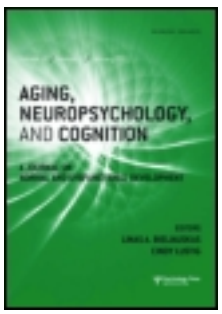

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Screening for Dementia Using an Informant Interview*

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ABSTRACT

The effectiveness of an informant interview as a screening and assessment instrument for dementia was evaluated in a community survey of 398 people aged 78 or over. Participants received a battery of neuropsychological tests and were diagnosed for dementia by *Diagnostic and Statistical Manual of Mental Disorders*, 4th ed. (DSM-IV; American Psychiatric Association, 1994) criteria. Informants were independently interviewed about changes in everyday cognitive functioning over the previous five years. A factor analysis of the 31 items from the informant interview showed a large general factor. A long 31-item scale was constructed, as well as a short 12-item scale. The long scale had a sensitivity of 89% and a specificity of 89% for detecting dementia, while the short scale had a sensitivity of 83% and a specificity of 87%. Correlations with subtests of the neuropsychological battery ranged between .4 and .7. The informant scales were less affected by premorbid ability and education than was the Mini-Mental State Examination (MMSE).

Cognitive tests have a central place in screening and assessment of dementia. However, reports from an informant can provide useful complementary information on everyday cognitive functioning. While an informant history is commonly taken in clinical practice, there has been comparatively little work on developing formal assessment tools which gather data from an informant (Jorm, 1996). What evidence there is suggests that questionnaires directed at an informant perform as well as brief cognitive tests at screening for dementia (Jorm, 1997).

An advantage provided by an informant history is that it allows an assessment of change in cognitive performance from earlier in life, whereas cognitive tests only allow an assessment of current functioning. Although methods have been devised to estimate premorbid cognitive functioning, these are only partly successful (O'Carroll et al., 1995). It is well known that cognitive screening tests are associated with level of education, leading to concerns about test bias (Kittner et al., 1986), but informant-based assessments are virtually free of such an association (Jorm, 1996). Other advantages of informant-based assessment over traditional cognitive assessment include relevance to everyday functioning, less threat to the self-esteem of the person being assessed, possible use with nontestable or deceased participants in research studies, possibility of mail or telephone administration, and greater cross-cultural portability.

On the other hand, informant-based assessments may have disadvantages of their own. There is evidence that they can be affected by the emotional state of the informant and by the quality of the relationship between the patient and the informant (Jorm, 1996). Another limitation is that informant-based measures seem to only assess a global factor of cognitive decline,

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with no capacity to detect patterns of differential deficit (Jorm, 1996).

The present paper examines the validity of the Concord Informant Dementia Scale, an informant interview covering a range of domains affected by dementia. The aim of the paper is to assess the factorial structure of the interview, to develop a short screening test from the items in the interview, to evaluate the test at screening for dementia, to assess its associations with a range of neuropsychological tests, and to see whether it is affected by informant characteristics.

METHOD

Participants

Participants were taken from the Sydney Older Persons Study, a longitudinal study of elderly people living in an area of Sydney, Australia (Waite et al., 1996, 1997). The first wave of the study involved 630 community living elderly, aged 75 or over, recruited using two random samples: 320 participants from a local area probability sampling scheme and 327 participants from a war veterans/widows listing in the same local area, with response rates of 73% and 82% respectively (17 veteran participants were sampled again in the community sample; their data are used once throughout this paper). The second wave of the study was carried out three years later with 449 participants, representing a response rate from those traceable and still living of 95%. The data used in the present paper come from participants in the second wave who had an informant interview covering cognitive changes. There were 385 participants (174 males and 211 females) with the required data. The mean age of these participants was 83.9 years (range 78–99). Years of education was measured with a mean of 10 and a range of 3–19.

