.040	.014
Sex (girls=0, boys=1)	-.171	.038	<.001
Age	.202	.033	<.001
Age (quadratic)	.009	.003	.002
Age X gender	-.053	.016	.001
Age X country	-.087	.018	<.001
Clinical sample (N=511, R^2=.08, MSresidual=1.30)			
Predictor	B	SE of B	p (two-tailed)
Constant	4.333	.087	<.001
Sex (girls=0, boys=1)	-.539	.102	<.001
Age	.004	.030	.900
Age (quadratic)	-.032	.008	<.001
Age X gender	-.080	.042	.057

Note. The variable age was centered by subtracting the mean age from each age score (i.e., mean age was 12.71 and 12.69 for the non-clinical and clinical sample respectively).

Table 3: Regression Model for the (Square Root) CDI Scores in the Non-clinical Sample Breakdown by Gender and Country.

Non-clinical Dutch sample, boys (N=595, R^2=.01, MSresidual=1.12)			
Predictor	B	SE of B	p (two-tailed)
Constant	2.513	.062	<.001
Age 13-15	.108	.091	.235
Age 16-18	.444	.160	.006
Non-clinical Dutch sample, girls (N=752, R^2=.04, MSresidual=1.26)			
Predictor	B	SE of B	p (two-tailed)
Constant	2.534	.061	<.001
Age 13-15	.275	.087	.002
Age 16-18	.704	.135	<.001
Non-clinical Belgian sample, boys (N=834, R^2=.01, MSresidual=.97)			
Predictor	B	SE of B	p (two-tailed)
Constant	2.613	.055	<.001
Age 7-9	.369	.118	.002
Age 13-15	.067	.081	.411
Age 16-18	-.018	.096	.855
Non-clinical Belgian sample, girls (N=892, R^2=.01, MSresidual=1.03)			
Predictor	B	SE of B	p (two-tailed)
Constant	2.806	.055	<.001
Age 7-9	.079	.111	.474
Age 13-15	.060	.081	.457
Age 16-18	.276	.100	.006

Note. Age group 10-12 years was the reference group.

Table 4: Regression Model for the (Square Root) CDI Scores in the Clinical Sample Breakdown by Gender.

Clinical sample, boys (N=268, R^2=.04, MSresidual=1.12)			
Predictor	B	SE of B	p (two-tailed)
Constant	3.782	.121	<.001
Age 7-9	-.168	.252	.506
Age 13-15	-.092	.169	.586
Age 16-18	-.962	.274	.001
Clinical sample, girls (N=243, R^2=.01, MSresidual=1.11)			
Predictor	B	SE of B	p (two-tailed)
Constant	4.115	.116	<.001
Age 7-9	-.256	.274	.352
Age 13-15	.168	.155	.282
Age 16-18	-.125	.205	.541

Note. Age group 10-12 years was the reference group.

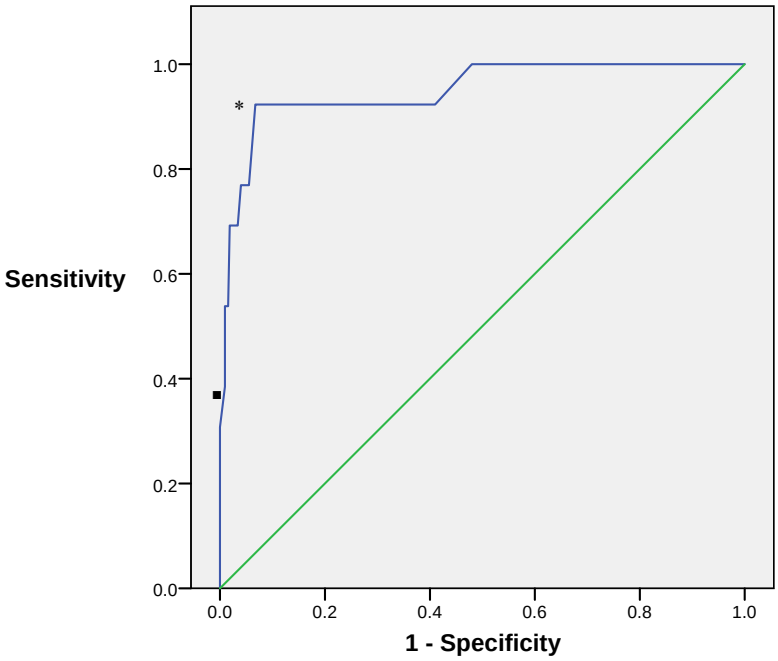
Table 5: Norms for the CDI Total Score in Non-clinical Youth Breakdown by Gender and Country.

