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Reliability of the Blessed Telephone Information-Memory-Concentration Test

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ABSTRACT

In-person cognitive evaluations can be costly and labor intensive in geographically widespread populations. Reliable telephone instruments that screen for cognitive status would greatly facilitate epidemiologic and other longitudinal studies. We evaluated the reliability of the Blessed Information-Memory-Concentration (IMC) test when administered by telephone. Eighty-four subjects with a wide range of cognitive abilities were administered the Blessed IMC twice over a 3-week interval. Forty-nine of the subjects were administered the test both by telephone and in-person, and 35 of the subjects were tested twice by telephone. Spearman's rank correlation was used to compare scores of the different administrations (.96; $P < .001$) and to examine test-retest reliability (.96; $P < .001$). The Blessed Telephone IMC (TIMC) test exhibits excellent reliability both when compared to in-person administration as well as in test-retest results. The Blessed TIMC appears to be a practical instrument for population and longitudinal studies when in-person assessment is not feasible. (*J Geriatr Psychiatry Neurol* 1995; 8:238–242).

Longitudinal studies of aging and dementia, as well as population-based research and epidemiologic investigations, are frequently hampered, because subjects are unable to come to the research center for evaluations and follow-up. Long-term follow-up can be hindered by time constraints, poor patient (or caregiver) mobility, and geographic distance between subjects' homes and clinical research centers (particularly with moves to more sheltered family or institutional environments). Studies of attrition and nonparticipation in research on aging demonstrate that subjects of greatest interest to the study may be more likely to drop out.[1] Home visits to assess cognitive function are a possible, but costly and labor-intensive, alternative. Reliable telephone instruments can facilitate follow-up in longitudinal studies and clinical trials, and can potentially be used for screening populations in epidemiologic studies.

The need for reliable telephone measurements of cognition has become increasingly apparent in recent years. Hence, several instruments have been developed to evaluate twin cohorts[2,3] or to follow inaccessible subjects.[4,5] Some of these procedures necessitate mailing materials ahead of time and require up to an hour for completion.[3,4] Several briefer instruments, such as the Telephone Interview for Cognitive Status (TICS) and the modified version (TICS–M),[5–7] correlate well with the Mini-Mental State Examination (MMSE),[8] and can provide useful information. In our investigations of a geographically dispersed cohort, we needed an instrument that could be administered over the telephone and that would permit direct comparison with in-person longitudinal data.

In this study, therefore, we examined the reliability of a telephone-administered Blessed Information-Memory-Concentration test (TIMC) as compared to in-person administration, and of repeat-telephone administration (test-retest reliability) in subjects with a range of Blessed scores.

METHODS

Subjects

Thirty-nine men and 45 women, aged 50 to 98 years (mean, 74 years; SD, 9.4) were recruited from neurology clinics, longitudinal studies, and clinical trials at the Johns Hopkins School of Medicine. The mean education level for the subjects was 12 years (range, 4–20 years; SD, 3.7).

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Fifty-nine (70%) of the subjects met criteria for dementia,[9] primarily Alzheimer's disease (n = 55). The remaining subjects with dementia had multi-infarct dementia (n = 2) and normal pressure hydrocephalus (n = 2). Twenty-five subjects were considered normal, although two of these individuals were diagnosed with depression according to DSM-III-R[9] criteria.

Instrument and Procedures

The Blessed Information-Memory Concentration (IMC) Test[10] is a brief mental status instrument that has been used widely in clinical populations and research studies.[11-13] The Blessed IMC test lends itself to telephone administration, because it contains no visual prompts or written instructions, and administration time is under 10 minutes. All participants were interviewed by a registered nurse or a trained psychometrist with experience testing Alzheimer patients. During the Blessed TIMC administration, subjects were requested not to use clocks or calendars to assist them in answering questions. In addition, caregivers were asked to provide no cues or answers to test items even if the participant requested help.

