

Evaluation of the CES-D in Six Countries Using Rasch Item Response Theory (IRT) Analysis

Bushnell DM¹ and Whalley D²

¹Health Research Associates, Seattle, Washington, USA; ²Galen Research, Manchester, UK

OBJECTIVES

To evaluate the scaling properties of the Centers for Epidemiologic Studies – Depression Scale (CES-D) in six countries through the application of the one-parameter (Rasch) IRT model.

METHODS

Data Collection:

Data taken from the Longitudinal Investigation of Depression Outcomes (LIDO). Patients coming for care at participating primary care facilities were invited to complete the screening assessment. Using a cut-point of 16 or above on the CES-D, those who met eligibility criteria (i.e., age 18-75, able and willing to participate in all scheduled visits, provide adequate locator information, willing to sign consent), were enrolled and invited to a baseline visit. The following analysis utilizes this baseline data.

Analysis:

Rasch Item Response Theory provides:

- a method for obtaining objective, fundamental, linear measures from stochastic observations of ordered category responses.
- estimates of item locations (calibrations) along a common measurement continuum expressed in log-odd units (logits) with standard errors.
- information-weighted fit (INFIT) and outlier-sensitive fit (OUTFIT) statistics expressed in mean square (MNSQ) and standardized (ZSTD) values.

LIDO

Longitudinal Investigation of Depression Outcomes (LIDO) is a multi-national, multi-site, longitudinal study of depression outcomes in six countries: Israel, Spain, Australia, Brazil, USA, and Russia. The study is funded by the National Institute of Mental Health (NIMH) and the National Alliance for Mental Illness (NAMI). The study is led by Dr. David C. Bushnell, Director of Health Research Associates, Seattle, WA, USA, and Dr. David Whalley, Director of Galen Research, Manchester, UK. The study is a collaborative effort between Health Research Associates, Galen Research, and the National Institute of Mental Health (NIMH). The study is a multi-national, multi-site, longitudinal study of depression outcomes in six countries: Israel, Spain, Australia, Brazil, USA, and Russia. The study is funded by the National Institute of Mental Health (NIMH) and the National Alliance for Mental Illness (NAMI). The study is led by Dr. David C. Bushnell, Director of Health Research Associates, Seattle, WA, USA, and Dr. David Whalley, Director of Galen Research, Manchester, UK. The study is a collaborative effort between Health Research Associates, Galen Research, and the National Institute of Mental Health (NIMH).

RESULTS

Sample:



Table 1: Sociodemographics

	Age (mean (SD))	Gender (% female)	Marital (% married)	Education (mean yrs)	Income* (USD) (median/month)
Be'er Sheva	41.4 (14.3)	62	67	11.9 (2.7)	842
Barcelona	41.5 (15.2)	71	56	10.7 (3.4)	564
Melbourne	39.4 (14.3)	65	26	12.5 (3.8)	491
Porto Alegre	39.9 (13.6)	75	53	9.3 (3.4)	178
Seattle	41.8 (15.0)	67	48	13.3 (2.3)	1700
St. Petersburg	47.0 (16.2)	72	45	11.8 (3.5)	35

Table 2: Items Statistics by country (Logits, Standard Errors, INFIT and OUTFIT values)

