

# A Comparison of the Psychometric Strengths of the Public-domain Zung Self-rating Depression Scale with the Proprietary Beck Depression Inventory-II in Barbados

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## ABSTRACT

**Objective:** To compare the psychometric strengths of two venerable measures of depression, the Zung Self-rating Depression Scale (Zung SDS) and the Beck Depression Inventory-II (BDI-II) in a Caribbean university student population and to provide researchers and clinicians interested in measures of depression with psychometric evidence that differentiates the two instruments for a Caribbean sample.

**Methods:** Undergraduate student volunteers ( $n = 415$ ; 75% females, 25% males; mean age = 25.2 years) completed the instruments as part of a larger study. Correlational analyses evaluated internal consistency reliabilities. Missing value analyses and corrected item-total correlations are also reported for each scale.

**Results:** The BDI-II demonstrated marginally superior internal consistency reliability ( $\alpha = 0.88$ ) than the Zung SDS ( $\alpha = 0.85$ ). Correlation between the Zung SDS and the BDI-II was strong ( $r = 0.67$ ,  $p < 0.01$ ). The Zung SDS was less psychometrically adequate, only 53% of respondents (compared to 81% for the BDI-II) completed the entire form, suggesting that the structure or wording of the questions may be problematic. Comparison of corrected item-total correlations and missing value analyses indicates that many Zung SDS items are problematic. A preliminary effort to evaluate the factor structure of the Zung SDS was complicated by the large number of missing values.

**Conclusion:** Head-to-head comparison of the Zung SDS and the BDI-II indicates that the BDI-II demonstrates superior psychometric properties. This paper does not evaluate sensitivity and specificity; nonetheless, researchers interested in measures of depressive symptoms and clinicians looking for a tool to assess depression in Barbados can be confident in the strong psychometric properties of the BDI-II demonstrated thus far. Modified versions of the Zung SDS merit further research.

**Keywords:** Caribbean, depression, psychometrics, university students

## Comparación de las Fortalezas Psicométricas de la Escala de Zung para la Autoevaluación de la Depresión (SDS) – de Dominio Público – con el Inventario de Depresión de Beck II – de Código Cerrado – en Barbados

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## RESUMEN

**Objetivo:** Comparar la fortaleza psicométrica de dos instrumentos de medición de la depresión altamente apreciados: la Escala de Zung para la autoevaluación de la depresión (Zung SDS) y el Inventario de Depresión de Beck II (BDI-II), en una población de estudiantes universitarios del Caribe, y proporcionar a los investigadores y clínicos interesados en la medición de la depresión, evidencias psicométricas que diferencian los dos instrumentos en una muestra caribeña.

**Métodos:** Estudiantes voluntarios de pregrado ( $n = 415$ ; 75% hembras, 25% varones; edad promedio = 25.2) completaron los instrumentos como parte de un estudio mayor. Los análisis correlacionales evaluaron las confiabilidades de la consistencia interna. También se reportan el análisis de valores perdidos y las correlaciones ítem-total corregidas, para cada escala.

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**Resultados:** *El BDI-II demostró una confiabilidad de consistencia interna marginalmente superior ( $\alpha = 0.88$ ) a la de la Escala de Zung SDS ( $\alpha = 0.85$ ). La correlación entre la Escala de Zung SDS y el Inventario BDI-II fue alta ( $r = 0.67$ ,  $p < 0.01$ ). La Escala de Zung SDS fue menos adecuada psicométricamente; sólo el 53% de los encuestados (en comparación con el 81% para el BDI-II) respondieron el cuestionario totalmente, lo cual sugiere que la estructura o la formulación de las preguntas podrían haber sido problemáticas. La comparación de las correlaciones ítem-total corregidas y los análisis de valores perdidos indican que muchos ítems en la Escala de Zung SDS son problemáticos. Un esfuerzo preliminar por evaluar la estructura factorial de la Escala de Zung SDS, se complicó por el gran número de valores perdidos.*

