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Research article

Reliability, validity and psychometric properties of the Greek translation of the zung depression rating scale

Konstantinos N Fountoulakis*[1], Apostolos Iacovides[1], Stavros Samolis[1], Soula Kleanthous[1], Stergios G Kaprinis[1], George St Kaprinis[1] and Per Bech[2]

Address: [1]3rd Department of Psychiatry, Aristotle University of Thessaloniki, Greece and [2]Frederiksborg General Hospital, Department of Psychiatry, Hillerod, Denmark

E-mail: Konstantinos N Fountoulakis* - kfount@med.auth.gr; Apostolos Iacovides - kfount@med.auth.gr; Stavros Samolis - samoliss@med.auth.gr; Soula Kleanthous - kfount@med.auth.gr; Stergios G Kaprinis - kaprinis@med.auth.gr; George St Kaprinis - kaprinis@med.auth.gr; Per Bech - gabean@fa.dk

*Corresponding author

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Abstract

Introduction: The current study aimed to assess the reliability, validity and psychometric properties of the Greek translation of the Zung Depression Rating Scale (ZDRS).

Methods: The study sample included 40 depressed patients 29.65 ± 9.38 years old and 120 normal comparison subjects 27.23 ± 10.62 years old. In 20 of them (12 patients and 8 comparison subjects) the instrument was re-applied 1–2 days later. Translation and Back Translation was made. Clinical Diagnosis was reached by consensus of two examiners with the use of the SCAN v.2.0 and the IPDE. Statistical Analysis included ANOVA, the Pearson Product Moment Correlation Coefficient, Principal Components Analysis and Discriminant Function Analysis and the calculation of Cronbach's alpha (α)

Results: Both Sensitivity and specificity exceed 90.00 at 44/45, Chronbach's alpha for the total scale was equal to 0.09, suggesting that the scale covers a broad spectrum of symptoms. Factor analysis revealed five factors (anxiety-depression, thought content, gastrenterological symptoms, irritability and social-interpersonal functioning). The test-retest reliability was satisfactory (Pearson's R between 0.92).

Conclusion: The ZDRS-Greek translation is both reliable and valid and is suitable for clinical and research use with satisfactory properties. Its properties are similar to those reported in the international literature, although the literature is limited. However one should always have in mind the limitations inherent in the use of self-report scales.

Background

The Zung Depression Rating Scale (ZDRS) [1] is a self-reporting instrument and was originally developed in order to assess depression symptoms without the bias of an administrator affecting the results. The items in the ZDRS scale may also help patients begin to discuss previously nebulous symptoms, especially those patients who present with physical symptoms of depression such as headache or insomnia.

The ZDRS is a well-known and world-widely used self-rating scale for the measurement of depression. Along with the Beck Depression Inventory [2] and the CES-D[3,4] these are the most popular self-administered instruments for the assessment of depression. They are supposed to be used as screening tools rather and not substitutes for an in-depth interview [5]. They can also be an efficient tool for screening patients for depression [6] and have been used successfully for many years in the primary care setting. Higher scores on this scale are indicative of more severe depression [7]

ZDRS consists of 20 items that cover affective, psychological, and somatic symptoms. The patient specifies the frequency with which the symptom is experienced (that is: a little = 1, some = 2, a good part of the time = 3, or most of the time = 4) [8].

Except from the use of the raw ZDRS score, another way to rate is the SDS index, which is obtained by dividing the ZDRS raw score with 80, which is the maximum score. Minimum score is 20. It is expected that most people with depression score above 50 (SDS index 0.62). A subject with ZDRS score below 50 is considered normal, with a score of 50–59 (SDS 0.62–0.74) is considered to suffer from mild depression, with score 60–69 (SDS 0.75–0.86) depression is considered moderate to marked, while with a score of 70 or above depression is considered to be severe.

The **aim** of the current study was to assess the reliability, validity and psychometric properties of the Greek translation of the Zung Depression Rating Scale

Material and methods

Material

Forty patients (25 males and 15 females) aged 29.65 ± 9.38 years (range 18–55) suffering from Major Depressive disorder according to DSM-IV [9] and depression according to ICD-10 criteria [10], and 120 normal comparison subjects (71 males and 49 females aged 27.23 ± 10.62 years (range 18–51) entered the study. In 20 of them (12 patients and 8 normal comparison subjects) the instrument was re-applied 1–2 days later.

