

Reliability and Validity of the Severe Impairment Battery (SIB) in Korean Dementia Patients

This study was conducted to examine the reliability, validity and clinical utility of the Severe Impairment Battery (SIB) for a Korean population. 69 dementia patients with Clinical Dementia Rating (CDR) stages 2 or 3 were participated in this study. The SIB, Korean version-Mini Mental State Examination (K-MMSE), CDR, and Seoul-Activities of Daily Living (S-ADL) were administered. The validity of the SIB was confirmed by evaluating the correlation coefficients between the SIB and K-MMSE, CDR, S-ADL, which were found to be significant. Cronbach's alpha for the total SIB score and each subscale score showed high significance, and the item-total correlation for each subscale was also acceptable. The test-retest correlation for the total SIB score and subscale scores were significant, except for the praxis and orienting to name. The total SIB score and subscale scores were examined according to CDR. The results suggest that the SIB can differentiate the poor performances of severely impaired dementia patients. On the basis of the receiver operating characteristic (ROC), it can be concluded that the SIB is able to accurately discriminate between CDR 2 and 3 patients. The results of this study suggest that the SIB is a reliable and valid instrument for evaluating severe dementia patients in Korean population.

Key Words : *Dementia; Neurophysiological Tests; Severe Impairment Battery; Reproducibility of Results; Reliability and Validity; ROC Curve*

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INTRODUCTION

Dementia is one of the most severe pathologies in old age, and as it progresses, it eventually leads to severe impairment of cognitive function, and activities of daily living, as well as behavioral problems. The progression of dementia results in global and severe impairment across all spheres of cognitive function. Therefore, it is important to evaluate the changes, which take place over time and the presence and extent of the preserved abilities as dementia progresses. This information may help in the management of severely demented patient, and could be used in the design of psychosocial and environmental interventions. The therapeutic efficacy can be also evaluated in severely demented patients if they are tested with more appropriate instruments.

Many neuropsychological instruments have been developed which are designed to assess mild to moderate cognitive impairment and are in common usage. However, as dementia progresses to the advanced stages, the ability of these conventional neuropsychological and mental status assessments to measure cognitive functions becomes increasingly limited, because many dementia patients perform at floor levels (1). Moreover, since it can be difficult to test severely

demented patients, due either to their refusal or the severity of deterioration, most of the instruments commonly used in cases of mild dementia show a limited range of scores and exhibit the floor effect in the advanced stages.

One approach to the assessment of the cognitive functions of severely impaired dementia patients involves the use of observer-based rating scales. For example, the Clinical Dementia Rating Scale (CDR) (2) and Global Deterioration Scale (GDS) (3) enable the clinician to evaluate the severity of dementia and the presence or absence of symptoms on the basis of clinical interviews with family members or other informants. Another way to avoid the floor effect is to use neurologic procedures such as the Glasgow Coma Scale (4), which evaluates the presence of neurologic signs and symptoms rated in conjunction with basic cognitive and functional skills. Although these approaches adequately assess the global dementia severity, they do not provide a performance-based evaluation of the dementia patient's cognitive abilities and cannot detect relatively spared abilities in various cognitive domains. Therefore several instruments have been developed to overcome these limitations and to assess patients with severe dementia who are unable to complete standard neuropsychological tests, viz. the Severe Cognitive Impairment

Profile (SCIP) (5), the Preliminary Neuropsychological Battery (BNP) (6), the Test for Severe Impairment (TSI) (7), and the Severe Impairment Battery (SIB) (8).

The SIB is a particularly reliable, valid and useful instrument for evaluating cognitive changes in dementia patients whose level of functioning is in the moderate to severe range (1). The SIB was also more apt to identify differences in the performances in the 5-10 score region of the Mini Mental State Examination (MMSE) (9), thus avoiding the floor effect (10). The information provided by the SIB appeared to be fairly independent of that obtained from the CDR and GDS in the moderate to severe stages, although the utility of the SIB in milder dementia was limited (1).

At present, the number of instruments that can be used in this country to evaluate patients with severe dementia who cannot complete conventional neuropsychological tests is very limited. Recently, Kim et al. developed the Severe Dementia Rating Scale (SDS) (11), which has a similar form to the Korean version-Mini Mental State Examination (K-MMSE) (12). The SDS is composed 30 items that are independent of the education of the patients, and allows the various cognitive domains to be assessed within a shorter period of time. However, it has two main limitations, namely that it provides limited comprehensive information about the patient's cognitive functions and that the test-retest reliability interval is very short.

This study was conducted to examine the reliability and validity of the SIB for a Korean population with the purpose of making a more comprehensive and appropriate instrument available for the evaluation of dementia patients with severe impairment. Also, the receiver operating characteristic (ROC) curve was used to determine the degree to which the SIB discriminates dementia severity and to examine its clinical utility.

MATERIALS AND METHODS

Subjects

This study included 69 (male=19, female=50) patients with the diagnosis of dementia according to DSM-IV (13) and NINCDS/ADRDA (14) criteria treated at a Geropsychiatry Clinic, Department of Psychiatry, Samsung Medical Center. 54 had Alzheimer's disease (AD), 7 had the mixed type of dementia and 8 had other types of dementia, e.g., vascular dementia, dementia due to Parkinson's disease, dementia not otherwise specified. Only patients with CDR stages 2 or 3 and scores of less than 15 on the K-MMSE were included in this study. 25 subjects were rated as CDR stage 2, and 44 as stage 3. The mean K-MMSE total score was 5.49 (SD=3.91). The mean age of the subjects was 74.4 yr (SD=10.0), and their mean length of education was 7.91 yr (SD=5.78).