Procedure

The participants received a medical/neurological assessment by a physician experienced in geriatric medicine. This assessment included a standardized medical history examining both past and current health, a neuropsychological test battery, and detailed medical and neurological examination. Dementia was diagnosed according to DSM-IV criteria A and B (American Psychiatric Association, 1994). Amongst those meeting this definition, a subdiagnosis of Alzheimer's disease (AD) was made on the basis of National Institute of Neurological and Communicative Disorders and Stroke and the Alzheimer's Disease and Related Disorders Association (NINCDS-ADRDA) probable/possible criteria (McKhann et al., 1984), and vascular dementia was assessed according to DSM-IV criteria. Cases of dementia were rated for severity following Cullen, Grayson and Jorm (1996). The assessment included the MMSE (Folstein, Folstein, & McHugh, 1975) and the following neuropsychological tests.

Memory

Participants were given the Logical Memory I and II and Visual Reproduction I and II subtests from the Wechsler Memory Scale-Revised (Wechsler, 1987) and the Reid Memory Test, a word-list learning task in which a list of 7 words has to be recalled over 5 learning trials (Reid et al., 1996).

Verbal fluency

Participants were asked to give as many words as possible that fit a particular category in 60 seconds (Lezak, 1995). The categories were words beginning with F, words beginning with A, words beginning with S, and animals. The F, A, and S scores were totalled.

Premorbid intelligence

The National Adult Reading Test was used to estimate premorbid intelligence (Nelson, 1982). This test requires the participant to read aloud 50 irregularly spelled words. The test correlates highly with general intelligence and is relatively resistant to decline in mild dementia.

Constructional ability

Participants were asked to copy a cube and the drawing was scored from 1 to 9, reflecting the number of visible edges reproduced (Moore & Wyke, 1984). They were also asked to draw a large clock and set the hands at 3:30 (Strub & Black, 1985). The clock was scored based on global impression, from normal through mild and moderate to severe deficit.

Confrontation naming

A 24-item short form of the Boston Naming Test (Kaplan, Goodglass, & Weintraub, 1983) was used to index performance in this domain. Because of time constraints in the interview, the full test was not used. Previous experience with this test had shown that some of the omitted items behaved inappropriately in our Australian context.

Reasoning/Judgment
A 10-item short form of the Similarities subtest of the Wechsler Adult Intelligence Scale-Revised (Wechsler, 1981) was used to estimate verbal abstraction and reasoning.

Informant Interview
One of several social scientists carried out an interview with an informant nominated by the participant. The social scientist administered the Concord Informant Dementia Scale, a standardized 31-item questionnaire designed to assess changes over the previous five years. The questions were chosen to cover the domains in the Clinical Dementia Rating (CDR; Hughes, Berg, Danziger, Coben, & Martin, 1982), namely memory (8 items), orientation (4 items), judgment and problem solving (3 items), involvement in community affairs (3 items), involvement in home and hobbies (6 items), and personal care (3 items). A further 4 items were added to cover language. Many of the questions were taken or adapted from the Informant Questionnaire on Cognitive Decline in the Elderly (Jorm & Jacomb, 1989). Each item was rated on a scale from 0 (*no, there has been no change*) to 3 (*much worse*). The Appendix shows the first 12 items which comprise the Short Concord Informant Dementia Scale (SCIDS). The validation of this short informant scale is the major aim of the present paper. The informant interview was not used by the physician in making a diagnosis of dementia.

In addition, informant stress was measured with the General Health Questionnaire (Goldberg & Williams, 1988), and informant life satisfaction (Neugarten, Havinghurst, & Tobin, 1961) and aspects of participant-informant personal bonding (Wilhelm & Parker, 1988) were considered.

Ethics
The study was approved by Central Sydney Area Health Service of the New South Wales Department of Health. Informed consent was obtained from both participants and informants after the procedures were fully explained.