**Conclusión:** *La comparación estrecha de la Escala Zung SDS con el BDI-II indica que este último posee propiedades psicométricas superiores. El presente trabajo no evalúa ni la sensibilidad ni la especificidad. No obstante, los investigadores interesados en las medidas de síntomas depresivos y los clínicos que buscan una herramienta para evaluar la depresión en Barbados, pueden estar seguros de la fortaleza de las propiedades psicométricas demostradas por el Inventario BDI-II hasta el momento. Las versiones modificadas de la Escala de Zung SDS merecen ulterior investigación.*

**Palabras claves:** Caribeño, depresión, psicométricas, estudiantes universitarios

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## INTRODUCTION

Depression has been identified as a key public health problem facing the Caribbean (1) and has been found to be associated with negative outcomes in the region, such as burnout and absenteeism (2), and obesity (3). In Barbados, research has focussed on decreased maternal willingness to breastfeed (4) and maternal depressive symptoms affecting infant cognitive development (5). In addition, depressive symptoms appear to be a psychological consequence of major public health problems, such as chronic diseases (6). Hence, there is a need to establish reliable, valid and cost-effective measures of depression for Caribbean people.

The measurement of depressive symptoms in university students is worthy of study both because of the relative lack of research attention to this area in the Caribbean and because this population places unique demands on clinicians. Although the prevalence of psychiatric disorders in university students is equivalent to that in non student peers (7), some authors have suggested that the prevalence and severity is increasing in university mental health services (8). A recent survey of university students in the United States of America (USA) reported 15.6% point prevalence for depression and anxiety disorders, as well as a two per cent self-report of suicidal ideation in the past two weeks (9).

The Beck Depression Inventory (BDI) is one of the most thoroughly researched self-report depression inventories with both clinical and non-clinical samples (10). The Beck Depression Inventory-II (11) is a 21-item revision of the original BDI designed to measure the presence and severity of depression. The revision focussed particularly on DSM-IV criteria for depression with a stated goal of adding, eliminating, or reworking items to conform to diagnostic criteria. The paper-and-pencil test takes only five minutes to complete and is appropriate for ages 13 to 80 years. The brevity and simplicity of the BDI-II support use in a wide variety

of settings, including outpatient counselling, inpatients and primary care. The range of possible scores is 0 to 63. The manual suggests the following cutoff scores: 0–13 (minimal depression), 14–19 (mild), 20–28 (moderate) and 29–63 (severe). However, the manual indicates that these ranges can be adjusted based on the characteristics of the sample. The BDI instruments are the most widely researched measure of depression. In the Caribbean, studies supporting the psychometric strength of the original BDI and the BDI-II are available from Jamaica (12), Barbados (13) and Puerto Rico (14).

The Zung Self-rating Depression Scale [Zung SDS] (15) is a 20-item likert-style (4-point) rating scale for depression and has the advantage of being available in the public domain *ie* at no cost to the assessor. A modified version of the Zung SDS has been used to assess depression in recent research in Trinidad and Tobago (16–18). For the present study, we employed the original version of the Zung for two reasons: first, the Zung was administered *via* interview in the studies in Trinidad and Tobago because of the “low literacy rate of the target populations” (18). The adult literacy rate in Barbados is reported to be 97.6% (17); hence, it was viable to administer the instrument as originally designed. Second, the original version of the Zung has been validated in a much larger number of settings and with larger samples than those used in the studies in Trinidad and Tobago, which speaks to its durability and ample research base.

The Zung SDS was developed as a short, simple and quantitative self-report measure of depression. The scale attempts to include all of the symptoms of depression. The items aim to penetrate the affective, behavioural, cognitive and physiological aspects of depression. The items were selected on the basis of the diagnostic criteria for depression and factor analytic studies.

The Zung SDS can be completed in five minutes and the instructions for scoring are simple. There are no training requirements, and the instrument has been widely used. The Zung SDS has been used in a variety of other countries such as the Netherlands (20), Colombia (21), China (22) and Japan (23).