To evaluate the reliability of telephone administration as compared to in-person measurements, 26 subjects were administered the Blessed IMC test followed by the telephone procedure (TIMC), while 23 subjects received the tests in reverse order. The order of administration depended on scheduled visits to the center. Subjects who had been tested in person were retested by phone within 4 weeks; subjects were tested by phone first if they were scheduled to return to the center within the same amount of time. The average interval between administrations was 21 days (range, 10–38 days). There were approximately equal numbers of subjects in each of the following Blessed score intervals as determined by initial score: 0–4, 5–9, 10–14, 15–19, and 20 and above.

To determine test-retest reliability, 35 participants were administered the Blessed TIMC test on two occasions separated by an average interval of 20 days (range, 12–31 days). Equal numbers of subjects were recruited for each of the Blessed score intervals as described above.

Analysis

The correlation between in-person and telephone scores was assessed using the Spearman's Rank Correlation Coefficient.[14] Analyses were performed to determine if there were significant differences between the Blessed TIMC and IMC scores using a paired *t* test. Separate analyses were performed by gender, age, education, and the order of the test (telephone or in-person first). A multiple-regression analysis was also performed to determine if the differences between the Blessed TIMC and IMC scores could be predicted by any of these covariates. A 95% prediction interval based on a normal distribution was also calculated, which would give the likely difference between the Blessed TIMC and IMC scores for an individual. In addition, for each individual item on the Blessed IMC/TIMC, McNemar's

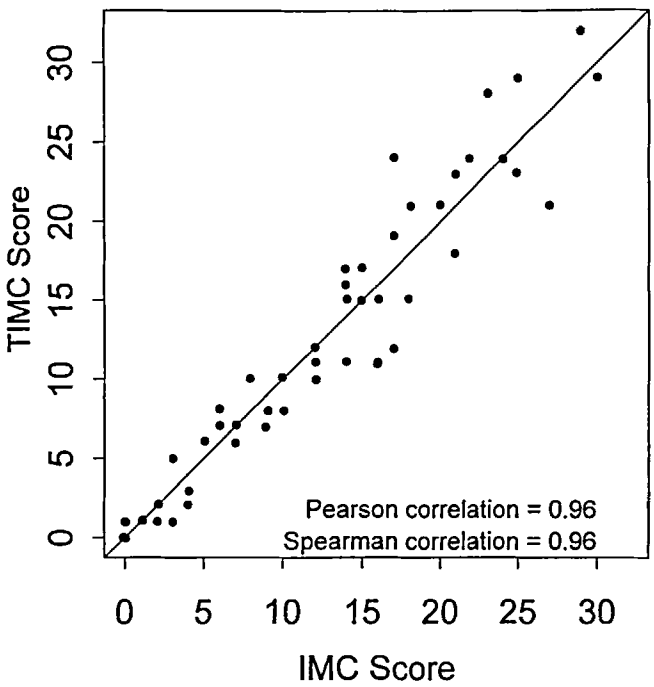

Figure 1. Correlation of Blessed IMC and TIMC scores.

Test[14] was used to determine whether one instrument tended to favor a correct response more than the other instrument. If neither instrument favors a particular response, correct or incorrect, we would expect about an equal number of people giving the two types of discordant answers (i.e., correct in person/incorrect by phone vs. incorrect by phone/correct in person). Similar analyses were performed to evaluate the association between the test and retest Blessed TIMC scores.

RESULTS

As shown in Figure 1, Blessed IMC scores were highly correlated with Blessed TIMC scores (Spearman's rank correlation = .96; $P < .001$). Table 1 shows average differences between Blessed TIMC and IMC scores for gender, age, education, and order of administration.

Table 1. Difference between Blessed TIMC and IMC Scores

	n	*Average In-Person Score*	*Mean Difference (TIMC–IMC)*	*Standard Error*	*t test*	*P value*
Gender						
Male	24	10.0	−.33	.52		
Female	25	15.2	.24	.53	.77	.45
Age*						
<76	23	13.4	−.74	.52		
≥76	26	12.0	.58	.51	−1.81	.08
Education*						
<12	15	14.8	.87	.55		
≥12	34	11.7	−.44	.46	−1.66	.10
Order						
TIMC first	23	13.0	−.35	.50		
IMC first	26	12.4	.23	.54	.77	.44

*Age and education were dichotomized using the median as a cutoff.

