

Rasch analysis to test the cross-cultural item equivalence of the Alzheimer's Disease Assessment Scale – Cognitive (ADAS-Cog)

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BACKGROUND

Introduction: Bias is a significant challenge to the validity of cognitive tests. Differential item functioning (DIF) is present when different groups have differing responses on test items, after controlling for overall ability. Differential Item Functioning (DIF) investigates the items in a test, one at a time, for signs of interactions with sample characteristics. Item functioning is intended to be invariant with respect to aspects of the participants, such as gender, ethnicity and cultural status. The DIF analysis for one item is as independent as possible of the DIF analyses of the other items. But a consequence is that the overall impact of item DIF, accumulated across the whole test, is unclear.

Test Bias across cultures : It has long been documented that there is no such thing as a culture free test, to the extent that cultural bias-the constant and systematic statistical error due to ethnic group membership-can undermine the validity of a test.¹ The construct or behavior sampled in a given item or combination of items may not be associated with the construct in question in the same way across all cultures. Additionally, the individual items in a test may be established on specific cultural norms, or the meaning of the item can vary across cultures. There are a number of operational issues when evaluating cross-cultural differences using results obtained from rating scales².

Methodological Question: As the ADAS-Cog is translated and utilized across many countries, identifying items that show DIF for various geo-cultural groups, can help guide rater training and data monitoring programs to develop tailored training across cultures. Do test items on the ADAS-Cog function in different ways for different geo-cultural groups?

METHODS

Selection of Geo-Cultural Groups

Data were obtained from the CODR CPATH dataset. Data were grouped according to culture, with attention focused on the presence and impact of clinical trials. The subsequent groups were delineated prior to considering the amount of available data for each geo-cultural group and include raters who were likely to share more culturally within each group. The authors acknowledge that culture is social and is not strictly rooted in geography or lineage.

The groups are intended solely for the purpose of this study. Hence, we overlook the multiple cultural subjectivities and hybridity³, acculturation and appropriation, and variability that exist within and between the groups composed for this study. Similar groupings have been identified in our previously published study⁴.

Sample characteristics and geo-cultural groupings

Geo-cultural group	Countries	N
Africa	South Africa	95
Australia	Australia, New Zealand	164
Eastern Asia	Singapore, Taiwan, Hong Kong	46
Northern Europe	Belgium, Czech Republic, Aland (Finland), Germany, Netherlands, Poland, Great Britain, Norway, Sweden, Austria, Denmark	503
Russia	Russia	23
Southern Europe	Bulgaria, Romania, Spain, France, Italy	334
United States of America	United States of America (US), Canada	2571
TOTAL		3736

Eastern Asia and Russia were not included in the analysis due to small sample size. A principle components analysis assessed unidimensionality of the subscales. Differential Item Functioning (DIF) analysis examined cross-cultural differences among each item of the ADAS-Cog.

Rasch and Differential Item Functioning (DIF) Analyses

The Rasch measurement model assumes that the probability of an item score is a function of the difference between the subject's level of cognitive functioning and the level of the cognitive symptom expressed by the item. The Mantel-Haenszel statistic was used for identification of DIF. The procedure was performed in jMetrik (version 3.0, 2013) and produces effect size computation and Educational Testing Services (ETS) DIF classifications:

A= Negligible DIF
B= Slight to Moderate DIF
C= Moderate to Large DIF

RESULTS

Comparison group was North America (US and Canada)

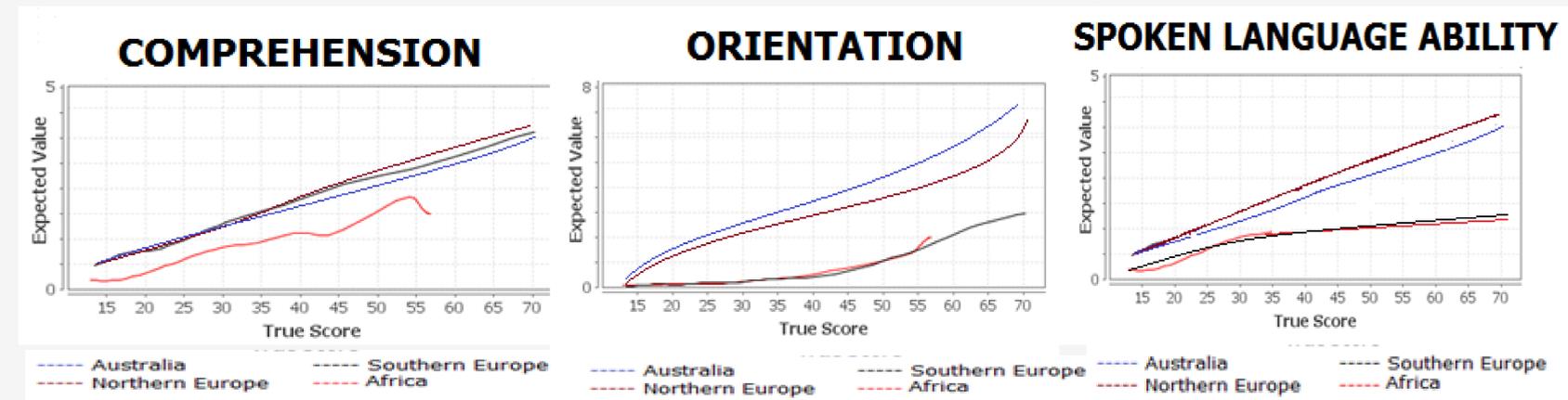
A= Negligible DIF; B= Slight to Moderate DIF; C= Moderate to Large DIF

