

ORIGINAL ARTICLE

**DETERMINING THE CUT-OFF SCORE FOR A MALAY
LANGUAGE VERSION OF THE CENTRE FOR
EPIDEMIOLOGIC STUDIES DEPRESSION SCALE (CESD)**

*Siti Raudzah Ghazali**, *Ask Elklit***, *Rekaya Vincent Balang**,
*M Ameenudeen Sultan****, *Yoke Yong Chen**

***Department of Psychological Medicine, University Malaysia Sarawak, Lot 77, Section 22 KTL D, Jalan Tun Ahmad Zaidi Aduce, Kuching, 93150 Sarawak, Malaysia; **National Centre for Psychotraumatology, University of Southern Denmark & University of Ulster, Northland Rd, Londonderry BT48 7JL, United Kingdom; ***Department of Paediatric and Child Health, University Malaysia Sarawak, Lot 77 Section 22 KTL D, Jalan Tun Ahmad Zaidi Aduce, Kuching, 93150 Sarawak, Malaysia.**

Abstract

Objective: The objective of this study is to determine the optimal cut-off score for the Centre for Epidemiologic Studies Depression scale (CESD) according to Malaysian adolescent norms. **Methods:** This is a cross-sectional study. Nine hundred and thirty-one adolescents aged 13 to 17 years-old completed the CESD and Hopkins Symptom Checklist-depression scale (HSCL-depression). **Results:** Results from the receiver operating characteristic (ROC) curve, kappa coefficients and odds ratio analysis showed that CESD cut-off score of 27 was suitable to be used according to Malaysian norms, demonstrating a specificity of 93%. **Conclusion:** The findings suggest a cut-off score 27 should be used for screening of depression for Malaysian adolescents using the CESD. *ASEAN Journal of Psychiatry, Vol. 15 (2): July – December 2014: 146-152.*

Keywords: Depression, Malaysian Adolescents, CESD, Cut-off Score

Introduction

Adolescent depression accounts for great mortality and morbidity, and has formed a material and moral burden for society [1]. The prevalence of depression in adolescence has been reported to be around 29% in the United States [2], 9.5% in India [3], 22.9% in Hunan, China [4] and 21% in Thailand [5], and is associated with significant risk of suicide and other psychosocial impairment [1]. Therefore the diagnosis of adolescent depression is crucial. One of the commonly used screening tools for depression in Malaysia is the Centre for Epidemiologic Studies Depression Scale (CESD) [7].

Radloff (1977) have shown the feasibility of CESD as a depression screening tool in the

general population with good psychometric properties [7]. CESD has been used to assess depression among adolescents in the United States [8], in Sweden [13], and in Thailand [5]. Carol et al. (1999) also has shown a high sensitivity and specificity of CESD when were able to discriminate depression patients from dysthymia and those without depression [10]. These evidences showed that although CESD is suggested not to be used as a diagnostic tool individually [7], CESD is widely used for the assessment of depression and is consistent with the DSM-IV diagnosis of major depression [11].

One of the inadequacies for the feasibility of the CESD in Malaysia is that its cut-off scale has not been determined and validated, and recommended cut-off scores used have not

been consistent. Most of the suggested CESD cut-off scores were derived from western populations according to their own norms. This could lead to inaccuracies in reporting the prevalence of depression in Malaysia. The purpose of this study, then, is to determine an optimal cut-off score for CESD according to Malaysian norms, and present future directions for clinical application and research on depression.

Methods

Participants

Data in the present study were collected from a survey questionnaire with a total responding population of 931 adolescents aged from 13 to 17 ($M_{age}= 15$, $SD=1.46$; 352 male, 579 female). Adolescents that took part in this study were from five different ethnic groups: Malays (34.8%), Iban (31.8%), Chinese (14.3%), Bidayuh (7.7%), and other ethnic minorities including Indians, Kelabit and Melanau which considered as a group (11.4%, Table 1).

Procedures

Following ethical approval from Faculty of Medicine and Health Sciences, University Malaysia Sarawak Ethical Committee, the Malaysian Ministry of Education and the Sarawak Education Department, thirty schools were invited to take part in the study, with seventeen agreeing to participate. Written consent was obtained from both participants and their legal guardians. During data collection, participants were informed regarding their rights including issues of confidentiality. Students who were suspected to develop depressive symptoms during data collection were advised and referred to a psychiatrist if necessary.