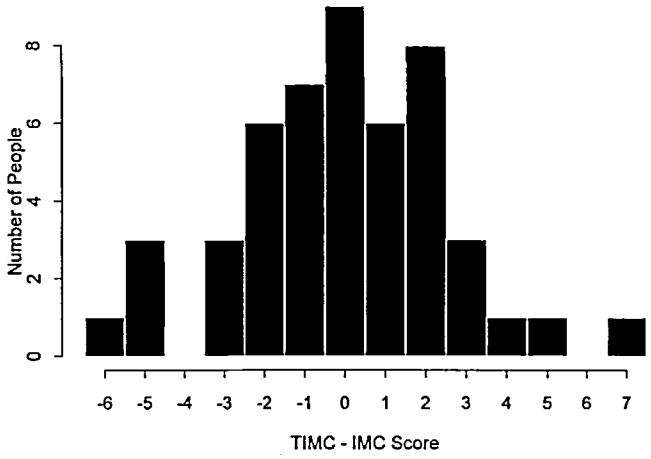

Figure 2. Distribution of score differences between Blessed TIMC and IMC.

A multiple-regression analysis was performed including these covariates, and none were significant. The average score difference of the TIMC–IMC was –0.05, and not statistically different from zero ($t_{(48)} = -0.11$; $P > .5$). The distribution of score differences, shown in Figure 2, can be approximated by a Normal distribution with mean = –0.05 and variance = 6.75. A 95% prediction interval for the difference in scores is –5.16 to 5.06 points, as suggested by Figure 2.

Exact percent agreement for each one of the test items is shown in Table 2. Agreement of 80% or more was obtained for most of the items (20/27). The following items had agreement of less than 80% — item 5: Name of this place; 6: What street is it on; 7: How long have you been here; 13: Part of the day; 15: Season; 24: Months backwards; and 27: Recall of name and address. For 24 of the items, the observed agreement was significantly higher ($P < .05$) than the expected agreement as calculated from the kappa statistic.[15] Additional analysis of discordant answers (correct vs. incorrect) found systematic differences between the TIMC and IMC responses. Using McNemar's test, asymmetry was found in item 5: Name of this place, and item 6: What street is it on, which were answered incorrectly by a significantly higher number of subjects on the Blessed IMC test than on the TIMC. The exact P values for these two items based on McNemar's test were .013 and .006, respectively (Table 2).

The Blessed TIMC test-retest correlation was also high, as shown on Figure 3 (Spearman's rank correlation = .96; $P < .001$). Age, gender, education, and time 1 score were not predictive of score differences in the two telephone administrations in a multiple-regression analysis. Table 3 shows average differences between time 1 and time 2 TIMC scores for gender, age, and education.

Table 2. Agreement and Disagreement between IMC and TIMC Score for Each Test Item (N = 49)

	Item	Exact Agreement %	Number of Discordant Answers		McNemar's Exact Test Probability
			Type I*	Type II†	
1	Name	100	–	–	–
2	Age	90††	1	4	.375
3	When born	80††	4	6	.754
4	Where born	94	2	1	1.00
5	Name of this place	71††	2	12	.013
6	What street is it on	76††	1	11	.006
7	How long have you been here	73††	8	5	.581
8	Name of this city	88††	2	4	.688
9	Today's date	84††	3	5	.727
10	Month	86††	5	2	.453
11	Year	80††	4	6	.754
12	Day of week	80††	5	5	–
13	Part of day	65	10	7	.629
14	Time	86††	1	6	.125
15	Season	71††	8	6	.791
16	Mother's first name	96††	2	0	.500
17	How much schooling did you have	88††	2	4	.688
18	Name of one specific school	94††	2	1	1.00
19	What kind of work have you done	88††	2	4	.688
20	Who is the President now	84††	4	4	–
21	Who was the last president	82††	5	4	1.00
22	Date WWI	84††	4	4	–
23	Date WWII	88††	3	3	–
24	Months of the year backwards‡	71††	6	6	–
25	Count 1–20§	90††	3	1	.625
26	Count 20–1‖	82††	7	1	.070
27	Recall name and address**	61††	5	0	.063

