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COMMENTARY

Rasch modeling of IQCODE scores in people with dementia

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The Informant Questionnaire for Cognitive Decline in the Elderly (IQCODE; Jorm and Jacomb, 1989) is an informant-rated instrument which is useful in situations in which the person being assessed for cognitive impairment is unable or unwilling to undergo cognitive testing, or where there may be a question about the validity of cognitive testing. Its performance as a screening tool is comparable to that of cognitive screening tests such as the Mini-Mental State Examination). Limitations on face-to-face consultations during the COVID-19 pandemic have opened up another use for the IQCODE as an adjunct to telephone testing methods such as the Telephone Interview for Cognitive Status-Modified (Brandt *et al.*, 1993).

The IQCODE has been validated against other measures of cognitive change (Jorm *et al.*, 1996), clinical diagnosis (Jorm, 2004; van Nieuwkerk *et al.*, 2021), brain autopsy findings (Rockwood *et al.*, 1998), neuroimaging findings (Cordoliani-Markowiak *et al.*, 2003), incident dementia (Louis *et al.*, 1999), and mortality (Jorm, 2004). It has also been the subject of a Cochrane review (Quinn *et al.*, 2021).

The original IQCODE has 26 items, and the Short IQCODE (also known as IQCODE-16) has 16 items (Jorm, 1994). Each item is rated on a 5-point Likert scale from "Much improved" (1) to "Much worse" (5). For example, "Recalling conversations a few days later" is item 5 on the IQCODE and item 3 on the Short IQCODE. The informant is asked to rate how the person is now in comparison with how they were 10 years ago. Both major forms of the IQCODE are available in multiple languages and can be used without a licence fee. The Short IQCODE has been reported to be correlated 0.98 with the original version (Jorm, 2004), and it is now in widespread use.

In clinical use, the standard method of calculating a total score involves dividing the summed item scores by either 26 for the IQCODE or by 16 for the Short IQCODE. This method generates a score out of 5, with higher scores indicating greater cognitive decline over the previous 10 years. When screening for dementia, the developers have recommended using cutting points on the IQCODE of 3.27/3.30 and on the Short IQCODE of 3.31/3.38, whereas other researchers have proposed cutting points between 3.27 and 4.00 (Jorm, 2004). The thresholds for detecting clinically significant cognitive decline vary by the prior probability of cognitive impairment in the population under test (e.g., memory clinic attendees versus population samples), but are straightforward to apply.

The clinical utility of the IQCODE depends critically upon the availability of a suitable informant, who needs to have known the patient for the previous 10 years. It also relies upon truth telling by the informant, so is likely to have limitations in both civil and criminal medicolegal assessments. It may be influenced more generally by the response style of the informant and by the demand characteristics of the assessment situation, including social desirability. The IQCODE does not substitute for detailed clinical history-taking because it does not provide information about clinical course or trajectory, and it is silent as to etiology.

A potential problem with the IQCODE Likert scores is that the individual items may not be of equivalent "difficulty" and as a consequence the summed scores form an ordinal scale rather than a linear one (Boone, 2016). The Rasch model provides a mathematical method for dealing with this problem. Rasch analysis, named for Danish mathematician Georg Rasch, employs a statistical approach that is most often applied to categorical or ordinal data, including data from questionnaires. The Rasch model seeks to capture the trade-off between item difficulty and respondent ability and can be understood as a special case of item response theory (Raykov and Marcoulides, 2018). A polytomous Rasch model can be applied to Likert scales that measure a characteristic or ability using successive integers. Rasch models allow such nonlinear data to be converted into linear form, allowing interrogation using parametric statistics (Boone, 2016). Linear transformation has

advantages for psychometric scale development and subsequent modification, as well as in research applications.

Against this background, Truong *et al.* (2021) applied Rasch analysis to Short IQCODE data from the Memory and Ageing Study (MAS). The MAS is a longitudinal observational study based on a sample of nondemented community-residing individuals aged 70–90 years at enrolment drawn from the electoral rolls of the eastern suburbs of Sydney, Australia. The sample was of homogeneous white European ethnicity and at baseline participants lived mainly in private dwellings. The MAS participants have been seen biennially and extensively investigated (Sachdev *et al.*, 2010).