Measures

Center for Epidemiologic Study Depression Scale (CESD). The CESD includes 20 items comprising six scales reflecting major dimensions of depression: depressed mood, feelings of guilt and worthlessness, feelings of helplessness and hopelessness, psychomotor retardation, loss of appetite, and sleep

disturbance. High internal consistency has been reported (Cronbach's alpha coefficients = 0.85 to 0.90 [7]). The CESD score ranges between 0 and 60, with higher scores indicating a greater number of depressive symptoms. A standard cut-off of 16 leads to false positives in adolescents, so various cut-off scores ranging from 12 to 30 [12-13] have been recommended. For example, a cut-off score of 24 has been used for American populations, with a score above 24 considered a sign of clinical depression [2], whereas in Sweden, a cut-off score of 30 was used [13]. Separately, Zich, Attkisson and Greenfield (1990) suggested that cut-off scores of 16 to 26 are considered indicative of mild depression and scores of 27 or more indicative of major depression.

The Hopkins Symptoms Checklist-25 (HSCL-25) depression scale. The HSCL is a 25-item self-report inventory that assesses symptoms of anxiety (item 1 –item 10) and depression (item 11-item 25) on a 4-Likert scale [14]. In the present study, only HSCL-depression scale was used. A cut off score of 1.75 is used to identify clinically significant symptoms especially for South East Asian populations. The internal consistency of this questionnaire in the present study was high ($\alpha =.90$).

Translation and Back Translation

For the purpose of this study, all instruments were translated into the Malay language (Bahasa Malaysia) and were back translated by two academicians who are experts in both English and Malay languages. The content validity and reliability of the translated version was evaluated and tested before the actual study was conducted.

Statistical analysis

All analyses were conducted using the Statistical Program for the Social Sciences (SPSS, version 16.0) package. Data were double entered to identify data entry errors. A p -level of 0.05 was interpreted as significant.

Receiver Operating Characteristic (ROC) curve and reliability tests were used to determine the sensitivity and specificity in

order to determine an optimal cut-off score [15].

Results

A brief analysis on the internal consistency of CESD in Malay language was done and showed a good internal consistency with Cronbach’s alpha of 0.86 and no items was needed to remove that would improve the internal consistency of the scale.

The area under the curve was 0.86, $p < 0.001$ with 95% Confidence Interval between 0.84-

0.88, substantially above the random ROC (Figure 1). Although calculating ROC curve does not give an exactly correct result, the shoulder of the ROC suggested the most likely scores range 23-28 (Table 2 and Figure 2). The respective analyses for the threshold of depression (CESD score equal to or higher than 23) revealed very similar results as HSCL-depressive score obtained (Table 3). However, in consideration of the scale’s sensitivity, specificity and kappa coefficients, different CESD cut-off scores were taken into consideration before finalizing the most suitable cut-off score to be used with the Malaysian adolescent population.

Table 1. The frequencies and percentage of the socio-demographic information of the participants

| Socio-demographic data (N = 931) | Frequencies | Percentage (%) |
|----------------------------------|-------------|----------------|
| <i>Sex</i> | | |
| Female | 579 | 62.2 |
| Male | 352 | 37.8 |
| <i>Age</i> | | |
| 13 | 196 | 21.1 |
| 14 | 221 | 23.7 |
| 15 | 104 | 11.2 |
| 16 | 221 | 23.7 |
| 17 | 189 | 20.3 |
| <i>Ethnicity</i> | | |
| Bidayuh | 72 | 7.7 |
| Chinese | 133 | 14.3 |
| Ibanese | 296 | 31.8 |
| Malays | 324 | 34.8 |
| Others | 106 | 11.4 |
| <i>Living condition</i> | | |
| Single parent | 110 | 11.8 |
| Both parent | 780 | 83.8 |
| others | 41 | 4.4 |