Differential Functioning can be a result of the understanding of the item construct, the administration of the item, or the scoring of the item

- : Favors reference group (indicating the item is harder for this group, than the comparison group (North America))

+ : Favors the focused group (indicating the item is easier for this group, than the comparison group, (North America)).

Item	Africa	Australia	Northern Europe	Southern Europe
Comprehension	CC-	AA-	AA-	AA-
Commands	AA-	AA-	BB-	BB-
Constructional Praxis	BB-	AA-	BB-	BB-
Word Finding Difficulty in Speech	AA+	BB-	AA-	AA-
Ideational Praxis	BB-	BB-	AA-	AA-
Naming Objects and Fingers	AA+	AA+	AA+	BB-
Orientation	AA+	CC-	BB-	AA+
Word Recognition Task	BB-	BB-	BB-	BB-
Remembering Test Instructions	AA+	AA+	AA+	AA+
Word Recall Tasks	CC-	CC-	BB-	BB-
Spoken Language Ability	CC-	BB-	BB-	CC-



- Moderate to significant differential item functioning ($p \leq .0038$) was found for all groups for the Word Recognition Task, Word Recall and Comprehension of Spoken Language subtests, with Africa showing the most significant differences compared to North America (the comparison group).
- Individuals in Africa also had significant difficulties scoring the Comprehension subtest. Australia and Northern Europe also had difficulties with the Orientation subtest.

CONCLUSIONS

- The results highlight the need for thorough individualized training and data review on the ADAS-Cog across different groups (geo-cultural), to reduce sources of unreliability.
- The results showed support to further assess administration and scoring of specific items across cultural groups.
- There is need for targeted training in specific subtests for multicenter clinical trials that are implemented at international sites, and an emphasis on appropriate cross cultural testing, cultural and language adaptation of the ADAS-Cog.

REFERENCES

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DISCLOSURES AND CONTACT INFORMATION

A Khan is a full-time employee of NeuroCog Trials, Durham, NC, USA, and has received support from National Institute of Health, Janssen, Astellas, Celgene and Stanley Medical Research Foundation. AS Atkins is a full-time employee of NeuroCog Trials, Durham, NC, USA, and has received support from National Institute of Mental Health. I Stroescu, is employees of NeuroCog Trials. RSE Keefe currently or in the past 3 years has received investigator-initiated research funding support from the Department of Veteran's Affairs, Feinstein Institute for Medical Research, GlaxoSmithKline, National Institute of Mental Health, Novartis, Psychogenics, Research Foundation for Mental Hygiene, Inc., and the Singapore National Medical Research Council. He currently or in the past 3 years has received honoraria, served as a consultant, or advisory board member for AbbVie, Akebia, Amgen, Asubio, AviNeuro/ChemRx, BiolineRx, Biogen Idec, Biomarin, Boehringer-Ingelheim, Eli Lilly, EnVivo/FORUM, GW Pharmaceuticals, Janssen, Lundbeck, Merck, Minerva Neurosciences, Inc., Mitsubishi, Novartis, NY State Office of Mental Health, Otsuka, Pfizer, Reviva, Roche, Sanofi/Aventis, Shire, Sunovion, Takeda, Targacept, and the University of Texas South West Medical Center. Dr. Keefe receives royalties from the BACS testing battery, the MATRICS Battery (BACS Symbol Coding) and the Virtual Reality Functional Capacity Assessment Tool (VRFCAT). He is also a shareholder in NeuroCog Trials and Sengenix.

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