Severe Impairment Battery (SIB)

Saxton et al. developed the SIB to assess patients with severe dementia who cannot complete conventional neuropsychological tests. The SIB contains 51 questions which take a total of about 20 min to administer, and the possible scores range from 0 to 100. The SIB is divided into 9 subscales, viz. social interaction skills (score 0-6), memory (score 0-14), orientation (score 0-6), language (score 0-46), attention (score 0-6), praxis (score 0-8), visuospatial ability (score 0-8), construction (score 0-4) and orienting to name (score 0-2), each of which yields individual scores. There is no cut-off score for normal subjects as the test is only intended to be used with patients known to be severely impaired. However, it is possible to grade the severity of impairment by rating those who score less than 63 on the SIB (corresponding approximately to less than 4 on the MMSE). Also, in terms of its administration, the SIB is composed of very simple one-step commands, which are presented together with gesture cues and can be repeated several times to facilitate comprehension.

The SIB used in this study was translated into Korean by three clinical psychologists, who made sure that all the characteristics and structure of the original SIB were maintained in the Korean version. Two items in the language subscale were modified. First, we changed the item 'recite the months of the year' to 'recite the days of the week', because the original item was too easy for Koreans. Second, the phrase 'people spend money' was not natural when it was translated into Korean, thus we changed it to 'I bought something'.

In terms of its administration, the original materials (photograph of spoon and cup, blocks) of the SIB were familiar to the patients. However, the patients mistook the color of certain blocks. For example, as sometimes occurs in normal elderly, those patients with severe cognitive impairment or a low educational level sometimes mistook a 'blue' block for a 'green' one. Thus, when they failed to indicate the correct color for the blue block, we informed them of their mistake before passing on to the next item. All of the items of the SIB are presented in the appendix.

Korean version-Mini Mental State Examination (K-MMSE)

The MMSE was developed to evaluate the subject's orientation, memory, attention & calculation, and visuospatial and language abilities. Kang et al. conducted a study to examine the validity of newly constructed K-MMSE. It contains 30 questions, and the possible scores range from 0 to 30.

Seoul-Activities of Daily Living (S-ADL)

The S-ADL (15) was developed to assess basic activities of daily living, including self-care/hygiene, toileting, ambulation, and so on. It is composed of 12 items, and the possible scores range from 0 to 24. Using the S-ADL, the clinician eval-

uates the subject's functional disability by conducting interviews with the caregivers.

Clinical Dementia Rating (CDR)

The CDR assesses the cognitive performance in six categories; memory, orientation, judgment and problem solving, community affairs, home and hobbies, and personal care. The information needed to evaluate each category is obtained by semi-structured interviews with both the patient and a reliable informant. The CDR provides descriptors for each category and a global CDR score of five levels of impairment (0=no dementia, 0.5=questionable, 1=mild, 2=moderate, 3=severe).

Data analysis

Statistical analyses were performed with SPSS 11.0 for WINDOWS. The Mann-Whitney U test and Spearman correlation were used to test for significant differences in the total SIB, K-MMSE and S-ADL scores according to sex, age and education. The validity of the SIB was determined by calculating the Spearman correlation coefficients between the SIB and the K-MMSE, CDR, and S-ADL. Cronbach's coefficient alpha and item-total correlation coefficients were generated to examine the internal consistency of the SIB. Also, Spearman correlation coefficients were generated to evaluate the 3 months test-retest reliability. The Mann-Whitney U test was used to assess the differences in the mean SIB total score for the various CDR stages. Finally, a ROC curve was used to compare the sensitivity, specificity and probability

Table 1. Correlations between the SIB and other variables

	K-MMSE	CDR	S-ADL
SIB	0.875*	-0.678*	-0.661*

SIB, Severe Impairment Battery; K-MMSE, Korean version-Mini Mental State Examination; CDR, Clinical Dementia Rating; S-ADL, Seoul-Activities of Daily Living.

* $p < 0.01$.

Table 3. Test-retest reliability of the SIB (n=15)

	Spearman's ρ
SIB total score	0.79 [†]
Social interaction	0.71 [†]
Memory	0.69 [†]
Orientation	0.63*
Language	0.74 [†]
Attention	0.53*
Praxis	0.45
Visuospatial ability	0.58*
Construction	0.88 [†]
Orienting to name	0.00

SIB, Severe Impairment Battery.

* $p < 0.05$, [†] $p < 0.01$.

of correctly discriminating dementia severity in the case of the SIB, K-MMSE and S-ADL.

RESULTS

Demographical characteristics

Sex and education had no significant effect on the K-MMSE, SIB, S-ADL or CDR, but significant correlations were found between age and the total K-MMSE score ($\rho_{(69)}=0.26$, $p < 0.05$) and age and the total SIB score ($\rho_{(69)}=0.27$, $p < 0.05$).

Validity

The construct validity of the SIB was examined by comparing the total SIB score with the total K-MMSE, CDR and S-ADL scores (Table 1). The Spearman correlation coefficient between the SIB and the K-MMSE was 0.875 ($p < 0.01$); between the SIB and the CDR was -0.678 ($p < 0.01$); and between the SIB and the S-ADL was -0.661 ($p < 0.01$).

Table 2. Internal consistency of the SIB

	Cronbach's α
SIB total score	0.97
Social interaction	0.77
Memory	0.76
Orientation	0.57
Language	0.94
Attention	0.77
Praxis	0.90
Visuospatial ability	0.83
Construction	0.86

SIB, Severe Impairment Battery.