Table 2. Validity characteristics of the CESD at different cut-offs (N = 931)

| Cut-off score ¹ | Sensitivity | specificity | Kappa | OR ² | 95% CI ³ |
|----------------------------|-------------|-------------|-------------|-----------------|---------------------|
| 16.5 | 0.92 | 0.57 | 0.41 | 15.44 | 9.89-24.10 |
| 17.5 | 0.90 | 0.64 | 0.45 | 16.34 | 10.74-24.87 |
| 18.5 | 0.87 | 0.68 | 0.50 | 15.64 | 10.73-22.82 |
| 19.5 | 0.84 | 0.72 | 0.52 | 13.86 | 9.78-19.65 |
| 20.5 | 0.81 | 0.77 | 0.53 | 13.29 | 9.53-18.52 |
| 21.5 | 0.76 | 0.79 | 0.56 | 13.44 | 9.73-18.56 |
| 23.5 | 0.67 | 0.82 | 0.54 | 11.76 | 8.60-16.09 |
| 24.5 | 0.62 | 0.87 | 0.53 | 11.66 | 8.49-16.03 |
| 25.5 | 0.57 | 0.89 | 0.51 | 11.26 | 8.14-15.58 |
| 26.5 | 0.52 | 0.92 | 0.49 | 11.39 | 8.11-15.99 |
| 27.5 | 0.47 | 0.93 | 0.46 | 11.76 | 8.19-16.88 |
| 28.5 | 0.43 | 0.94 | 0.43 | 11.77 | 8.04-17.23 |
| 29.5 | 0.37 | 0.95 | 0.40 | 11.15 | 7.48-16.63 |
| 30.5 | 0.34 | 0.96 | 0.36 | 11.70 | 7.53-18.18 |

Note. ¹Area under the curve, AUC =0.86, $p < 0.001$. ²Odds ratio, ³Confidence Interval, Sensitivity, specificity, kappa, odd ratios and 95% CI are provided for the CESD questionnaires. [Bold= chosen cut-off scores].

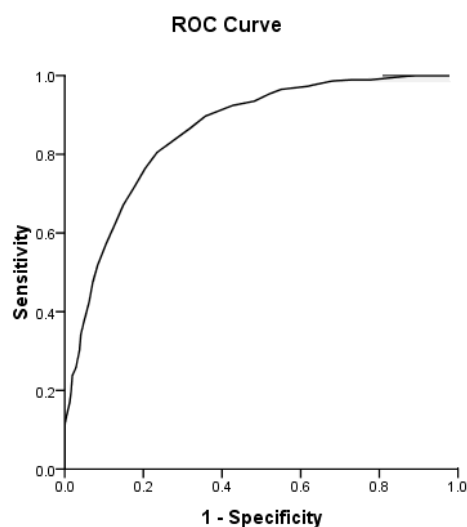


Figure 1. ROC plots for the diagnostic sensitivity and 1-specificity of CESD

Table 3. Different CESD cut-off scores and HSCL depressive score in relation to prevalence of depressive risk (N = 931)

| | CESD ≥ 16 | CESD ≥ 23 | CESD ≥ 27 | CESD ≥ 29 | HSCL |
|-------------------------------|----------------|----------------|----------------|----------------|------------|
| | N (%) | N (%) | N (%) | N (%) | N (%) |
| Prevalence of depressive risk | 616 (66.2) | 363 (39.0) | 238 (25.6) | 192 (20.6) | 369 (39.6) |

Sensitivity could not be calculated since an interview of a randomized sample was not been carried out in this study [16]. Therefore, specificity of 90% was taken into consideration. Kappa coefficient less than 0.4 is considered as a poor agreement of a scale [17]. Combination consideration of these

results (i.e. sensitivity, specificity, kappa coefficient), a cut-off score of 27 was chosen. With CESD cut-off score set at 27, results showed that 47% of depressives are classified as depressive, and only 7% of those not depressed were “misclassified” as depressive.