Patients and normal comparison subjects were free of any medication for at least two weeks and were physically healthy with normal clinical and laboratory findings (Electroencephalogram, blood and biochemical testing, thyroid function, test for pregnancy, 12 and folic acid).

Patients came from the inpatient and outpatient unit of the 3rd Department of Psychiatry, Aristotle University of Thessaloniki, General Hospital AHEPA, Thessaloniki, Greece. They were consecutive cases and were chosen because they fulfilled the above criteria.

The normal comparison group was composed of members of the hospital staff and relatives of patients. A clinical interview confirmed that they did not suffer from any mental disorder and their prior history was free from mental and thyroid disorder.

All patients and normal comparison subjects provided written informed consent before participating in the study.

Note: the study sample was identical with that used for the CES-D standardization study[4]

Method

Translation and back translation was made by two of the authors, one of whom did not knew the original English text. The final translation was fixed by consensus.

Clinical diagnosis was reached by consensus of two examiners. The Schedules for Clinical Assessment in Neuropsychiatry (SCAN) version 2.0 [11,12] and the International Personality Disorders Examination (IPDE) [13–15] were used. Both were applied by one of the authors (KNF) who has official training in a World Health Organization Training and Reference Centre. The IPDE did not contribute to the clinical diagnosis of depression, but was used in the frame of a global and comprehensive assessment of the patients. The second examiner performed an unstructured interview.

Procedure

The identification of potential cases and normal comparison subjects was done first and subjects were referred for detailed evaluation. The use of structured interviews and the final consensus decision of the two examiners determined which subjects would be included in the study. Testing with the ZDRS followed.

Statistical analysis

Analysis of Variance (ANOVA) [16] was used to search for differences between groups. The Pearson Product Moment Correlation Coefficient R was calculated to assess the test-retest reliability. Principal Components Analysis (Varimax Normalized Rotation) was performed, and factor coefficients and scores were calculated. Finally, Discriminant Function Analysis was performed as well.

Item Analysis [17] was performed, and the value of Cronbach's alpha (α) for ZDRS and its factor subscales was calculated. Receiver Operator Characteristic Curves (ROC curves) and histogram of frequencies were created as well.

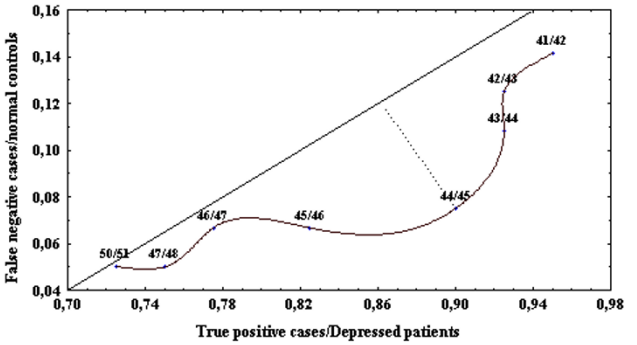

Figure 1
ROC analysis Curve-the score level 44/45 has the largest distance from the dichotomous

Results

The calculation of sensitivity (Sn) and specificity (Sp) at various cut-off levels showed that both variables exceed 90.00 at 44/45 (SDS 0.55/0.56), with 111 normal comparison subjects and 36 patients correctly classified. Nine 9 normal comparison subjects and 4 patients were classified into a wrong diagnostic group (table 1). Receiver Operation Curve Analysis (figure 1) confirmed these results.

Chronbach's alpha for the total scale was equal to 0.09, and this is a very low value, suggesting that the scale covers a broad spectrum of symptoms and represents a global assessment of depression.

The histogram of ZDRS scores in normal comparison subjects reveals that they do not follow the normal distribution in this population, but manifest a skewness towards lower values (figure 2).

The factor analysis of cases (varimax normalized rotation) revealed five factors (table 2). The first one explained 15% of total variance, included items No 1, 2, 4, 9 and 10 and largely reflects a factor of anxiety-depression. The second one explained 16% of total variance, included items No 11, 12, 14, 16, 17, 18 and 20 and largely reflects a cognitive (thought content) factor. The third factor explained 11% of total variance, included items No 5, 7 and 8 and reflects gastrenterological symptoms. The fourth explained 10% of total variance, included items No 11, 12 and 15 and represents an aspect of symptomatology similar with factor 2, with the addition of irritability. The last factor explained 13% of total variance, included items No 3, 6, 10 and 19 and reflects social and interpersonal functioning. Factor loadings and coefficients are shown in table 2. All five factors explained 64% of total ZDRS variance.