The factorial structures of the Zung SDS and the BDI-II have been well established with a number of populations. A recent meta-analysis (18) suggests that both instruments are composed of a relatively well-defined set of 2–3 factors. Two-factor models of the BDI-II have been supported, for university student populations, in North America and the Caribbean (13, 19).

It is important to recognize that students, as a population, have distinctive characteristics pertaining to depressive symptoms. Students are susceptible to momentary distress that may result in temporary elevated scores on self-report measures but not merit a diagnosis of depression (20). Therefore, although students' self-report measures of depressive symptoms may not necessarily generalize well to other groups, as a non-clinical sample they offer a reliable opportunity for the purpose of comparing the Zung SDS and the BDI-II in a single time frame.

The present study is part of an ongoing effort to establish valid, convenient, and cost-effective measures of depression and anxiety for use in the Anglophone Caribbean (27, 28). We hope that this explicit comparison of both instruments will inform researchers interested in measures of depression and clinicians' choices for screening and evaluation of depression.

## SUBJECTS AND METHODS

Four hundred and fifteen undergraduate university students (75% women, mean age = 25.2 years) participated on a voluntary basis during class time. Volunteers received no compensation; participation was subject to informed consent. This study was reviewed by the local ethics committee and complies with standards in Barbados.

In addition to the Zung SDS and the BDI-II, participants completed the State-Trait Anxiety Inventory-Trait version [STAI-T] (29), the Ego Resiliency-89 [ER-89] (30), and the Perceived Stress Scale-10 item version [PSS] (31) as part of a larger study. In the present study, these three instruments were employed as measures of concurrent validity of the BDI-II and the Zung SDS.

The STAI-T is a widely used 20-item measure of trait anxiety rated on a 4-point likert scale. The manual reports strong reliability in North American populations *eg* strong internal consistency (alphas ranging from 0.86 to 0.92 and test-retest reliability ranging from 0.65 to 0.7). In the present sample, alpha for the STAI-T was 0.88.

The PSS is a self-report instrument designed to assess the degree to which situations and circumstances in one's life are appraised as stressful. The instrument presents a series of questions using a 5-point likert scale. Higher scores reflect

higher reported levels of stress. The PSS has high coefficient alpha reliabilities, generally 0.75 and above (32). In the present sample, alpha for the PSS was 0.79.

The ER-89 is a 14-item self-report measure developed for research purposes. This scale has been used as a predictor of coping and has generally good reliability *eg* coefficient alpha values approaching 0.80 (30). In the present sample, Cronbach's alpha for the ER-89 was 0.76.

Students completed the questionnaire in groups during class time. Including oral instructions, approximate administration time was 25 minutes. Psychometric properties were assessed using internal consistency and test-retest reliabilities, correlational analysis of concurrent validities, and factor analytic techniques.

## RESULTS

Four hundred and fifteen students completed all or part of the Zung SDS and the BDI-II. Eighty-two per cent ( $n = 341$ ) completed the entire BDI-II; however, only 53% ( $n = 223$ ) completed the entire Zung SDS; 49% ( $n = 202$ ) completed both instruments. The BDI-II demonstrated good internal consistency reliability ( $\alpha = 0.88$ ) which was slightly stronger than that of the Zung SDS ( $\alpha = 0.84$ ). The BDI-II scores correlated with those of the Zung SDS ( $r = 0.67$ ,  $p < 0.01$ ). Our psychometric report on the BDI-II, including the results of confirmatory factor analysis, has been previously published (27). Convergent and discriminant validity measures were all significant and in the theoretically expected directions (Table 1).

Table 1: Concurrent validity comparison among the BDI-II, Zung SDS, ER-89, STAI-T, and PSS-10

	BDI-II	Zung SDS	PSS-10	STAI-T
Zung SDS	0.71 (202)			
PSS-10	0.61 (328)	0.62 (216)		
STAI-T	0.69 (312)	0.65 (210)	0.71 (362)	
ER-89	-0.35 (316)	-0.46 (207)	-0.31 (364)	-0.40 (340)

Note: Numbers in parentheses indicate total  $n$  for each pair;  $p < 0.01$  for all values.