*Type I is correct in-person and incorrect on the phone; †Type II is incorrect in-person and correct on the phone. ‡Item 24: agreement within one point = 83%. §Item 25: agreement within one point = 92%. ‖Item 26: agreement within one point = 86%. **Item 27: Agreement within one point = 82%; within 2 points = 94%. ††Observed agreement significantly higher than expected as calculated from the kappa statistic ($P < .05$).

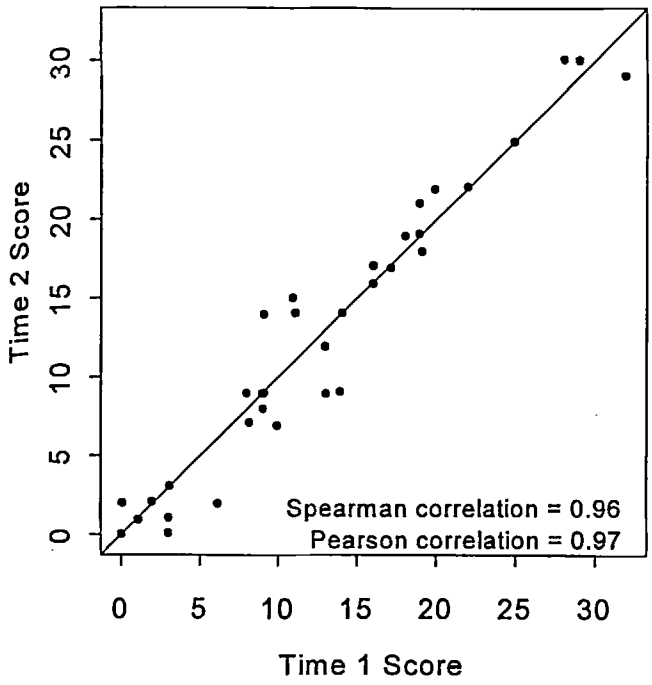

Figure 3. Correlation of times 1 and 2 Blessed TIMC scores.

The average score difference was –0.17, and not statistically different from zero ($t_{(34)} = -0.46$; $P > .5$).

DISCUSSION

The Blessed TIMC provides results comparable to the Blessed IMC test, exhibits excellent test-retest reliability, and can be a practical alternative when in-person evaluations are not feasible or more frequent assessments are desirable. Most instruments developed for telephone usage[5,6,16,17] are either abbreviations of longer instruments or are unrelated to procedures generally administered in the clinic. A strength of the Blessed TIMC is that it allows administration of the same instrument in person or over the telephone, allowing item-by-item comparison of data.

Although the majority of items were answered in the same way on the Blessed IMC and TIMC tests, two items, item 5: Name of this place and item 6: What street is it on? showed discrepancies between in-person and telephone administrations. Incorrect responses were more frequent at the research center, presumably due to the subjects' relative unfamiliarity with the center as compared to their homes. Omitting these two items may further strengthen the comparability of test scores for larger studies, but did not significantly affect the results of our study when excluded from the analyses.

Table 3. Difference between Time 1 and Time 2 TIMC Scores

	n	*Mean Difference (Time2 – Time1)*	*Standard Error*	*t*	*P value*
Gender					
male	15	–.13	.65		
female	20	–.20	.44	–.09	>.5
Age*					
<75	18	–.33	.51		
≥75	17	0	.56	–.44	>.5
Education*					
<12	11	.36	.73		
≥12	24	–.42	.43	.92	.33

*Age and education were dichotomized using the median as a cutoff.