Statistical Analysis
Receiver operating characteristics (ROCs) were used to evaluate the ability of the scales to discriminate dementia cases from noncases. The effectiveness of informant scales as screening tests for dementia was assessed by calculating sensitivity and specificity against all possible cutpoints and choosing the cutpoint which maximized sensitivity plus specificity. A principal components analysis was carried out on the 31 items from the informant questionnaire, and LISREL structured factor analysis models addressed the factor structure of the items. The internal reliability of informant scales was assessed using coefficient alpha. Associations of informant scales with other variables were assessed with Pearson correlation coefficients. Because of the large number of correlations examined, the $p < .01$ significance level was used. Missing values were removed listwise throughout all analyses. Analyses involving dementia diagnoses thus used only 360 of the 385 subjects who had informant scale data.

RESULTS

Table 1 shows the means for the MMSE and the long and short informant scales, over the dementia diagnosis categories of nondemented, mild, moderate and severe. The MMSE appears to discriminate best between moderate and severe levels, while both informant scales also discriminate among the lower levels of dementia and well. Figure 1 shows the operating characteristics of the 3 scales against a dichotomous dementia diagnosis of nondemented versus mild or worse. When the long informant scale was evaluated as a screening test for dementia, a cutpoint of between 6 and 7 gave a sensitivity of 89%, a specificity of 89%, and an ROC area of 0.91. For the short informant scale, a cutpoint of between 3 and 4 gave a sensitivity of 83%, a specificity of 87% and an ROC area of 0.89. The MMSE with cutpoint between 23 and 24 had sensitivity and specifity of 0.84 and 0.88, respectively, with an ROC area of 0.93.

A principal components analysis of the 31 informant items showed a large general factor which accounted for 72% of the variance (eigenvalue of 22.2). The next four factors accounted for only 4%, 3%, 2%, and 2% of the variance with eigenvalues 1.3, 0.8, 0.7, and 0.6 respectively, strongly supporting a single factor solution. To investigate possible factor structures corresponding to the domains among the 31 items (memory, orientation, etc.), several LISREL models were attempted. We encountered convergence problems in all of these models, excepting a single factor model, and a 7-factor model where each factor was defined by loading only to the items in just one of the 7-

Table 1. Mini-Mental State Examination (MMSE) and Clinical Dementia Rating (CDR) Scale Scores for each Level of Dementia Diagnosis.

	Dementia diagnosis			
	Well	Mild	Moderate	Severe
n	261	28	51	20
%	72.5%	7.8%	14.2%	5.6%
		MMSE (R^2 = 76%)		
Mean[a]	26.4	22.1	19.8	5.9
		31-item CDR (R^2 = 75%)		
Mean	33.7	47.2	68.9	112.3
		12-item SCIDS (R^2 = 69%)		
Mean	13.6	19.3	27.5	43.7

Note. SCIDS = Short Concord Informant Dementia Scale.
[a] On each scale, all means differed from each other by the Scheffe 0.05 criterion.

item domains. The latent correlations among these 7 factors averaged 0.91 (*SD* of 0.05). That is, our data would not allow other than a single factor solution.

The 31 items were scored to give a scale ranging from 0 to 93. The internal reliability of the scale was very high (alpha = .99). Given this high reliability, it is apparent that a shorter scale would be quite adequate. However, because of the way the interview was structured, with a separate introduction for each section, it was not feasible to choose the best items from each section. Instead, the first two sections (memory and orientation) were selected to evaluate a short 12-item scale with scores ranging from 0 to 36. Internal reliability of the short scale was .97.

The long and short informant scales correlated –.80 and –.77, respectively, with the MMSE. Table 2 shows the correlations with the sociodemographic characteristics of the subjects and with the neuropsychological tests. For comparison, the table also shows the correlations of the MMSE with the same variables. It can be seen that the MMSE had higher correlations with all the neuropsychological tests than the informant scales, while the correlations with the short scale were only marginally lower than with the long scale. The table also shows that the informant scales were less affected by education and premorbid intelligence than was the MMSE.

