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Our newly developed Simple Cognitive test can be also used by computer or paper

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<http://www.brain-riha.jp/>

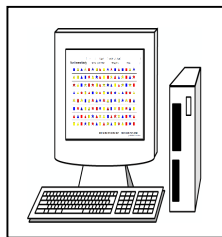
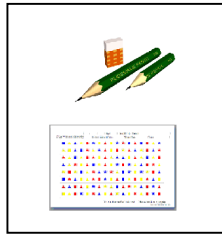
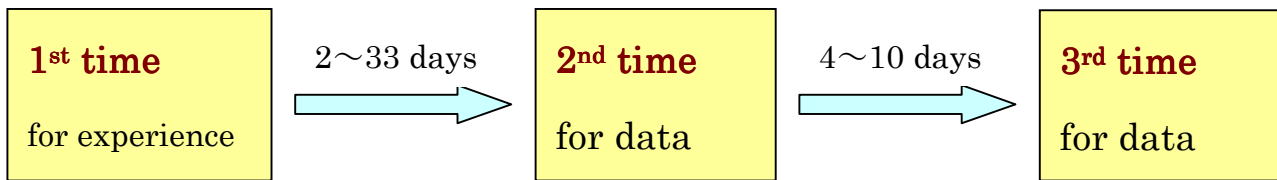
<http://www.akeai.or.jp/>

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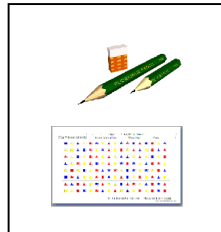
Aim: Simple Cognitive test (SC-test) is our newly developed test for early detection of cognitive function's decline. It was examined whether the same evaluation would be obtained also by computer or paper.

Methods: In SC-test, figures are located in 8 lines. A reference figure is at the left end of each line. There are 9 types of figures, which are combination of three shapes (star, quadrilateral, triangle) and three colors (blue, yellow, red). In three minutes, a testee chooses the figures in which both of shape and color are different from the reference figure. In this test, full mark is 50 points. Points are subtracted when figures are chosen by mistake. We can use this test by computer or paper. In this study, it was examined whether there is a difference between paper and computer(with touch panel monitor). Candidates were 18 persons of day rehabilitation users.

In order to have experience, the tests by paper and computer were done on the 1st time, and these were not adopted as data. The 2nd time of tests were performed after 2 to 33 days from the 1st time, and we used paper in the morning, computer in the afternoon. The 3rd time of tests were performed after 4 to 10 days from the 2nd time, and we used computer in the morning, paper in the afternoon.