CES-D Item	ISRAEL					SPAIN					AUSTRALIA					BRAZIL					USA					RUSSIA				
	Calibration	Real SE	Info	Inf	Outf	Calibration	Real SE	Info	Inf	Outf	Calibration	Real SE	Info	Inf	Outf	Calibration	Real SE	Info	Inf	Outf	Calibration	Real SE	Info	Inf	Outf	Calibration	Real SE	Info	Inf	Outf
CESD1: I feel lonely	-0.11	0.05	1.00	0.99	0.99	-0.11	0.05	1.00	0.99	0.99	-0.11	0.05	1.00	0.99	0.99	-0.11	0.05	1.00	0.99	0.99	-0.11	0.05	1.00	0.99	0.99	-0.11	0.05	1.00	0.99	0.99
CESD2: I feel sad	0.11	0.05	1.00	0.99	0.99	0.11	0.05	1.00	0.99	0.99	0.11	0.05	1.00	0.99	0.99	0.11	0.05	1.00	0.99	0.99	0.11	0.05	1.00	0.99	0.99	0.11	0.05	1.00	0.99	0.99
CESD3: I feel hopeless	0.21	0.05	1.00	0.99	0.99	0.21	0.05	1.00	0.99	0.99	0.21	0.05	1.00	0.99	0.99	0.21	0.05	1.00	0.99	0.99	0.21	0.05	1.00	0.99	0.99	0.21	0.05	1.00	0.99	0.99
CESD4: I feel that I was just as good as other people and I felt hopeful about the future	0.31	0.05	1.00	0.99	0.99	0.31	0.05	1.00	0.99	0.99	0.31	0.05	1.00	0.99	0.99	0.31	0.05	1.00	0.99	0.99	0.31	0.05	1.00	0.99	0.99	0.31	0.05	1.00	0.99	0.99
CESD5: I feel that I was just as good as other people and I felt hopeful about the future	0.41	0.05	1.00	0.99	0.99	0.41	0.05	1.00	0.99	0.99	0.41	0.05	1.00	0.99	0.99	0.41	0.05	1.00	0.99	0.99	0.41	0.05	1.00	0.99	0.99	0.41	0.05	1.00	0.99	0.99
CESD6: I feel that I was just as good as other people and I felt hopeful about the future	0.51	0.05	1.00	0.99	0.99	0.51	0.05	1.00	0.99	0.99	0.51	0.05	1.00	0.99	0.99	0.51	0.05	1.00	0.99	0.99	0.51	0.05	1.00	0.99	0.99	0.51	0.05	1.00	0.99	0.99
CESD7: I feel that I was just as good as other people and I felt hopeful about the future	0.61	0.05	1.00	0.99	0.99	0.61	0.05	1.00	0.99	0.99	0.61	0.05	1.00	0.99	0.99	0.61	0.05	1.00	0.99	0.99	0.61	0.05	1.00	0.99	0.99	0.61	0.05	1.00	0.99	0.99
CESD8: I feel that I was just as good as other people and I felt hopeful about the future	0.71	0.05	1.00	0.99	0.99	0.71	0.05	1.00	0.99	0.99	0.71	0.05	1.00	0.99	0.99	0.71	0.05	1.00	0.99	0.99	0.71	0.05	1.00	0.99	0.99	0.71	0.05	1.00	0.99	0.99
CESD9: I feel that I was just as good as other people and I felt hopeful about the future	0.81	0.05	1.00	0.99	0.99	0.81	0.05	1.00	0.99	0.99	0.81	0.05	1.00	0.99	0.99	0.81	0.05	1.00	0.99	0.99	0.81	0.05	1.00	0.99	0.99	0.81	0.05	1.00	0.99	0.99
CESD10: I feel that I was just as good as other people and I felt hopeful about the future	0.91	0.05	1.00	0.99	0.99	0.91	0.05	1.00	0.99	0.99	0.91	0.05	1.00	0.99	0.99	0.91	0.05	1.00	0.99	0.99	0.91	0.05	1.00	0.99	0.99	0.91	0.05	1.00	0.99	0.99
CESD11: I feel that I was just as good as other people and I felt hopeful about the future	1.01	0.05	1.00	0.99	0.99	1.01	0.05	1.00	0.99	0.99	1.01	0.05	1.00	0.99	0.99	1.01	0.05	1.00	0.99	0.99	1.01	0.05	1.00	0.99	0.99	1.01	0.05	1.00	0.99	0.99
CESD12: I feel that I was just as good as other people and I felt hopeful about the future	1.11	0.05	1.00	0.99	0.99	1.11	0.05	1.00	0.99	0.99	1.11	0.05	1.00	0.99	0.99	1.11	0.05	1.00	0.99	0.99	1.11	0.05	1.00	0.99	0.99	1.11	0.05	1.00	0.99	0.99

Similar patterns were noted across the six countries as shown by the goodness-of-fit statistics (see Table 2). Three items with MNSQ values below the recommended range (<0.85 indicating redundancy) were identical at each site (*I felt depressed, I felt sad, and I could not shake off the blues*). Furthermore, items that were above the range (>1.25 indicating that they yield responses that do not conform to the response patterning of most other items) included two of the positively framed items: *I felt that I was just as good as other people and I felt hopeful about the future*. All items covered the construct well for most language versions, although some gaps in measurement were observed (see Figure 1). Finally, some degree of item overlap/redundancy was evident in all language versions, with several items sharing the same location on the underlying construct.

Table 3: Measurement Continuum by Country

Israel	Spain	Australia	Brazil	USA	Russia
cesd19	cesd19	cesd15	cesd19	cesd19	cesd15
cesd15	cesd15	cesd19	cesd15	cesd15	cesd19
cesd09	cesd09	cesd17	cesd17	cesd17	cesd17
cesd17	cesd10	cesd02	cesd02	cesd02	cesd02
cesd10	cesd10	cesd09	cesd10	cesd10	cesd10
cesd02	cesd17	cesd02	cesd09	cesd09	cesd01
cesd13	cesd02	cesd03	cesd09	cesd03	cesd05
cesd20	cesd13	cesd01	cesd13	cesd13	cesd03
cesd14	cesd03	cesd04	cesd04	cesd04	cesd13
cesd04	cesd05	cesd03	cesd04	cesd04	cesd20
cesd03	cesd14	cesd20	cesd14	cesd14	cesd09
cesd06	cesd07	cesd14	cesd05	cesd05	cesd19
cesd05	cesd20	cesd05	cesd18	cesd18	cesd06
cesd08	cesd06	cesd09	cesd06	cesd06	cesd04
cesd01	cesd18	cesd06	cesd08	cesd08	cesd08
cesd18	cesd04	cesd18	cesd07	cesd07	cesd18
cesd07	cesd11	cesd16	cesd16	cesd16	cesd11
cesd11	cesd12	cesd07	cesd20	cesd20	cesd07
cesd16	cesd16	cesd12	cesd12	cesd12	cesd12
cesd12	cesd08	cesd11	cesd11	cesd11	cesd12

A similar item hierarchy (using item calibrations from Table 2) can be seen across the six countries. The hierarchy goes from the more difficult to endorse items at the top (i.e., items 19 and 15) to the easier to endorse at the bottom (i.e., items 11 and 12).

CONCLUSION

Although the CES-D is a commonly employed measure of depression severity, it may be necessary to take a closer look at its scalability. Such information is vital for the appropriate use and interpretation of multi-center and multi-national data resulting from this instrument.