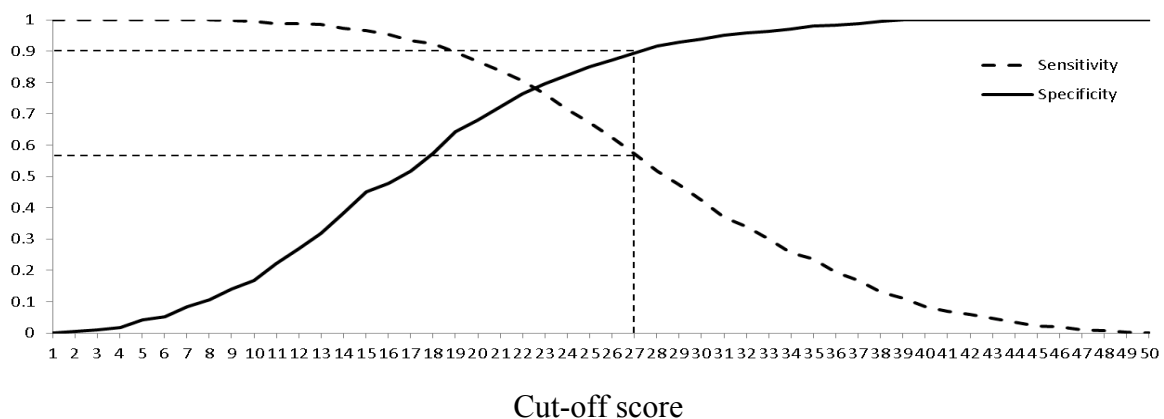


Figure 2. Plot of the diagnostic sensitivity and specificity of CESD as a function of the cut-off value. The dotted lines showed the sensitivity and specificity of the CESD cut-off score of 27

Discussion

The major finding of the present study indicates that a CESD cut-off score of 27 is suggested for use in Malaysian populations. This is a much higher score in comparison with what was originally recommended in the manual, where a cut-off score of 16 was used for depressive symptoms. The cut-off score found in this study is much higher than those of previous studies conducted in European and other Western countries [2, 18].

To the best of our knowledge, this study is the first to determine the optimal cut-off score of CESD according to Malaysian norms. The cut-off score of 27 is higher than the original score of 16 [7] but the recommended score for adults

is surpassed by more than half of the adolescents in this study, an improbable outcome. The use of a cut-off lower than 27 would make the scale over-sensitive, while the use of a higher cut-off score than 27 would decrease the sensitivity and result in the inclusion of fewer potentially depressed participants.

A possible explanation for the high total scores might be the swinging mood in adolescence. A similar problem was found in a Swedish study [13] prompting the use of a cut-off score of thirty. A probability of disease is estimated from experience, local data or published literature would be more efficient use of the information for the determination of CESD cut-off score according to the local norms. A

CESD cut-off score of 16 (recommended in the manual), 23 and 27 [19] were chosen to make the comparison and feasibility of these cut-off score to be used locally. CESD cut-off score of 29 instead of 30 that recommended by Olsson & von Knorring (1997) was chosen because the kappa coefficient of cut-off score 30 was less than . A score of 40 is considered to be a poor agreement of the scale [17]. Therefore, the cut-off score of 27 is in agreement with results in other studies of prevalence of adolescent depression [20]. The cut-off score of 27 demonstrated a sensitivity of 47% and specificity of 93%.

One limitation of this study is that only the HSCL-depression subscale was used as the referent standard for the ROC analysis of the CESD. HSCL was originally used as a screening tool for PTSD [14]. Yet, the fifteen depression items of HSCL-depression are consistent with the DSM-IV diagnosis of major depression. Also, depressive symptoms are highly comorbid with other symptoms of distress in adolescents. Although the prevalence of adolescent depression in the present study was similar to other prevalence studies, other depression screening tools such as Child Depression Inventory, Beck Depression Inventory and qualitative interviews for depression could be used as the referent standard in order to further validate the optimal cut-off score of CESD that suits Malaysian norms. Despite these limitations, the present study presents a standardized CESD cut-off score which confers greater generalizability among Malaysian adolescents.

Conclusion

In summary, the present data suggests that the CESD is a good screening tool to use for detecting depressive episodes in an adolescent population because of its standardized cut-off score of 27 allows it to discriminate between adolescents with and without depressive symptoms. Although psychiatric services in Malaysia are still in their infancy, and services are not utilized at their optimum level, the rise in adolescent depression cases indicates that urgent attention to this area of mental health care is required.

Acknowledgments

This study was funded by the National Centre for Psychotraumatology University of Southern Denmark Grant : Grant No UNIMAS L18403 F05 00 PTSD . We thank Professor Peter Songan, The Deputy Vice Chancellor (Research and Innovation), The Research and Innovation Management Center (RIMC) of Universiti Malaysia Sarawak for supporting this study. Our sincere thanks to all participants who had given us their full cooperation during the data collection. Many thanks to Zayn Al-Abideen Gregory, UiTM Sarawak for assistance with editing.