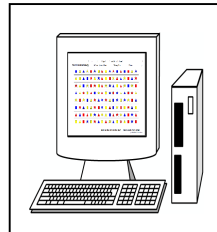


Morning



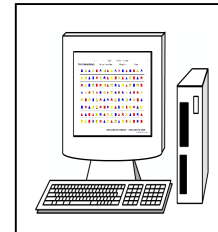
Paper

Afternoon



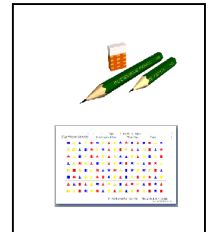
Computer with
touch panel

Morning



Computer with
touch panel

Afternoon



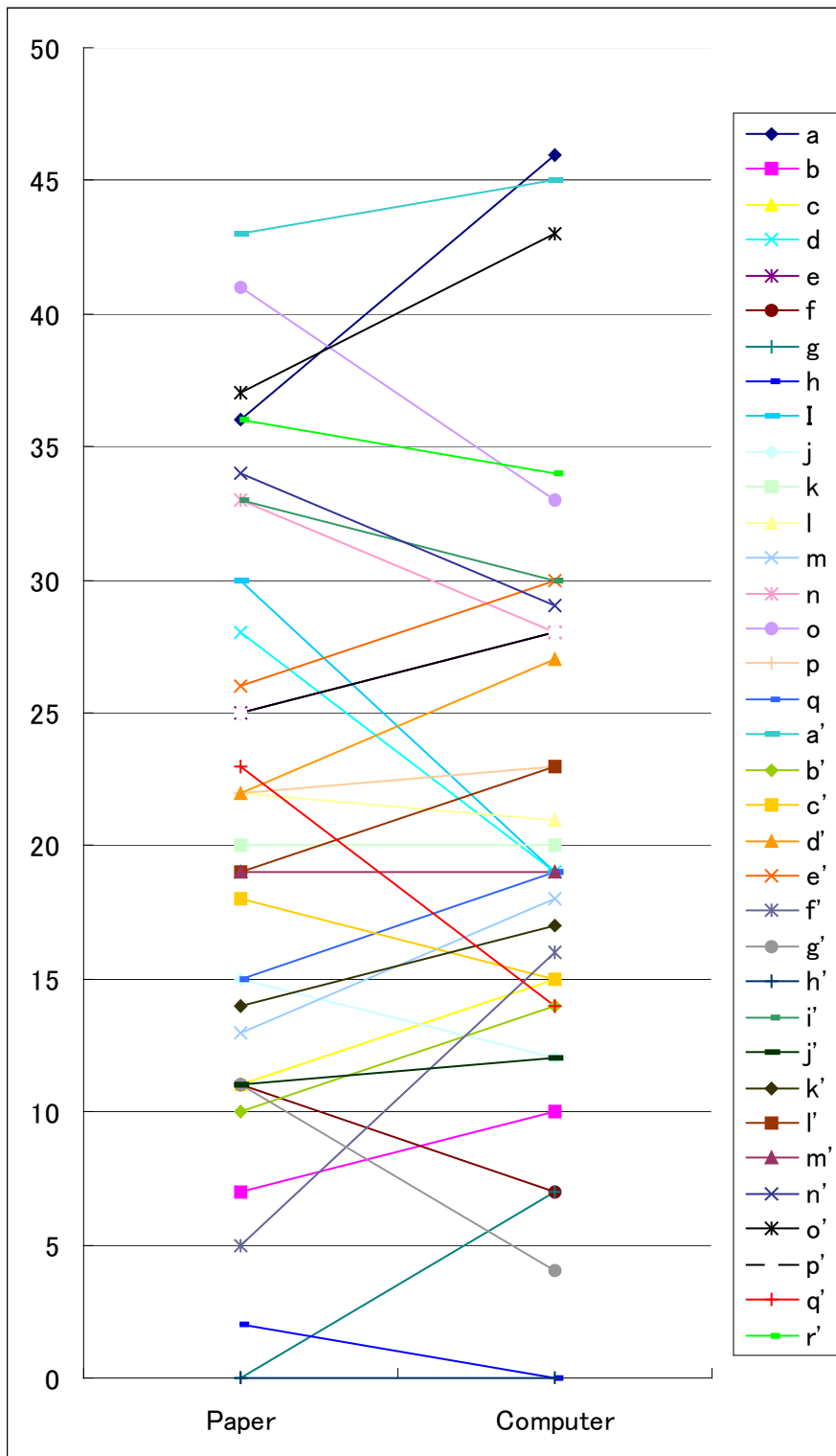
Paper

The procedure of data acquirement.