Table 4. Means and standard deviations of the SIB for each CDR group

	CDR 2 (n=25) Mean (SD)	CDR 3 (n=44) Mean (SD)	p
SIB total score	71.48 (12.28)	33.91 (22.94)	0.000
Social interaction	4.92 (1.29)	3.58 (1.65)	0.001
Memory	7.36 (2.77)	2.65 (3.04)	0.000
Orientation	3.44 (1.39)	1.88 (1.52)	0.000
Language	34.20 (6.56)	15.74 (11.29)	0.000
Attention	4.88 (1.33)	1.98 (1.88)	0.000
Praxis	6.28 (2.49)	2.19 (2.66)	0.000
Visuospatial ability	5.68 (2.38)	2.93 (3.03)	0.001
Construction	3.72 (0.61)	1.63 (1.60)	0.000
Orienting to name	1.52 (0.65)	1.49 (0.69)	0.861

SIB, Severe Impairment Battery; CDR, Clinical Dementia Rating.

Total scores of the SIB subscale: Social interaction (6), Memory (14), Orientation (6), Language (46), Attention (6), Praxis (8), Visuospatial (8), Construction (4), Orienting to name (2).

Reliability

The Cronbach's coefficient alpha and item-total correlation coefficients were generated to examine the internal consistency of the SIB (Table 2). The internal consistency of the total SIB score was 0.97, and that of the SIB subscales ranged from 0.57 (orientation) to 0.94 (language). The item-total correlation for the SIB subscales was also acceptable ($p < 0.01$).

Data from those 15 subjects who were tested again after an interval of 3 months allowed the assessment of the test-retest reliability using Spearman correlation coefficients (Table 3). The test-retest correlation for the total SIB score was statistically significant. Significant subscale correlations were observed for social interaction, memory, orientation, language, attention, visuospatial ability and construction. However, the test-retest correlation for the praxis and the orienting to name subscales did not reach significance.

SIB score according to dementia severity

The subjects were separated into two groups according to their dementia severity using the CDR with the aim of measuring the total SIB score and subscale scores (Table 4). As a result, the difference in the total SIB score and its subscale scores between the CDR 2 and CDR 3 groups was significant, except for the orienting to name subscale. Despite their pervasive deficits, the more severely demented patients belonging to the CDR 3 group showed a wide range of total SIB score and subscale scores.

In the analysis of impairment in the individual cognitive domains, the CDR 2 patients had greater impairment in the individual cognitive domains, especially in memory and

orientation, as compared with that in the full score of each subscale. On the other hand, their construction, attention and social interaction abilities were comparatively maintained. The CDR 3 patients had more severe impairment than the CDR 2 patients in all cognitive domains, and this greater impairment was especially notable for construction, attention and praxis.

Receiver Operating Characteristic (ROC) Curve

The ROC curve was used to determine the degree to which the SIB allows the dementia severity to be discriminated (CDR 2 vs. CDR 3). The sensitivity and specificity levels of the SIB were also compared with those of the K-MMSE and S-ADL (Table 5). The sensitivity and specificity of the SIB in the differentiation of the CDR 2 and CDR 3 patients were both 88% when the cut-off score was 62.5. When the cut-off score of the K-MMSE was 5.5, the corresponding sensitivity and specificity were 86% and 88%, respectively. The sensitivity and specificity of the S-ADL were 84% and 82%, respectively, when the cut-off score was 6.5. Grossly, the sensitivity and specificity of the SIB were higher than those of both the K-MMSE and S-ADL.

The Area Under the Curve (AUC) for each test revealed that the SIB (AUC=90.6%) was more accurate than both the K-MMSE (AUC=90%) and S-ADL (AUC=88.1%) in the differentiation of the CDR 2 and CDR 3 patients. The diagnostic accuracy of the K-MMSE was similar to that of the SIB. However, as a result of the diagnostic accuracy of the K-MMSE subscales, it was found that only the place orientation, registration, language and visuospatial subscales could be usefully discriminated between the CDR 2 and CDR 3 patients using this instrument (Table 6). The diagnostic accuracy of the S-ADL was lower than that of both the SIB and K-MMSE. Fig. 1 shows the results in the form of the ROC curve.

Table 5. Sensitivity and specificity of the SIB, K-MMSE and S-ADL

	AUC	Cut-off	Sensitivity	Specificity
SIB	0.906	62/63	88%	88%
K-MMSE	0.900	5/6	86%	88%
S-ADL	0.881	6/7	84%	82%

SIB, Severe Impairment Battery; K-MMSE, Korean version-Mini Mental State Examination; S-ADL, Seoul-Activities of Daily Living; AUC, Area Under Curve.

Table 6. AUC of the K-MMSE subtests

	AUC
Time orientation	0.623
Place orientation	0.857*
Registration	0.874*
Attention and Calculation	0.548
Recall	0.517
Language and Visuospatial	0.820*

AUC, Area Under Curve.

* $p < 0.01$.

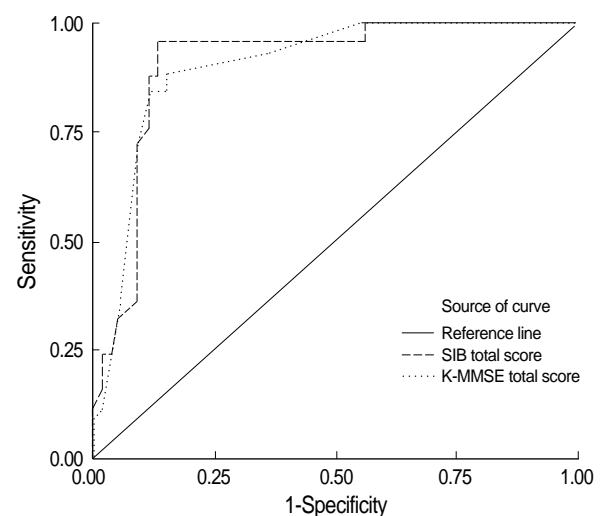


Fig. 1. ROC curves of the SIB and K-MMSE.