	z < -2	-2 to -1	-1 to 0	0 to 1	1 to 2	z > 2
Non-clinical Dutch sample, boys						
Age 10-12	0	1 – 2	3 – 5	6 – 12	13 – 20	21 – 54
Age 13-15	0	1 – 2	3 – 6	7 – 13	14 – 21	22 – 54
Age 16-18	0 – 1	2 – 4	5 – 8	9 – 15	16 – 25	26 – 54
Non-clinical Dutch sample, girls						
Age 10-12	0	1 – 2	3 – 5	6 – 12	13 – 22	23 – 54
Age 13-15	0	1 – 2	3 – 7	8 – 14	15 – 25	26 – 54
Age 16-18	0 – 1	2 – 4	5 – 9	10 – 18	19 – 29	30 – 54
Non-clinical Belgian sample, boys						
Age 7-9	0 – 1	2 – 3	4 – 8	9 – 15	16 – 23	24 – 54
Age 10-12	0 – 1	2 – 3	4 – 6	7 – 12	13 – 20	21 – 54
Age 13-15	0 – 1	2 – 3	4 – 6	7 – 12	13 – 20	21 – 54
Age 16-18	0 – 1	2 – 3	4 – 6	7 – 12	13 – 20	21 – 54
Non-clinical Belgian sample, girls						
Age 7-9	0 – 1	2 – 3	4 – 7	8 – 14	15 – 23	24 – 54
Age 10-12	0 – 1	2 – 3	4 – 7	8 – 14	15 – 22	23 – 54
Age 13-15	0 – 1	2 – 3	4 – 7	8 – 14	15 – 22	23 – 54
Age 16-18	0 – 1	2 – 3	4 – 8	9 – 16	17 – 25	26 – 54

Table 6: Norms for the CDI Total Score in Clinically Referred Youth Breakdown by Gender.

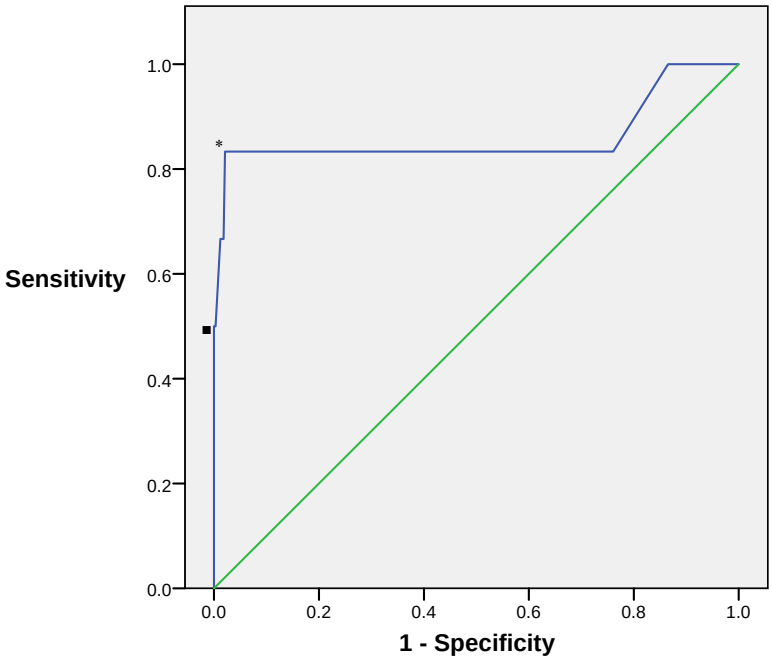
	z < -2	-2 to -1	-1 to 0	0 to 1	1 to 2	z > 2
Boys						
Age 7-9	0 – 1	2 – 6	7 – 12	13 – 22	23 – 36	37 – 54
Age 10-12	0 – 2	3 – 7	8 – 13	14 – 24	25 – 38	39 – 54
Age 13-15	0 – 2	3 – 6	7 – 13	14 – 23	24 – 37	38 – 54
Age 16-18	0	1 – 2	3 – 7	8 – 15	16 – 27	28 – 54
Girls						
Age 7-9	0 – 2	3 – 6	7 – 14	15 – 25	26 – 39	40 – 54
Age 10-12	0 – 3	4 – 8	9 – 16	17 – 27	28 – 42	43 – 54
Age 13-15	0 – 3	4 – 9	10 – 17	18 – 29	30 – 44	45 – 54
Age 16-18	0 – 2	3 – 8	9 – 15	16 – 26	27 – 41	42 – 54

Figure 1: ROC Curve of YSR DSM-oriented Depression Symptoms and CDI



Note. The AUC=.95, p<.001. The cutoff of 16 (*) obtained by ROC and 23 by means of logistic regression analysis (■).

Figure 2: ROC Curve of YSR DSM-oriented Anxiety Symptoms and CDI.



Note. The AUC=.95, p<.001. The cutoff of 21 (*) obtained by ROC and 30 by means of logistic regression analysis (■).