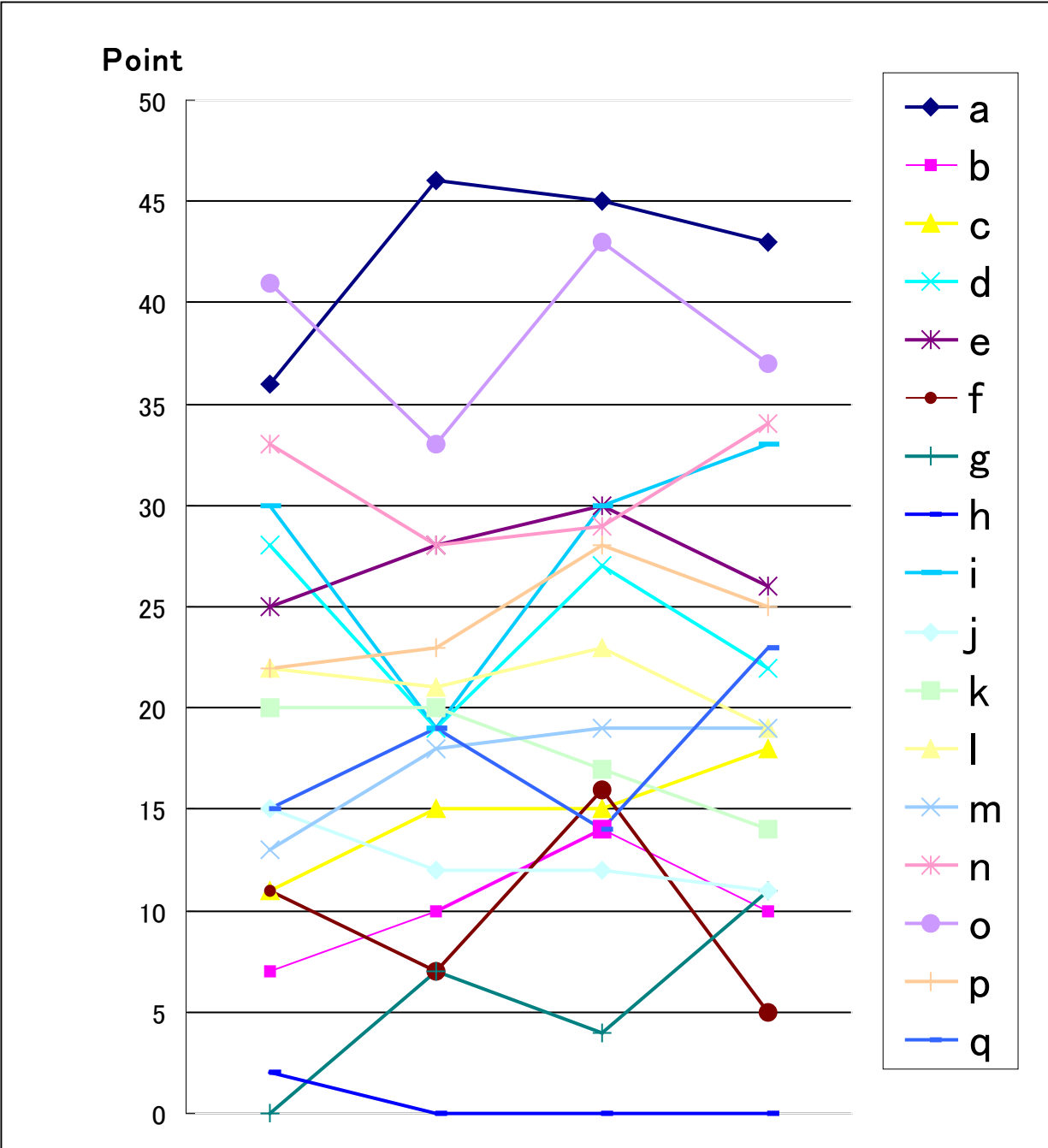
Results:

The average age of 18 persons of day rehabilitation users is 79.4 (± 7.37) year-old. The average point from 35 data by paper test is 20.49 (± 11.53). The average point from 35 data by computer test is 20.71 (± 11.33).

	2nd time		3rd time		Age
	Paper	Computer	Computer	Paper	
a	36	46	45	43	68
b	7	10	14	10	84
c	11	15	15	18	80
d	28	19	27	22	82
e	25	28	30	26	86
f	11	7	16	5	61
g	0	7	4	11	74
h	2	0	0	0	84
i	30	19	30	33	68
j	15	12	12	11	82
k	20	20	17	14	78
l	22	21	23	19	86
m	13	18	19	19	79
n	33	28	29	34	91
o	41	33	43	37	76
p	22	23	28	25	83
q	15	19	14	23	85
r			34	36	83



The line graph of SC-test data for parallel forms reliability.