DISCUSSION

In this study, the reliability and validity of the SIB were examined, and its clinical utility for discriminating dementia severity was proved using the ROC curve. The results of this study suggest that the SIB is a reliable, valid, and useful instrument for evaluating severely impaired dementia patients.

The significant correlation that was obtained between the SIB and the K-MMSE, CDR and ADL suggests that the SIB has appropriate construct validity, as was previously observed. In particular, the high correlation between the total SIB and K-MMSE scores indicates that the SIB evaluates global cognitive functioning in patients with severe dementia. Cronbach's coefficient alpha for the total SIB score and each subscale score and the item-total correlation for the SIB subscales showed high significance, indicating that the SIB has excellent internal consistency. The test-retest correlation for the total SIB score and each subscale scores was relatively significant. This result suggests that the performance on this instrument has acceptable stability over time. However, the test-retest correlation for the praxis subscale was not significant in this study, whereas the one month test-retest correlation for this subscale was 0.63 ($p < 0.01$) in a previous study (1). This discrepancy may be attributed to the change in the functioning of the patients caused by the long retest interval. The test-retest correlation for the orienting to name subscale was not significant either, possibly due to the fact that the difference in the orienting to name subscale score was not notable, because almost all of the patients were successful in this subscale.

The total SIB score and the SIB subscale scores were compared according to the dementia severity using the CDR. It was found that the difference in the total SIB score and its subscale scores between the CDR 2 and CDR 3 patients was significant, except for the orienting to name subscale. Despite their pervasive deficits, the more severely demented patients belonging to CDR 3 showed a wide variation in both the total SIB scores and the scores on each subscale. These results suggest that the SIB is useful for evaluating dementia patients with a moderate to severe range of functioning, and can differentiate between the poor performances of very severely impaired dementia patients. The SIB can also avoid the floor effect that was frequently observed in conventional neuropsychological tests used for evaluating patients in the advanced stages. In the analysis of the impairment in individual cognitive domains according to dementia severity, the CDR 2 patients had greater impairment in memory and orientation than other cognitive domains. On the other hand, the construction, attention and social interaction abilities were comparatively maintained. The CDR 3 patients showed more severe impairment than the CDR 2 patients in all cognitive functions. In particular, greater impairment was observed in the construction, attention and praxis subscales. However,

the difference in the orienting to name subscale score between the CDR 2 and CDR 3 patients was not significant. This result indicates that recognition of self is relatively maintained until the advanced stages of dementia. These aspects of the comparative decline in various cognitive domains are consistent with the clinical course of AD, so the result of this study should provide us with a better understanding of natural history in AD. However, there is a limitation in that this study included not only AD patients but also patients with other forms of dementia. Therefore, it is necessary to compare the different aspects of cognitive impairment by dementia subtype in a further study.

On the basis of the ROC curve, it can be concluded that the SIB was very useful for discriminating between CDR 2 and CDR 3 patients, as was the total K-MMSE score. However, the time orientation, attention/calculation and recall subscale scores were at floor and consequently, these subscales were not apt to discriminate dementia severity in the moderate to severe stages of dementia. The S-ADL had a somewhat lower sensitivity, specificity and diagnostic accuracy than those of the SIB and K-MMSE. These results indicate that the SIB has greater clinical utility than the K-MMSE and S-ADL, because it can provide comprehensive information about the changes in various types of cognitive functioning (i.e. social functioning, memory, language, and so on) of the patients and can discriminate between the relative impairment in the cognitive domains in the final stages of the disease.

This study has several limitations. First, the dementia subtype was not taken into consideration. Because those cognitive functions that are more impaired or spared may differ according to dementia subtype, it is important that the different aspects of cognitive impairment be examined by dementia subtype in a further study. Second, there is a possibility that the change in the functioning of the patients caused by the long retest interval may have affected the test-retest correlation coefficient.

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Appendix The Severe Impairment Battery (SIB)

명시된 경우를 제외하고, 필요하다면 지시를 반복할 수 있다.