BDI-II: Beck Depression Inventory-II; Zung SDS: Zung Self-rating Depression Scale; STAI-T: State-Trait Anxiety Inventory-Trait version; ER-89: Ego Resiliency-89; PSS: Perceived Stress Scale-10 item version.

Corrected item-total correlations and missing value analyses for both instruments are reported in Tables 2 and 3. Only one BDI-II item ("Loss of interest in sex") had a response rate below 95%. However, not one of the 20 Zung SDS items achieved a response rate equal to or greater than 95%. The range of corrected item-total correlations for the BDI-II was 0.27 to 0.58; the range for the Zung SDS was 0.17 to 0.65. It is clear that the dramatically lower response rates to the Zung SDS raise serious questions about the adequacy of items.

Qualitative review of the omitted items suggests some particular difficulties with individual questions. First, for

Table 2: Missing value analysis and corrected item-total correlations for the Beck Depression Inventory-II

Item	Corrected Item-total Correlation	Number Missing	Per cent
1. Sadness	0.51	18	4.3
2. Pessimism	0.51	4	1.0
3. Past failure	0.41	1	0.2
4. Loss of pleasure	0.56	1	0.2
5. Guilty feelings	0.43	2	0.5
6. Punishment feelings	0.43	3	0.7
7. Self-dislike	0.55	3	0.7
8. Self-criticalness	0.56	3	0.7
9. Suicidal thoughts or wishes	0.49	3	0.7
10. Crying	0.52	5	1.2
11. Agitation	0.48	5	1.2
12. Loss of interest	0.54	6	1.4
13. Indecisiveness	0.56	9	2.2
14. Worthlessness	0.52	7	1.7
15. Loss of energy	0.45	4	1.0
16. Changes in sleep	0.35	11	2.7
17. Irritability	0.54	7	1.7
18. Changes in appetite	0.48	9	2.2
19. Concentration difficulty	0.58	6	1.4
20. Tiredness or fatigue	0.44	4	1.0
21. Loss of interest in sex	0.27	31	7.5

would be to revise item wording to focus on dating or intimate relationships instead of sexual activity. A second area of concern is the wording of the four response categories on the Zung SDS. In particular, the minimum category of response is "a little of the time". Participants noted objections to the item by writing "N/A" or "never" in a number of instances, particularly for items referencing sexual activity, suicidality, and death wish.

Lastly, we attempted an exploratory factor analysis (EFA) of the Zung SDS to evaluate the factor structure in a Barbadian student population. This analysis proved problematic largely as a function of missing values. Following the recommendations of Costello and Osborne, we employed principal axis factoring with a promax rotation in an attempt to extract viable factors (33). The EFA suggested a 3 to 5-factor model with most eigenvalues clustering around 1 (Table 4). In general, factor loadings were quite low (*eg*, < 0.40) for the majority of items on any factor (Table 5). Consequently, following standard recommendations for elimination of items would leave only a small number of items loading on each factor. This raises a number of serious concerns about the theoretical structure and clinical utility of the Zung SDS. In contrast, our previously reported confir-

Table 3: Missing value analysis and corrected item-total correlations for the Zung Self-rating Depression Scale

Item	Corrected Item-total Correlation	Number Missing	Per cent
1. Downhearted and blue	0.61	26	6.3
2. Feel best in morning	0.17	23	5.5
3. Crying spells	0.53	42	10.1
4. Trouble sleeping	0.42	37	8.9
5. Eating	0.26	29	7.0
6. Enjoy sex	0.31	95	22.9
7. Losing weight	0.27	53	12.8
8. Constipation	0.19	70	16.9
9. Fast heartbeat	0.33	58	14.0
10. Tired	0.48	51	12.3
11. Clear mind	0.64	32	7.7
12. Easy to do things	0.65	30	7.2
13. Restless	0.25	42	10.1
14. Hopeful	0.54	29	7.0
15. Irritable	0.34	50	12.0
16. Decision-making	0.60	30	7.2
17. Useful and needed	0.59	34	8.2
18. Full life	0.49	41	9.9
19. Better off dead	0.33	93	22.4
20. Enjoy things	0.58	42	10.1