Chronbach's alpha for the individual factors (subscales that include the items that load in each one) was fair, with values from 0.23 to 0.45. Only factor 2 had high internal consistency with alpha equal to 0.86.

Depressed patients did not differ from normal comparison subjects in age. On the contrary they differed in every ZDRS individual item score and total score ($p < 0.001$ – table 3). It is very interesting that the two groups differed in the scores of factors 1, 3 and 5 ($p < 0.001$), that is in the essence of anxiety, depression, gastrenterological symptoms, and social and interpersonal functioning, but not in the score of factors 2 and 4, that is thought content and irritability.

The test-retest reliability proved to be satisfactory. Individual items had good Pearson correlation coefficients with lower for item No 6 (R = 0.51) and higher for item No 7 (R = 0.89). The coefficient for the total ZDRS score was excellent and equal to 0.92.

Discriminant function analysis results are shown in table 4. Two separate analyses were performed, with the forward stepwise method, one with individual ZDRS items and a second with factor scores. The first one performed excellently while the second one was fair. The results of the first one suggest that when the D-C equation, that is:

2.65*(itl) - 0.45*(it2) + 2.03*(it3) + 1.14*(it4) - 0.97*(it6) + 1.56*(it7) + 0.82*(it8) + 1.18*(it9) + 1.13*(it10) + 1.02*(it11) - 2.37*(it12) - 1.46*(it15) + 0.91*(itl6) + 0.97*(itl7) takes values above 15.52, then the subject is a depressed patient. This method correctly classified all normal comparison subjects and 90% of patients.

Table 1: Sensitivity and Specificity of ZDRS at various cut-off levels. The optimum is at level 44/45

ZUNG						
level	**tn**	**fp**	**fn**	**tp**	**Sn**	**Sp**
41/42	103	17	2	38	95.00	85.83
42/43	105	15	3	37	92.50	87.50
43/44	107	13	3	37	92.50	89.17
44/45	**111**	**9**	**4**	**36**	**90.00**	**92.50**
45/46	112	8	7	33	82.50	93.33
46/47	112	8	9	31	77.50	93.33
47/48	114	6	10	30	75.00	95.00
48/49	114	6	10	30	75.00	95.00
49/50	114	6	10	30	75.00	95.00
50/51	114	6	11	29	72.50	95.00

Table 2: Factor loadings and coefficients after Factor Analysis (Varimax normalized rotation) of normal comparison subjects and patients data

	Factor Loadings					Factor Coefficients				
	Factor	Factor	**Factor**	**Factor**	**Factor**	**Factor**	**Factor**	**Factor**	**Factor**	**Factor**
Item No	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
1	***0.53***	-0.30	-0.38	-0.23	0.45	0.12	0.07	-0.08	0.01	0.12
2	***-0.59***	0.44	0.08	0.03	0.25	-0.32	0.23	-0.06	-0.11	0.38
3	0.27	-0.17	-0.29	-0.07	***0.74***	-0.03	0.15	-0.06	0.09	0.41
4	***0.75***	-0.16	-0.07	-0.05	0.14	0.40	0.05	0.10	0.12	-0.07
5	-0.12	0.39	***0.66***	0.05	-0.12	0.10	0.10	0.38	-0.09	0.09
6	0.03	0.19	0.11	0.40	***-0.66***	0.24	-0.08	-0.06	0.24	-0.40
7	0.25	-0.24	***-0.70***	0.29	0.20	0.05	0.01	-0.44	0.37	-0.01
8	0.03	0.05	***-0.70***	-0.32	0.05	-0.13	0.17	-0.46	-0.16	-0.05
9	***0.73***	0.01	-0.03	-0.23	0.30	0.36	0.20	0.13	-0.03	0.09
10	***0.49***	-0.15	-0.26	-0.20	***0.46***	0.14	0.13	-0.03	0.00	0.18
11	-0.28	***0.43***	0.33	***0.47***	-0.12	0.03	0.11	0.07	0.22	0.12
12	-0.26	***0.43***	0.29	***0.43***	-0.25	0.06	0.09	0.04	0.20	0.01
13	0.63	-0.13	-0.38	-0.32	0.15	0.24	0.12	-0.12	-0.07	-0.08
14	-0.32	***0.51***	0.21	0.34	-0.26	0.01	0.15	-0.03	0.12	0.02
15	0.26	-0.14	0.01	***-0.72***	0.09	0.00	0.03	0.15	-0.47	-0.04
16	-0.21	***0.60***	0.13	0.29	-0.06	0.04	0.28	-0.06	0.12	0.15
17	0.05	***0.79***	0.10	-0.02	-0.17	0.18	0.44	-0.05	-0.09	0.06
18	-0.29	***0.64***	0.21	0.08	-0.41	0.02	0.22	-0.03	-0.09	-0.08
19	0.24	-0.46	0.14	0.31	***0.60***	0.06	-0.15	0.23	0.33	0.32
20	-0.24	***0.51***	0.12	0.32	-0.35	0.06	0.15	-0.09	0.13	-0.07
Expl. Var	3.08	3.14	2.22	1.93	2.50					
Prp. Totl	15%	16%	11%	10%	13%					
Total Var Expl					0.64%					