The Blessed TIMC test has limitations common to all telephone instruments. While all subjects were able to complete testing, the procedure was sometimes difficult in the severely demented subjects, who had poor telephone communication skills and short attention spans. We could not always be sure that the subject was not using clocks or calendars to assist in answering orientation questions. On a few occasions, we perceived possible "cheating," including help by caregivers. When this occurred, the test was interrupted and the caregiver reinstructed not to give further assistance before proceeding. Lastly, impaired hearing can certainly limit test interpretation. We did not screen for hearing loss in our subjects, but none had obvious impairment that appeared to affect testing. In some situations, however, it may be difficult to assess adequacy of hearing on the phone.

The Telephone Blessed was highly acceptable to the subjects as a method for increasing frequency of data collection and following subjects who no longer return for study. One reason for its acceptance was the short amount of time needed for administration: average administration time was 5 minutes. Although generalizability to more diverse population samples remains to be determined, its brevity and reliability also make it potentially useful as a screening instrument. Studies of its sensitivity and specificity for detecting dementia are in progress at our center. The Blessed TIMC test and other telephone instruments can be an efficient approach to some of the difficulties in longitudinal and epidemiologic studies of cognition in aging.

Acknowledgments

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References

1. Powell DA, Furchtgot E, Henderson M, et al. Some determinants of attrition in prospective studies on aging. *Exp Aging Res* 1990; 16:17–24.
2. Breitner JCS, Welsh KA, Magruder-Habib KM, et al. Alzheimer's disease in the National Academy of Sciences Registry of aging twin veterans. *Dementia* 1990; 1:297–303.
3. Nesselroade JR, Pedersen NL. Factorial and criterion validities of telephone assessed cognitive measures: age and gender comparisons in adult twins. *Res Aging* 1988; 10:220–234.

4. Kent J, Plomin R. Testing specific cognitive abilities by telephone and mail. *Intelligence* 1987; 11:391–400.
5. Welsh KA, Breitner JCS, Magruder-Habib KM. Detection of dementia in community volunteers using telephone screening of cognitive status. *Neuropsychiatry Neuropsychol Behav Neurol* 1993; 6:103–110.
6. Brandt J, Spencer M, Folstein M. The Telephone Interview for Cognitive Status. *Neuropsychiatry Neuropsychol Behav Neurol* 1988; 1:111–117.
7. Brandt J, Welsh KA, Breitner JC, et al. Hereditary influences on cognitive functioning in older men. A study of 4000 twin pairs. *Arch Neurol* 1993; 50:599–603.
8. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state." A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res* 1975; 12:189–198.
9. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders,* 3rd Ed. Revised. Washington, DC: American Psychiatric Association, 1987.
10. Blessed G, Tomlinson BE, Roth M. The association between quantitative measures of dementia and of senile change in the cerebral gray matter of elderly subjects. *Br J Psychiatry* 1968; 114:797–811.
11. Katzman R, Brown T, Fuld P, et al. Validation of a short orientation-memory-concentration test of cognitive impairment. *Am J Psychiatry* 1983; 140:734–739.
12. Katzman R, Aronson M, Fuld P, et al. Development of dementing illnesses in an 80-year-old volunteer cohort. *Ann Neurol* 1989; 25:317–324.
13. Thal LJ, Grundman M, Golden R. Alzheimer's disease: a correlation analysis of the Blessed Information-Memory-Concentration Test and the Mini-Mental State Exam. *Neurology* 1986; 36:262–264.
14. Armitage P, Berry G. *Statistical methods in medical research,* 2nd Ed. Oxford: Blackwell Scientific Publications, 1988.
15. Rosner B. *Fundamentals of biostatistics,* 4th Ed. Belmont: Wadsworth Publishing Co., 1995.
16. Lanska DJ, Schmidt FA, Stewart JM, Howe JN. Telephone assessed mental state. *Dementia* 1993; 4:117–119.
17. Roccaforte WH, Burke WJ, Bayer BL, Wengel SP. Validation of the telephone version of the Mini-Mental State Examination. *J Am Geriatr Soc* 1992; 40:697–702.