References

1. Lopez AD, & Murray, CC. The global burden of disease. *Nat Med.* 1998; 4 (11): 1241-1243.
2. Paxton RJ, Valois RF, Watkins KW, Huebner ES, & Drane, JW. Sociodemographic differences in depressed mood: Results from a nationally representative sample of high school adolescents. *J Sch Health.* 2007; 77(4): 180-186.
3. Nair MKC, Paul MK, & John R. Prevalence of depression among adolescents. *Indian J Pediatr.* 2004; 71 (6): 523-524.
4. Yang J, Yao S, Zhu X, Zhang C, Ling Y, Abela JR, & McWhinnie C. The impact of stress on depressive symptoms is moderated by social support in Chinese adolescents with subthreshold depression: A multi-wave longitudinal study. *J Affect Disord.* 2010; 127 (1): 113-121.
5. Charoensuk S. Negative thinking: A key factor in depressive symptoms in Thai adolescents. *Issues Ment Health Nurs.* 2007; 28(1): 55-74.
6. Harrington R, Fudge H, Rutter M, Pickles A, & Hill J. Adult outcomes of childhood and adolescent depression: I. Psychiatric status. *Arch Gen Psychiatry.* 1990; 47(5): 465.

7. Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. *Appl Psychol Meas.* 1977; 1(3): 385-401.
8. Rushton JL, Forcier M, & Schechtman RM. Epidemiology of Depressive Symptoms in the National Longitudinal Study of Adolescent Health. *J Am Acad Child Adolesc Psychiatry.* 2002; 41(2): 199-205.
9. Cuijpers P, Boluijt P, van Straten A. Screening of depression in adolescents through the Internet : sensitivity and specificity of two screening questionnaires. *Eur Child Adolesc Psychiatry.* 2008; 17(1):32-8.
10. Carol A, Prescott CA, Mcardle JJ, Hishinuma ES, Johnson RC, Miyamoto RH, Andrade, NN, Edman J, Makini Jr, GK, Nahulu LB, Yuen NYC, & Carlton, BS. Prediction of Major Depression and Dysthymia From CES-D Scores Among Ethnic Minority Adolescents. *J Am Acad Child Adolesc Psychiatry.* 1998; 37 (5): 495–503.
11. American Psychiatric Association. Diagnostic and statistical manual of mental disorders, DSM-IV 4th ed. text rev. Washington, DC: American Psychiatric Association. 2000.
12. Lewinsohn PM, Seeley JR, Roberts RE, Allen NB. Center for Epidemiologic Studies Depression Scale (CES-D) as a screening instrument for depression among community-residing older adults. *Psychol Aging.* 1997; 12: 277-87.
13. Olsson G, & von Knorring AL. Depression among Swedish adolescents measured by the self rating scale Center for Epidemiology Studies-Depression Child (CES-DC). *Eur Child Adolesc Psychiatry.* 1997; 6(2): 81-87.
14. Khuon F, & Lavelle J. Indochinese versions of the Hopkins Symptom Checklist-25: a screening instrument for the psychiatric care of refugees. *Am J Psychiatry.* 1987; 144(4): 497-500.
15. Zweig MH, & Campbell G. Receiver-operating characteristic (ROC) plots: A fundamental evaluation tool in clinical medicine. *Clin Chem.* 1993; 39: 561–577.
16. Greiner M, Pfeiffer D, & Smith RD. Principles and practical application of the receiver-operating characteristic analysis for diagnostic tests. *Prev Vet Med.* 2000; 45(1): 23-41.
17. Fleiss JL, Levin B, & Paik MC. Statistical methods for rates and proportions. 2nd ed. Wiley; 1981.
18. Chabrol H, Montovany A, Chouicha K, & Duconge E. Study of the CESD on a sample of 1,953 adolescent students. *Encephale.* 2002; 28(5): 429-32.
19. Zich JM, Attkisson CC, & Greenfield TK. Screening for depression in primary care clinics: The CES-D and the BDI. *Int J Psychiatry Med.* 1990; 20: 259–277. doi:10.2190/LYKR-7VHP-YJEM-MKM2.
20. Husain R, Yusoff RM, Yaacob MJ, & Sulaiman Z. Depression and coping strategies among sexually abused children in a Malay community in Malaysia. *ASEAN Journal of Psychiatry.* 2009; 10: 169-180.

Corresponding author: Siti Raudzah Ghazali, Department of Psychological Medicine, Faculty of Medicine and Health Sciences, University Malaysia Sarawak, Lot 77 Section 22 KTL D, Jalan Tun Ahmad Zaidi Aduce, Kuching, 93150 Sarawak, Malaysia.

Email: gsraudzah@fmhs.unimas.my

Received: 8 December 2013

Accepted: 20 February 2014