Social Interaction		
1	(SI) a	<p>피검자에게 다가가 인사를 한다. “안녕하세요. 제 이름은 000입니다”</p> <p>2점: 자발적으로 고개를 숙이며 인사하거나 “안녕하세요”라며 인사함 1점: 검사자를 바라보지만, 인사를 하지는 않음</p>
	b	<p>손을 내밀어 검사실이나 책상을 가리킨다. “몇 가지 물어볼 게 있습니다. 질문에 대답해 주십시오” “저와 같이 검사실로 갑시다” 반응이 없으면 피검자의 팔을 잡고 격려한다. “저와 같이 갑시다”</p> <p>2점: 가리킨 방향으로 자발적으로 가거나, (alternative) 자발적으로 일어나 앉음 1점: 격려 후 반응</p>
	Alternative:	<p>피검자가 걸을 수 없다면, “몇 가지 물어볼 게 있습니다. 질문에 대답해 주십시오. 일어나 앉아 주시겠어요?” 반응이 없으면, 피검자의 팔을 잡고 격려한다. “일어나 앉아 주세요”</p>
	c	<p>손을 내밀어 의자를 가리킨다. “여기 앉으세요” 반응이 없으면, 피검자의 팔을 잡고, 의자가 있는 쪽으로 안내를 한다. “여기 앉으세요”</p> <p>2점: 자발적으로 의자에 앉거나, (alternative) 자발적으로 책상 쪽으로 오거나, (alternative) 자발적으로 책상을 잡아당김 1점: 격려 후 반응</p>
	Alternative:	<p>피검자가 휠체어를 타고 있다면, “이쪽으로 와서 책상 가까이에 앉으세요” 반응이 없으면, 살짝 피검자의 어깨를 밀면서 격려한다. “이쪽으로 와서 책상 가까이에 앉으세요”</p>
	Alternative:	<p>피검자가 고정 의자에 앉아 있고, 이동할 수 없다면, 작은 책상을 피검자 가까이에 두고, “책상을 000님 쪽으로 당기세요” 반응이 없으면, 지시를 반복하면서 책상을 만진다.</p>
Memory		
2	(M)	<p>“제 이름은 000입니다” 이름을 반복해서 말해준다. “제 이름이 뭔지 물어볼 테니까 기억하고 있으세요” “제 이름이 무엇입니까?” 정답 여부에 상관없이, “(예) 제 이름은 000입니다”</p> <p>2점: 자발적으로 정답 1점: 정답에 근접한 반응 (예) “고혜정”을 “고희정”으로</p>
Orientation		
3	(O)	<p>“당신의 이름은 무엇입니까?” 피검자가 성만 말하면, 전체 이름을 말하도록 격려한다. 예) “김, 뭐요?”</p> <p>2점: 전체 이름을 말함. 한번의 격려는 허용 1점: 성만 말함</p>
Language		
4	(L) a	<p>“여기에 이름을 쓰세요”</p> <p>2점: 자발적으로 맞게 씀(약간의 오류는 허용) 1점: 부분적으로 맞음(성만 쓴 경우)</p>
	b	<p>피검자가 4a에서 2점을 받으면 이 문항은 생략하고, 2점을 준다. 빈 줄이에 피검자의 이름을 쓴다 “이걸 베껴서 쓰세요”</p> <p>2점: 자발적으로 맞게 씀. 또는 4a에서 2점을 받음 1점: 부분적으로 맞음</p>
Orientation		
5	(O)	<p>“오늘이 몇 월입니까?” 반응이 없으면, “오늘이 O, O, 또는 O입니까?” 6개월 전의 월, 현재의 월, 전월을 예로 들어준다.</p> <p>2점: 자발적으로 정답 1점: 예를 들어준 후 정답</p>

Language				
6	(L)	“요일을 순서대로 얘기해 보세요” 반응이 없으면, “월요일, 화요일, 수요일, 그리고 ...?”	2점: 자발적으로 정답 1점: 격려 후에 맞게 반응하거나, 요일 하나를 빼고 반응한 경우(2번의 격려 허용)	
Orientation				
7	(O)	“이 도시의 이름은 무엇입니까?” 반응이 없으면, “여기가 (), (), 또는 () 입니까?” 정답과 다른 도시 이름 두 개를 예로 들어준다.	2점: 자발적으로 정답을 말함 1점: 예를 들어준 후 정답	
Language				
8	(L)	a	“커피 같은 뜨거운 차는 어디에 마시나요?” 반응이 없으면, “커피를 담아서 마실 수 있는 그릇의 이름은 뭐죠?”	2점: 컵, (찻)잔, 머그잔 1점: 관련된 다른 대답. 예: 유리컵, 커피포트, 또는 격려 후에 정답 0점: 관련 없는 물건. 예: 접시
		b	“국은 무엇으로 먹나요?” 반응이 없으면, “국을 먹을 때 사용하는 도구를 뭐라고 하죠?”	2점: 숟가락 1점: 관련된 다른 대답. 예: 대접, 국그릇, 또는 격려 후에 정답 0점: 관련 없는 물건. 예: 칼
		9	(L)	a
b	“이번엔 다른 손을 주세요.” 반응이 없으면, 지시 사항을 반복하거나 손바닥을 펴서 보여주는 동작을 해서 반응을 격려한다.	2점: 자발적으로 정답 1점: 정답에 근접한 반응. 예: 손을 들기는 하지만, 검사자쪽으로 내밀지 않는 경우, 같은 손을 내밀거나 격려 후 반응한 경우		
c	“손을 주세요”라고 쓰여진 카드를 다시 제시한다. “여기에 뭐라고 쓰여 있죠?” 반응이 없으면, 다음과 같이 격려한다: “이 카드에 쓰여진 것을 큰 소리로 읽어보세요” 카드를 치운다.	2점: 자발적으로 카드를 읽음 1점: 부분적으로 맞음. 예: 잘못 읽거나, 문장의 일부분만 읽음, 격려 후 맞음.		
Memory				
10	(M)	“죄송하지만, 뭐라고 말했죠?” 지시 사항을 일상적인 대화를 할 때 쓰는 언어로 제시한다. 반응이 없으면, 다음과 같이 격려한다: “뭐라고 말했죠?”	2점: 자발적으로 9c에서 말한 것을 정확하게 반복 1점: 부분적으로 맞음. 예: 문장의 일부분만 읽거나, 격려 후 맞음	
Language				
11	(L)	a	“따라해 보세요” “나는 물건을 샀다”	2점: 각 문항을 정확하게 반복 1점: 각 문항을 부분적으로 정확하게 반복하거나 단어를 사용한 말을 함. 예: “나는 아기들을 좋아해요”
		b	“아기”	
Attention				
12	(ATT)	“따라해 보세요” 2 5 87 41 582 694 6439 7286 42731 75836 같은 길이의 숫자 조합에서 모두 실패하면 중단한다.	2점: 3, 4, 또는 5개의 숫자 조합을 정확하게 반복 1점: 1개나 2개의 숫자 조합을 정확하게 반복	