both instruments, the most omitted item queried enjoyment or interest in sex. Interestingly, a number of students provided additional information in the margins, particularly for the Zung SDS. The most common comment was "N/A" or "does not apply". Considering that the largest demographic group in the sample was unmarried women, questions specifically querying sexual activity may have been uncomfortable (or even taboo) for some respondents. One alternative

matory factor analysis (CFA) of the BDI-II (27) suggested a 2-factor model, which is consistent with findings of earlier studies (24).

## DISCUSSION

The Zung SDS and the BDI-II have previously demonstrated good internal consistency in a Barbadian university student sample (13). However, item analysis and factor analytic

Table 4: Total variance explained for the Zung Self-rating Depression Scale

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Total
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	
1	5.34	26.72	26.72	4.86	24.31	24.31	4.29
2	1.89	9.44	36.16	1.37	6.84	31.16	2.93
3	1.52	7.62	43.78	0.82	4.11	35.28	2.42
4	1.25	6.27	50.06	0.59	2.96	38.24	2.48
5	1.08	5.38	55.44	0.44	2.195	40.43	0.92

Table 5: Structure matrix for the Zung Self-rating Depression Scale

	Factor				
	1	2	3	4	5
Z1	0.41	0.55	0.79	0.38	0.18
Z2	0.12	0.07	0.08	0.11	0.30
Z3	0.33	0.49	0.72	0.34	0.06
Z4	0.22	0.63	0.41	0.17	-0.14
Z5	0.25	0.05	0.14	0.46	0.08
Z6	0.27	0.07	0.27	0.39	0.07
Z7	0.07	0.22	0.21	0.41	0.08
Z8	0.11	0.14	0.43	0.19	0.06
Z9	0.22	0.52	0.25	0.25	0.16
Z10	0.39	0.48	0.21	0.34	0.46
Z11	0.71	0.53	0.25	0.58	0.13
Z12	0.71	0.45	0.26	0.70	0.28
Z13	0.20	0.45	0.15	0.01	0.14
Z14	0.65	0.38	0.19	0.32	0.24
Z15	0.25	0.37	0.22	0.14	0.37
Z16	0.73	0.38	0.24	0.27	0.29
Z17	0.78	0.23	0.38	0.23	0.15
Z18	0.60	0.22	0.12	0.25	0.07
Z19	0.26	0.30	0.36	0.08	-0.25
Z20	0.70	0.32	0.27	0.54	0.19

procedures reveal serious psychometric problems with the Zung SDS. This may be a function of both wording and content of items. The present study provides empirical support for preferential use of the BDI-II to assess depression in Barbadian university students. The Zung SDS is an attractive option economically, because the instrument is in the public domain and, therefore, may be copied and administered without concern for copyright. Thus, clinicians in settings with limited resources may be tempted to forgo use of the BDI-II, which has a retail cost of approximately US\$150 per package of 100. However, the BDI-II demonstrated psychometric superiority in the present study, and a much larger international research base establishes the reliability, validity, and clinical utility of the BDI-II. This study is limited by the sample size and composition and may not generalize easily beyond university populations. Further research should include samples more diverse in terms of age, gender and setting. Additionally, this study utilized the original version of the Zung SDS and, therefore, is not a direct comparison to prior research (16–18) conducted in Trinidad and Tobago using a modified version of the instrument.

Research on university student populations has intrinsic merit, but research on other groups, particularly clinical populations, is important to further establish the utility of the BDI-II in the Caribbean. Although the results do not permit generalization from student populations to the general population, the findings nevertheless should be useful to clinicians assessing adolescents and young adults in a broad range of treatment settings. Future research should consider utilizing a clinical sample of patients attending both public clinics and private practice offices, which would provide support for expanded use for both research and practice.

#### AUTHOR NOTE

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