Discussion

Self-administered scales heavily depend on the co-operation and reading ability of the patient. On the other hand they save time for the clinician. More, translations are difficult to access because of publication in various languages or national journals [18–21].

The current study reports observations on the reliability, the validity and psychometric properties of the Greek translation of the Zung Depression Rating Scale. The results suggest that this translation is well suited for use in the Greek population with high sensitivity and specificity at the cut-off level 44/45 and high test-retest reliability.

The reliability and validity of the Zung Depression Rating Scale has been examined in only a limited number of studies and not many translations of this scale have been published. In the original study [1] this scale was found be able to differentiate between depressed patients and normal comparison subjects. Later studies showed the relationship of the scale with the clinician's assessment of severity, the Beck Depression Inventory, the D dimension of the MMPI and an unstable relationship with the Hamilton Depression Rating Scale [22–26].

The highest published cut-point for the ZDRS was 60/61 [27] and with an unusually low sensitivity for detecting major depression. Other studies generally accept the level 49/50 and report 97% sensitivity and 63% specificity.

In another study, 69 randomly selected medical outpatients were clinically evaluated for depressive illness. ZDRS identified 30% of those depressed while missing those whose depression was presented under the guise of somatic illness [28].

While there are data supporting the content and construct validity of the ZDRS, the evidence regarding its reliability

Table 3: Greek translation of the ZDRS and comparison between normal comparison subjects and patients