Table 3 shows the correlations of the screening tests with characteristics of the informants. Whether assessed with an informant scale or the MMSE, greater cognitive impairment was associated with poorer mental health and lower life satisfaction in the informant, and with a lower level of perceived care from the subject. Of the informants, 19% were wives, 3% husbands, 36% daughters, 17% sons, 20% other females, and 4% other males. Frequency of face-to-face contact was relatively high, with 46% in daily contact, 12% more than once weekly, 19% weekly, 16% once/twice monthly, 7% several times yearly, and only 1% yearly or less. In logistic regression models predicting dementia diagnosis from the long or short informant scales, neither type of relationship (5 degrees of freedom) nor amount of contact (1 degree of freedom) moderated the informant scale-dementia relationship significantly.

Unfortunately, we do not have test-retest reliability data. However, the clinician making diagnoses also completed a CDR assessment. This involved making ''anchored'' judgments on 6 of the 7 domains in the long informant scale – memory, orientation, judgment, community affairs, hobbies, and personal care. A total score made from these ratings correlated .90 with the long informant scale and .86 with the short scale. Thus, there seems little room for rater un-

Fig. 1. Receiver operating characteristic (ROC) curves for Mini-mental State Examination (MMSE), and long and short informant scales against a dementia diagnosis (DX) of well versus mild, moderate, or severe.

reliability to be intruding in either of the informant scales.

Of the 99 subjects with a dementia diagnosis, 57 had AD but no vascular dementia, 18 had vascular dementia but no AD, 15 had both AD and vascular dementia, and the remaining 9 subjects had only other dementias. When analysis of variance contrasted these four groups on MMSE and the long and short informant scales, p values of .12, .07 and .22, respectively, were obtained. (The AD and vascular groups had effectively equal scores on all measures, with the worst scores occurring in the mixed AD and vascular group, and the best in the group having

Table 2. Correlations of Screening Tests with Sociodemographic Characteristics of Subjects and Neuropsychological Test Performance.

Subject characteristic	Long Informant Scale	Short Informant Scale	Mini-Mental State Examination
Sociodemographics			
Age	.16*	.14*	–.26**
Sex (male)	–.06	–.06	.09
Years of education	–.02	–.01	.11
Neuropsychological Tests			
Logical Memory I	–.56**	–.55**	.66**
Logical Memory II	–.47**	–.47**	.58**
Visual Reproduction I	–.60**	–.58**	.68**
Visual Reproduction I	–.44**	–.44**	.50**
Verbal Fluency – FAS	–.49**	–.47**	.59**
Verbal Fluency – Animals	–.58**	–.56**	.67**
National Adult Reading Test	.32**	.31**	–.54**
Cube Copying	–.52**	–.51**	.64**
Clock Drawing	.54**	.51**	–.64**
Reid Memory Test	–.73**	–.71**	.81**
Boston Naming Test	–.62**	–.60**	.71**
Similarities	–.40**	–.39**	.53**

* $p < .01$. ** $p < .001$.

only other dementias.) Thus, in a community population these instruments do not discriminate among specific types of dementia.

DISCUSSION

Despite the fact that the informant interview covered a broad range of functioning, the principal components analysis revealed that it was measuring only a single general factor. This finding confirms earlier work on informant questionnaires showing that they measure global decline rather than differentiated neuropsychological functioning (Jorm, 1996). It is possible, however, that various domains of cognitive decline might differentiate in a different population, for instance one with a higher prevalence of dementia. In the present sample, 72.5% were nondemented.

Because of the high reliability of the interview, it was possible to construct a much shorter interview which covered only memory and orientation, with no loss of reliability. The short informant interview, SCIDS, performed very well as a screening test for dementia. The sensitivity of 83% and specificity of 87% compares favourably with the results of other screening tests. A recent meta-analysis of studies comparing an informant questionnaire with a brief cognitive test found average sensitivities and specificities of 86% and 80% respectively for informant questionnaires, and 79% and 80% for brief cognitive tests (Jorm, 1997). In interpreting these sensitivities and specificities, it must be borne in mind that the gold standard of clinical diagnosis is itself imperfect, so that the maximum possible sensitivity and specificity will be lower than 100%. It is also important to point out that the cutoff between 3 and 4, which balanced sensitivity and specificity in the present community sample, may not be optimal in clinical populations. This remains a matter for further research.