Language 13 (L)	“먹고 싶은 것들을 모두 말씀해 주세요” 또는 “아침에 먹고 싶은/점심에 먹고 싶은/저녁에 먹고 싶은 것/또는 요리하고 싶은 것들을 모두 말씀해 주세요” 필요할 때마다 격려하며, 1분 안에 답한 항목들을 모두 기록한다.	2점: 4개 이상의 항목 1점: 3개 이하의 항목
Memory 14 (M)	“제 이름을 기억하십니까?” “(예) 제 이름은 OOO입니다” 앞서와 같은 이름을 정확하게 사용한다.	2점: 자발적으로 정답 1점: 정답에 근접한 반응. 예: ‘Karen’을 ‘Carol’로, 또는 ‘Smith’를 ‘Schmitt’로
Language 15 (L)	컵 그림을 보여주며, “이것이 무엇입니까?”	2점: 컵, (칫)잔 1점: 비슷한 것. 예: 유리컵, 머그잔
Praxis 16 (PR)	“이것을 어떻게 사용하는지 보여주십시오”	2점: 분명하게 실연 1점: 정답에 근접한 반응. 예: 컵을 위로 들어올리지만 확실하게 입으로 가져가지는 않음
Language 17 (L)	15에서 2점을 받았다면, 이 문항은 2점을 준다. 그러나 회상 시 필요하기 때문에 이 과정을 반드시 실시한다. “이것을 잡아보세요” (컵을 준다) “이것이 뭐죠?”	2점: 자발적으로 옳은 반응을 하거나, 15번에서 2점을 받은 경우 1점: 정답에 근접한 반응
Praxis 18 (PR)	피검자가 계속 컵을 잡고 있도록 한다. “이것을 어떻게 사용하는지 (다시) 보여주세요”	2점: 분명하게 실연 1점: 정답에 근접한 반응. 예: 컵을 위로 들어올리지만 확실하게 입으로 가져가지는 않음.
Language 19 (L)	15번이나 17번을 맞았다면 이 문항은 하지 않고, 1점을 준다. “이것이 모자 인가요, 컵인가요?” “이 컵을 기억하도록 해보세요” (컵을 집어 든다) “제가 몇 분 후에 다시 물어볼 테니까, 기억하려고 노력해 보세요”	1점: 컵, 또는 15번이나 17번을 맞춘 경우 0점: 모자 (2점 답은 없음)
20 (L)	손가락 그림을 보여주며, “이것이 무엇입니까?”	2점: 손가락 1점: 정답에 근접한 반응. 예: 수저, 먹는 도구
Praxis 21 (PR)	“이것을 어떻게 사용하는지 보여주십시오”	2점: 분명하게 실연 1점: 정답에 근접한 반응. 예: 손가락을 입쪽으로 올리 지만, 확실하게 손가락 쪽으로 입을 움직이지 않음
Language 22 (L)	20번에서 2점을 받았다면, 이 문항은 2점을 준다. 그러나 회상 시 필요하기 때문에 이 과정을 반드시 실시한다. “이것을 잡아보세요” (손가락을 준다) “이것이 뭐죠?”	2점: 자발적으로 옳은 반응을 하거나, 20번에서 2점을 받은 경우 1점: 정답에 근접한 반응
Praxis 23 (PR)	피검자가 계속 손가락을 잡고 있도록 한다. “이것을 어떻게 사용하는지 (다시) 보여주세요”	2점: 분명하게 실연 1점: 정답에 근접한 반응. 예: 손가락을 입 쪽으로 올 리지만, 확실하게 손가락 쪽으로 입을 움직이지 않음
Language 24 (L)	20번이나 22번을 맞았다면 실시하지 않고, 1점을 준다. “이것이 구두 인가요, 손가락 인가요?” 다시 컵과 손가락을 피검자에게 보여준다. “이 손가락을 기억하도록 해보세요” (손가락을 집어 든다) “이 컵도요” (컵을 집어 든다) “제가 몇 분 후에 다시 물어볼 테니까 잘 보시고 기억하려고 노력해 보세요”	1점: 손가락, 또는 20번이나 22번을 맞춘 경우 0점: 구두 (2점 답은 없음)

Memory

25 (M)

두 가지 다른 물건과 컵을 보드판 위에 다음 순서로 놓는다:

검사자 왼쪽 가운데 검사자 오른쪽
 플라스틱 용기 접시 컵

“이것 중에서 어떤 것이 제가 기억하라고 했던 거죠?”

모든 물건들을 거둔다.

2점: 컵, 손가락 모두 말함

1점: 컵, 손가락 중 하나만 말함

두 가지 다른 물건과 손가락을 보드판 위에 다음 순서로 놓는다:

검사자 왼쪽 가운데 검사자 오른쪽
 손가락 국자 포크

“이것 중에서 어떤 것을 제가 기억하라고 했었어요. 어떤 거였죠?”

피검자에게 컵과 손가락을 다시 보여준다.

“이 손가락을 기억하도록 해보세요” (손가락을 집어든다)

“이 컵도요” (컵을 집어든다) “제가 나중에 다시 물어볼 테니까 잘 보시고 기억하려고 노력해 보세요”

Language

26 (L)

피검자에게 파란색 토막을 보여주며,

“무슨 색깔입니까?”

반응이 없으면,

“이것이 파란색입니까, 빨간색입니까?”

2점: 자발적으로 정답

1점: 파란색과 가까운 색을 말하는 경우(예: 자주색, 남색), 혹은 둘 중에 고르라고 했을 때 맞추는 경우

Visuospatial ability

27 (VS)

파란색, 녹색, 빨간색 토막을 보드판 위에 다음과 같은 순서로 놓는다.

검사자 왼쪽 가운데 검사자 오른쪽
 파란색 초록색 빨간색

파란색 자극 토막을 들고, 피검자가 볼 때까지 토막을 움직여서 피검자가 토막을 보도록 한다.