		depressed		normal comparison subjects		
SDS item No	**description**	**Mean**	**s.d.**	**Mean**	**s.d.**	**P**
Age		29.65	9.38	27.23	10.62	0.233
1	I feel down-hearted and blue Αισθάνομαι κακόκεφος και έχω τις μαύρες μου	3.08	0.87	1.43	0.59	***0.000***
2	Morning is when I feel the best Το πρωί αισθάνομαι καλύτερα	1.95	1.05	2.76	0.99	***0.000***
3	I have crying spells or feel like it Κλαίω ή μούρχεται να κλάψω	2.51	0.85	1.28	0.50	***0.000***
4	I have trouble sleeping at night 'Εχω προβλήματα με τον ύπνο μου τη νύχτα	2.44	1.14	1.32	0.70	***0.000***
5	I eat as much as I used to Τρώω όσο έτρωγα συνήθως	2.08	0.96	3.07	0.93	***0.000***
6	I enjoy looking at, talking to and being with attractive women/men Μου αρέσει να κοιτάω, να μιλάω και να βρίσκομαι με ελκυστικές γυναίκες/άνόρες	2.15	1.16	3.33	0.92	***0.000***
7	I notice that I am loosing weight Παρατηρώ ότι χάνω βάρος	2.28	1.07	1.27	0.56	***0.000***
8	I have trouble with constipation 'Εχω πρόβλημα δυσκοιλιότητας	1.92	1.20	1.22	0.57	***0.000***
9	My heart beats faster than usual Η καρδιά μου χτυπά γρηγορότερα απ΄ το συνηθισμένο	2.28	1.05	1.30	0.51	***0.000***
10	I get tired for no reason Κουράζομαι χωρίς να υπάρχει λόγος	2.90	1.02	1.47	0.73	***0.000***
11	My mind is as clear as I used to be Το μυαλό μου είναι τόσο καθαρό όσο ήταν πάντα.	2.21	0.95	3.20	0.96	***0.000***
12	I find it easy to do the things I used to Μου είναι εύκολο να κάνω τα πράγματα που πάντα έκανα	1.56	0.64	3.15	0.97	***0.000***
13	I am restless and can't keep still Ειμαιαν ήσυχος και δε μπορώ να καθήσω ακίνητος.	2.77	0.90	1.61	0.79	***0.000***
14	I feel hopeful about the future Αισθάνομαι αισιόδοξα για το μέλλον	1.87	0.92	3.18	1.00	***0.000***
15	I am more irritable than usual Είμαιπερι σσδτερο ευερέθιστοζ από το συνηθισμένο	7.38	0.96	1.87	0.94	***0.003***
16	I find it easy to make decisions Το βρίσκω εύκολο να παίρνω αποφάσειζ	2.08	0.93	2.75	0.96	***0.000***
17	I feel that I am useful and needed Αισθάνομαι ότι είμαι Χρήσιμοζ και με έΧουν ανάγκη	2.51	1.14	3.00	0.93	***0.008***
18	My life is pretty full Η ζωή μου είναι γεμάτη	1.69	1.00	3.22	0.91	***0.000***
19	I feel that others would be better off if I were dead Αισθάνομαι ότι θα ήταν καλύτερα για τουζ άλλουζα νεγώ πέθαινα	1.67	0.93	1.07	0.42	***0.000***
20	I still enjoy the things I used to do Ακόμα απολαμβάνω τα πράγματα που συνήθιζα να κάνω.	1.87	1.13	3.20	0.95	***0.000***
ZDRS score		54.26	8.97	32.98	7.88	***0.000***
Fact 1 score	Anxious and depressed affect	0.71	1.34	-0.24	0.72	***0.000***
Fact 2 score	Thought content	-0.20	0.97	0.07	1.00	0.135
Fact 3 score	Gastrenterological problems	-0.54	1.39	0.18	0.76	***0.000***
Fact 4 score	Irritability	-0.34	1.17	0.11	0.92	0.012
Fact 5 score	Social Functioning	0.63	1.28	-0.21	0.79	***0.000***

Table 4: Discriminant Function Analysis Results.

A

Classification Functions				Classification Matrix			
SDS item No	**normal comparison subjects**	**depressed**	**D-C**	*Rows: Observed classifications*			
Constant	-47.84	-63.36	-15.52	*Columns: Predicted classifications*			
Item No 1	4.50	7.15	2.65		**% Correct**	**normal comparison subjects**	**depressed**
Item No 2	2.32	1.87	-0.45	**Comp subjects**	100.00	120	0
Item No 3	4.05	6.08	2.03	**depressed**	90.00	4	36
Item No 4	3.10	4.24	1.14	**Total**	97.50	124	36
Item No 6	3.00	2.03	-0.97				
Item No 7	3.19	4.74	1.56				
Item No 8	3.32	4.14	0.82				
Item No 9	1.35	2.53	1.18				
Item No 10	2.04	3.17	1.13				
Item No 11	4.46	5.48	1.02				
Item No 12	3.12	0.75	-2.37				
Item No 15	4.59	3.12	-1.46				
Item No 16	2.06	2.98	0.91				
Item No 17	0.02	0.99	0.97				

B

Classification Functions				Classification Matrix			
Factor No	**normal comparison subjects**	**depressed**	**D-C**	*Rows: Observed classifications*			
Constant	-0.42	-2.63	-2.21	*Columns: Predicted classifications*			
Factor 1	-0.43	1.30	1.72		**% Correct**	**normal comparison subjects**	**depressed**
Factor 2	0.12	-0.37	-0.49	**Comp subj**	95.00	114	6
Factor 3	0.32	-0.98	-1.30	**depressed**	72.50	11	29
Factor 4	0.21	-0.62	-0.83	**Total**	89.38	125	35
Factor 5	-0.38	1.15	1.53				