The SCIDS also had high correlations with the neuropsychological tests. These correlations are even more impressive when it is remembered that the informants were rating cognitive decline over five years, whereas the neuropsychological tests were assessing current cognitive function-

Table 3. Correlations of Screening Tests with Informant Characteristics.

Informant characteristic	Long Informant Scale	Short Informant Scale	Mini-Mental State Examination
Sociodemographics			
Informant age	–.05	–.03	–.04
Informant sex (male)	.04	.04	.00
Informant emotional state			
Mental ill health	.23**	.22**	–.22**
Life satisfaction	–.26**	–.27**	.27**
Relationship with subject			
Perceived care	–.41**	–.39**	.35**
Perceived control	–.13*	–.14*	.04
Perceived closeness	–.12	–.11	.05

* $p < .01$. ** $p < .001$.

ing. Consistent with the SCIDS being a measure of cognitive decline, it had no correlation with education and a smaller correlation with the National Adult Reading Test than the MMSE. Although the National Adult Reading Test is used to estimate premorbid intelligence, performance on this test is known to deteriorate in moderate dementia (O'Carroll et al., 1995), so that it does reflect current functioning to some extent. This sensitivity to moderate dementia may explain the correlation which was found between the test and the informants' ratings of decline.

Some previous work on informant-based assessment has indicated that it can be affected by the emotional state of the informant and by the quality of the relationship between the patient and the informant (Jorm, 1996). In the present study, associations were also found with the informants' mental health and life satisfaction, and with the degree of care perceived by the informant. However, these associations were also found for the MMSE, indicating that the associations are real and not simply due to contamination of the informants's ratings of cognitive decline.

Like a number of other informant questionnaires, the SCIDS asks about change from earlier functioning. Whereas the SCIDS asks about change over 5 years, other questionnaires have assessed change over several months, a year, 10 years, and ''compared to earlier in life'' (Jorm, 1996). Whether these different time frames make any difference is difficult to say. Apart from the scale measuring change over several months, the validity coefficients of the various scales are similar.

In conclusion, the study confirms the value of a short informant interview (the SCIDS) as a screening and assessment test for dementia. Such tests should be seen as complementary to existing cognitive screening and neuropsychological tests. They have the advantages of assessing everyday functioning, providing a direct measure of decline from previous performance, and of being uncontaminated by education.

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APPENDIX

Short Concord Informant Dementia Scale (SCIDS)

I am going to ask you a few questions about (respondent's) memory. I would like you to decide firstly if (respondent's) memory has declined in this way over the last 5 years and if it has I would like to know how severe you think the deterioration has been. The possible responses are:

(0) No, there has been no change.

If there was change, how severe was the change:

(1) A bit worse
(2) Somewhat worse, i.e., in between (1) and (3)
(3) Much worse.

1. Forgetting dates to do something, e.g., paying bills, appointments or when something was done, e.g., going on an outing, when visitors come.
2. Forgetting where he/she put something.
3. Forgetting what someone just told him/her.
4. Forgetting his/her address or telephone number.
5. Forgetting where things are usually kept.
6. Not knowing where to find things that have been put in a different place than usual.
7. Forgetting things about family and friends, e.g., where friends live, social occasions that may have happened in the past.
8. Not recognizing the faces of people he/she knows, e.g., friends, neighbors.
9. Forgetting what day, month and year it is.
10. Forgetting whether it was breakfast or dinner at the appropriate times.
11. Losing his/her way around places that are familiar to him/her, e.g., the local shops, when driving in places that are familiar to him/her (visiting family and friends), or in the home (finding where the bathroom is).
12. Losing his/her way around places outside his/her usual neighbourhood, e.g., the city.

To score the SCIDS, add up ratings (0–3) over all 12 items to get a score from 0 to 36. A score of 4+ detects dementia with a sensitivity of 83% and specificity of 87%.