“이 토막들 중에서 어느 것이..” (보드판을 가리키거나

책상을 두드리며) “이것과 색깔이 같습니까?”

반응이 없으면, “이것은 저의 파란색 토막이구요. 당신 앞에 있는 토막들 중에서 파란색 토막을 보여주세요”

(자극 토막과 보드판 위의 토막들을 가리킨다)

옳지 않은 반응을 하거나 반응을 하지 않는 경우,

피검자의 파란색 토막을 집어 들고

“이것입니다-이것이 파란색 토막이에요”

2점: 자발적으로 정답

1점: 격려 후 정답

0점: 검사자가 답을 말한 경우

Memory

28 (M)

다음과 같은 순서로 토막의 순서를 바꾼다.

검사자 왼쪽 가운데 검사자 오른쪽
 녹색 파란색 빨간색

“저한테 줬던 것(제가 보여드렸던 것)과 똑같은 것을 저에게 돌려주세요”

반응이 없으면,

“어떤 토막을 저한테 줬었죠?-이거입니까? 이거요?”

아니면 이거요?” (보드판에 있는 토막을 가리킨다)

옳지 않은 반응을 하거나 반응을 하지 않는 경우,

“이것입니다-이게 그거예요”(파란색 토막 집어든다)

2점: 자발적으로 정답

1점: 격려 후 정답

0점: 검사자가 답을 말한 경우

Visuospatial ability

29 (VS)

“이번엔 저에게 다른 토막을 주세요. 좀 전에

제가 보여드렸던 토막이 아니라 다른 토막이요”

반응이 없으면,

“이것은 파란색 토막입니다” (파란색 토막을 집어든다)

“다른 색깔 토막을 주세요”

2점: 자발적으로 정답

1점: 격려 후 정답

Language

30 (L)

a

빨간색 토막을 보여주며,

“이것은 무슨 색깔입니까?”

반응이 없으면,

“파란색입니까, 빨간색입니까?”

2점: 자발적으로 정답

1점: 빨간색과 가까운 색을 말하는 경우 (예: 분홍색, 주황색), 혹은 둘 중에 고르라고 했을 때 맞추는 경우

	b	초록색 토막을 보여주며, “이게 무슨 색인가요?” 반응이 없으면, “이게 초록색입니까, 파란색입니까?”	2점: 자발적으로 정답 1점: 피검자가 원래 색과 비슷하게 대답할 경우 (예: 올리브색, 핑색, 청록색 등) 혹은 둘 중에 고르라고 했을 때 맞추는 경우						
	c	검정색 네모 토막을 보여주며 “이게 무슨 모양이죠?” 반응이 없으면, “이게 네모입니까, 동그라미입니까?”	2점: 자발적 정답 1점: 힌트 후 정답						
Visuospatial ability	31 (VS)	보드판 위에 다음과 같은 순서로 검정색 토막을 놓는다. <table border="1" style="margin-left: 20px;"> <tr> <td>검사자의 왼쪽</td> <td>중앙</td> <td>검사자의 오른쪽</td> </tr> <tr> <td>세모</td> <td>동그라미</td> <td>네모</td> </tr> </table> 검정색의 네모 토막을 집어 들고 피검자가 볼 때까지 토막을 움직여서 피검자가 토막을 보도록 한다. “여기 있는 토막들 중에서” (보드판을 가리키거나 책상을 두드리며) “이것과 같은 모양의 토막이 어떤 것이가요?” 반응이 없으면, “제가 가지고 있는 건 네모입니다. 당신 앞에 있는 토막들 중에서 네모가 어떤 것인지 보여 주세요” 그래도 반응이 없으면, 정답을 가리키며, “이게 네모입니다”	검사자의 왼쪽	중앙	검사자의 오른쪽	세모	동그라미	네모	2점: 자발적 정답 1점: 힌트 후 정답 0점: 검사자가 알려준 경우
검사자의 왼쪽	중앙	검사자의 오른쪽							
세모	동그라미	네모							
Memory	32 (M)	다음과 같이 보드판 위의 토막 순서를 바꾼다. <table border="1" style="margin-left: 20px;"> <tr> <td>검사자의 왼쪽</td> <td>중앙</td> <td>검사자의 오른쪽</td> </tr> <tr> <td>동그라미</td> <td>네모</td> <td>세모</td> </tr> </table> “좀 전에 제가 보여드렸던 것과 같은 토막을 제게 주세요” 반응이 없으면, “제가 보여드렸던 것이 이것입니까, 아니면 이것입니까?” (보드판 위에 있는 토막들을 가리키면서) 틀린 답을 말하거나, 반응이 없으면, “이게 제가 보여드렸던 것입니다” (네모 토막을 들어서 보여준다)	검사자의 왼쪽	중앙	검사자의 오른쪽	동그라미	네모	세모	2점: 자발적 정답 1점: 힌트 후 정답 0점: 부적절한 대답 또는 검사자가 알려준 경우
검사자의 왼쪽	중앙	검사자의 오른쪽							
동그라미	네모	세모							
Visuospatial ability	33 (VS)	“이번에는 좀 전에 보여드렸던 것과는 다른 모양을 저에게 보여 주세요” 반응이 없으면, “이게 네모입니다” (네모 토막을 집어 든다) “제게 다른 모양을 보여 주세요”	2점: 자발적 정답 1점: 힌트 후 정답						
Language	34 (L)	a 동그란 토막을 보여주며, “이건 무슨 모양인가요?” 반응이 없으면, “이게 네모입니까, 동그라미입니까?”	2점: 자발적인 정답(원, 동그란) 1점: 힌트 후 정답						
	b	세모 모양의 토막을 보여주며, “이건 무슨 모양인가요?” 반응이 없으면, “이건 세모입니까, 네모입니까?”	2점: 자발적인 정답 1점: 힌트 후 정답 또는 ‘피라미드’						
Construction	35 (C)	a “동그라미를 그리세요” 반응이 없으면, 동그라미가 그려진 그림을 보여주면서 “이렇게 그려보세요”	2점: 자발적으로 그린 둥근 모양, 달걀모양, 타원모양 (약간의 실수는 인정) 1점: 비슷한 모양. 예: 적어도 반원정도는 그린 원 모양, 또는 힌트 후 그린 원이나 원을 그리려고 시도한 경우 0점: 직선, 점 등						
	b	“네모를 그리세요” 반응이 없으면, 네모가 그려진 그림을 보여주면서 “이렇게 그려보세요”	2점: 사각형, 직사각형 (약간의 실수는 인정, 하지만 4면이 있어야 함) 1점: 비슷한 모양. 예: 네모 모양이기는 하나 한쪽 끝이 열려져 있는 경우 (세모는 틀린 것으로 간주), 또는 힌트 후 그린 경우나 네모를 그리려고 시도한 경우 0점: 직선, 점 등						