Analysis with individual ZDRS items entering the procedure. When the equation: 2.65*(itl) - 0.45*(it2) + 2.03*(it3) + 1.14*(it4) - 0.97*(it6) + 1.56*(it7) + 0.82*(it8) + 1.18*(it9) + 1.13*(it10) + 1.02*(itll) - 2.37*(it12) - 1.46*(it15) + 0.91*(itl6) + 0.97** itl7) > 15.52 is true, then the subject is a depressed patient. This method correctly classified all normal comparison subjects and 90% of patients. B: Analysis with factor scores entering the procedure. When the equation: 1.72*(f1) - 0.49*(f2) - 1.3*(f3) - 0.83*(f4) + 1.53*(f5) > 2.21 is true, then the subject is a depressed patient. This method correctly classified 95% of normal comparison subjects and 72.5% of patients

is not conclusive. For the purpose of exploring the psychometric properties of the ZDRS, two studies were done using subjects from two markedly different socio-cultural settings: 213 male and female drug addicts in New York City and 206 male and female undergraduates in Nigeria. Findings included high coefficient alphas and large average item-correlations (total minus item) in both studies. It was concluded that the ZDRS rates well in terms of internal consistency reliability and construct validity [29].

Using both the English version and an Igbo translation of ZDRS in 132 first-time attenders to a hospital-based gen-

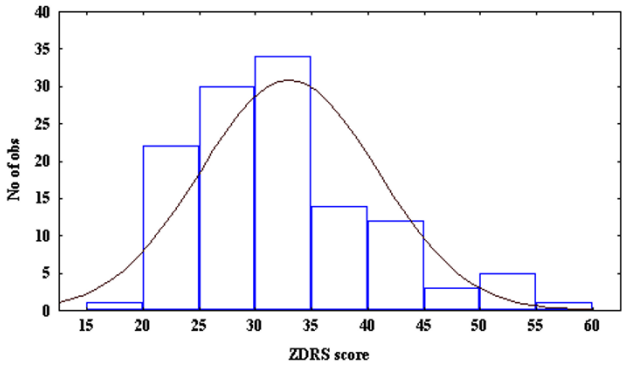

Figure 2
Histogram of ZDRS scores in Control subjects

eral outpatient clinic a prevalence rate of 25% for depressive symptoms was obtained. Fourteen percent scored within the range for "mild depression", while 11% obtained scores within the range for "moderate depression" [30].

Review studies on various self-administered instruments suggest that there is no significant difference between various self-administered depressive scales in terms of performance. Overall sensitivity is around 84% and specificity around 72% [31]. These instruments are of particular value in primary care settings because it is clear that primary care providers fail to diagnose and treat as many as 35% to 50% of patients with depressive disorders [32,33]. Depression is one of the most common psychiatric diagnoses in primary care populations [34]; major depressive disorders can be diagnosed in 6% to 9% of such patients. Obstacles to the appropriate recognition of depression include inadequate provider knowledge of diagnostic criteria; competing comorbid conditions and priorities among primary care patients; time limitations in busy office settings; concern about the implications of labeling; poor reimbursement mechanisms; and uncertainty about the value, accuracy, and efficiency of screening mechanisms for identifying patients with depression. Given that 50% to 60% of persons seeking help for depression are treated exclusively in the primary care setting, accurate detection in this setting is important [35] and self – administered instruments may help to ameliolate some of them. Many studies have assessed the effect of feedback of scale scores on physician practice patterns [36–45] and have shown improved recognition of depression with such feedback.

On the other hand, it should be noted that the diagnosis of depression is itself based on symptoms. A patient cannot truly be asymptomatic and have major depressive disorder. Thus, these screening questionnaires are actually being evaluated for their ability to detect unrecognized, rather than strictly asymptomatic, depressive symptoms and disease.

The Canadian Task Force on the Periodic Health Examination found fair evidence to exclude the use of depression detection tests from the periodic health examination of asymptomatic people [46]. The American Academy of Family Physicians advises physicians to remain alert for depressive symptoms in adolescents and adults [47]; this policy is under review. The American Medical Association recommends that all adolescents be asked annually about behaviors or emotions that indicate recurrent or severe depression [48].

Conclusion

The Greek translation of the ZDRS scale is both reliable and valid and is suitable for clinical and research use with satisfactory properties. However one should always have in mind the limitations inherent in the use of self-reporting scales.

The very low internal consistency of the scale, reported by the current study suggests that the ZDRS is not a unidimensional scale. It is also evident that its development was not based on the contemporary definition of depression but rather on that of the sixties. Thus, although sensitivity and specificity were proved to be high, the interpretation of its results should be made with caution.

Competing interests

None declared

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