From 1,037 MAS participants, Truong *et al.* (2021) identified 400 for Rasch analysis. These included 109 participants with dementia at Wave 6 and a random sample of 291 from the 814 participants who did not have dementia at Wave 6. They combined 10 locally dependent Short IQCODE items into five "super-items" to improve the fit of the model and then identified the best model that allowed conversion of raw ordinal data into interval-level data. They found a small but statistically significant difference between the ordinal raw scores and the interval-level Rasch scores. The mean Rasch score was slightly higher than the mean raw score, and a conversion table was provided. The interval-level Rasch scores were independent of the informant's gender, age, and relationship to the MAS participant. The authors acknowledged that their MAS sample lacked ethnic diversity, was recruited from an affluent area of Sydney, and may not generalize well to other older adults.

From a pragmatic perspective, a typical Short IQCODE mean score of, say, 4.00 in a person with cognitive impairment seen in a memory clinic would correspond to an MAS raw ordinal score of 64 and an MAS Rasch interval-level score of 64.96. As a regular user of the Short IQCODE, I doubt a difference of this magnitude would alter my clinical decision making. However, in conducting research using the Short IQCODE, I would be happy to employ the interval-level data generated through Rasch analysis.

References

Boone, W. J. (2016). Rasch analysis for instrument development: Why, When, and How? *CBE Life Sciences Education*, 15, rm4.

Brandt, J., Welsh, K. A., Breitner, J. C., Folstein, M. F., Helms, M. and Christian, J. C. (1993). Hereditary influences on cognitive functioning in older men. A study of 4000 twin pairs. *Archives of Neurology*, 50, 599–603.

Cordoliani-Mackowiak, M. A., Henon, H., Pruvo, J. P., Pasquier, F. and Leys, D. (2003). Post-stroke dementia: influence of hippocampal atrophy. *Archives of Neurology*, 60, 585–590.

Jorm, A. F. and Jacomb, P. A. (1989). The Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE): socio-demographic correlates, reliability, validity and some norms. *Psychological Medicine*, 19, 1015–1022.

Jorm, A. F. (1994). A short form of the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE): development and cross-validation. *Psychological Medicine*, 24, 145–153.

Jorm, A. F. (2004). The Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE): a review. *International Psychogeriatrics*, 16, 1–19.

Jorm, A. F., Christensen, H., Henderson, A. S., Jacomb, P. A., Korten, A. E. and Mackinnon, A. (1996). Informant ratings of cognitive decline of elderly people: relationship to longitudinal change on cognitive tests. *Age and Ageing*, 25, 125–129.

Louis, B., Harwood, D., Hope, T. and Jacoby, R. (1999). Can an informant questionnaire be used to predict the development of dementia in medical inpatients? *International Journal of Geriatric Psychiatry*, 14, 941–945.

Quinn, T. J., Fearon, P., Noel-Storr, A. H., Young, C., McShane, R. and Stott, D. J. (2021). Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE) for the detection of dementia within community dwelling populations. *Cochrane Database Systematic Reviews*, 2021, CD010079.

Raykov, T. and Marcoulides, G. A. (2018). *A Course in Item Response Theory and Modelling with Stata*. College Station, TX: Stata Press.

Rockwood, K. *et al.* (1998). Retrospective diagnosis of dementia using an informant interview based on the Brief Cognitive Rating Scale. *International Psychogeriatrics*, 10, 53–60.

Sachdev, P. S. *et al.* (2010). The Sydney Memory and Ageing Study (MAS): methodology and baseline medical and neuropsychiatric characteristics of an elderly epidemiological non-demented cohort of Australians aged 70-90 yeas. *International Psychogeriatrics*, 22, 1248–1264.

Truong, Q. *et al.* (2021). Enhancing precision of the 16-item Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE-16) using Rasch methodology. *International Psychogeriatrics*, 3, 1–11. DOI 10.1017/S1041610221002568.

Van Nieuwkerk, A. C., Pendlebury, S. T., Rothwell, P. M. and Oxford Vascular Study (2021). Accuracy of the Informant Questionnaire on Cognitive Decline in the Elderly for detecting pre-existing dementia in transient ischaemic attack and stroke. *Stroke*, 52, 1283–1290.

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