<p>Attention 36 (ATT)</p>	<p>“이제 제가 책상을 두드릴 것입니다. 그러면 제가 몇 번을 두드리는지 세어 보세요. 잘 들어보세요” 1초에 1번 두드리는 속도보다 더 빨리 책상을 세 번 두드린다. 그리고 두드리면서 “1-2-3”이라고 수를 센다. “이제 제가 두드릴 테니까, OOO님께서 직접 세 보세요” 5번을 두드린다. 딱 한번의 기회를 더 줄 수 있다.</p>	<p>2점: 자발적으로 5까지 션을 때 1점: 한 번의 기회를 더 주고 나서야 5까지 션을 때 0점: 두 번 이상의 기회를 주어야 하거나, 아니면 5까지 세지 못하는 경우</p>
<p>37 (ATT)</p>	<p>피검자의 주의를 끌기 위해 손가락을 흔든다. “자, 제 손가락을 보세요. 세 개의 손가락을 올리고 있습니다” 검지, 중지, 약지 손가락을 치켜든다. 그리고 나서 검지 손가락을 치켜든다. “지금 저는 손가락 하나를 올리고 있습니다” 그리고 나서 검지와 새끼 손가락을 편다. “자, 제가 손가락을 몇 개 펴고 있는지 세어 보세요” “(예) 두 개입니다” 그런 다음 검지 손가락만 올리고 있다. 피검자가 검사자의 손가락을 자발적으로 세지 못한다면, “제가 손가락을 몇 개 올리고 있는지 세어 보세요. 멈추지 마시고 계속 세어 보세요” 딱 한번의 기회를 더 줄 수 있다. (여기서부터 채점하기 시작한다)</p> <p>다음 순서대로 손가락을 편다. 검지와 새끼 (정답 2) 검지 (정답 1) 검지, 중지, 약지 (정답 3) 새끼 (정답 1) 검지, 중지, 약지, 새끼 (정답 4)</p>	<p>2점: 다섯 번 모두 정확하게 션 경우 1점: 다섯 번 모두 세기는 했지만, 한 번 멈춰서 한 번의 기회를 더 주었을 경우 0점: 틀렸거나, 두 번 이상의 추가적인 기회를 주어야 한 경우</p>
<p>Memory 38 (M)</p>	<p>보드판 위에 검과 두 개의 다른 물건을 다음과 같은 순서로 놓는다. 검사자의 왼쪽 가운데 검사자 오른쪽 계량 컵 컵 대접</p> <p>“이 물건들 중에서 제가 기억하라고 했던 것이 어떤 것이었나요?” 세 가지 물건을 모두 치운다.</p> <p>보드판 위에 손가락과 두 개의 다른 물건을 다음과 같은 순서로 놓는다. 검사자의 왼쪽 가운데 검사자 오른쪽 칼 주걱 손가락</p> <p>“이번에도 제가 기억하라고 했던 것이 있는데 그게 무엇인가요?”</p> <p>여기서 공식적인 면대면 검사는 끝이 나며, 피검자에게 이제는 집에 갈 준비를 하라고 말한다.</p>	<p>2점: 컵, 손가락 둘 다 대담 1점: 컵이나 손가락 중 하나만 대담</p>
<p>Orienting to name 39 (ON)</p>	<p>대기실로 돌아가는 동안이나, 집에 갈 준비를 하는 동안 피검자의 뒤에 서서 피검자의 이름을 불러본다.</p>	<p>2점: 자발적인 반응 (피검자가 뒤 돌아보는 경우) 1점: 약간의 반응 (언어적이든 비언어적이든. 하지만 소리가 들리는 방향을 확실하게 모르고 있음) 0점: 무반응</p>
<p>Language 40 (L)</p>	<p>만약 피검자가 39번 문항에서 반응을 보인다면 몇 가지 대화를 시도한다. “오늘 어떠셨나요?” 피검자가 한 단어로 반응을 한다면(예: “좋았어요”) 더 많은 얘기를 할 수 있도록 격려한다. “이번 주말에 뭐 하실 건가요?”, “오늘 손님이 오시나요?”</p>	<p>2점: 두 질문 중 어느 한 가지에 대한 적절한 대답. 하나의 완전한 문장으로 말해야 함</p> <p>1점: 적절한 대답이긴 하나 한두 단어로 대답함. (예: “괜찮았어요”, “예, 그래요”)</p>
<p>Alternative:</p>	<p>피검자가 39번 문항에서 아무런 반응을 보이지 않2었다면 이와 같은 질문들은 피검자가 떠나기 전 적절한 시기에 물어보아야 한다.</p>	