2nd time

3rd time

paper computer

computer paper

The line graph of SC-test data
for test-retest reliability.

Discussion:

We have to apologize first. The method of the statistics indicated in the abstract was mistaken. The statistical work was carried out anew.

35 sets of data were made by making paper test and computer test into one set. In order to investigate whether parallel forms reliability is between paper test and computer test, the intraclass correlation coefficient was used.

Intraclass correlation coefficient

ICC(2,1) = 0.896

95% confidence interval 0.804 ~ 0.946

The equivalent nature of paper test and computer test is very high in SC-test.

We presuppose that paper and computer are equivalent tests from the above conclusion. It was investigated whether four times measurement would have test-retest reliability by using the intraclass correlation coefficient.

Since subject **r** lacks some data, 17 subjects (**a~q**) have data for 4 times. We use these 17 sets of data for this analysis.

The result is shown below.

Intraclass correlation coefficient

ICC(1,1) = 0.905

95% confidence interval 0.817 ~ 0.960

It turns out that there is strong test-retest reliability in SC-test from this result.

Conclusion: SC-test can be done also by paper or computer, and an equal result is obtained. And test-retest reliability is also high. We have already reported that SC-test detects an early decline of cognitive function. And this time it turned out that SC-test is very convenient because paper and computer can be use similarly.

In order to record progress of cognitive function's decline or to carry out self-diagnosis, it is good to use a computer. The other hand, it is good to use paper for testing many persons at once.

You can download the computer program and the PDF document of *SC-test* from the following site **for free**.

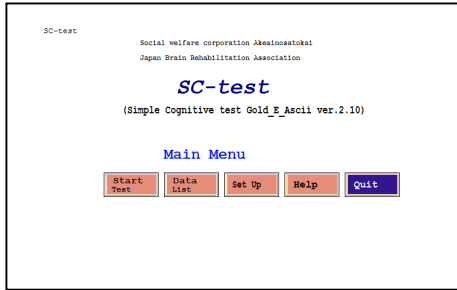
(*SC-test* computer program supports Windows 98, XP, Vista and 7. This program corresponds to the ASCII keyboard and touch panel.)

<http://www.akeai.or.jp/>

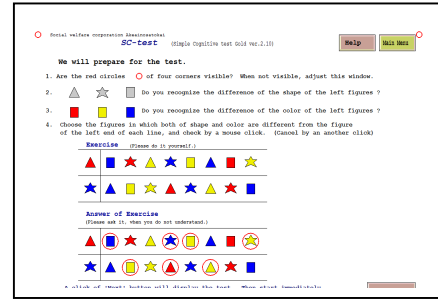
(Please download newest program from this site.)

The flow of *SC-test* computer program.

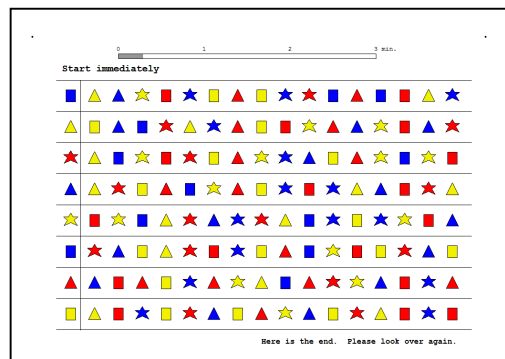
Main Menu



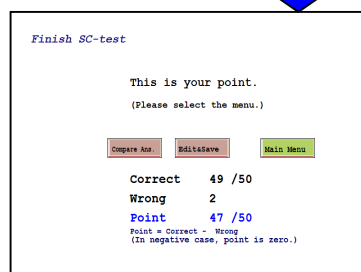
Prepare for test



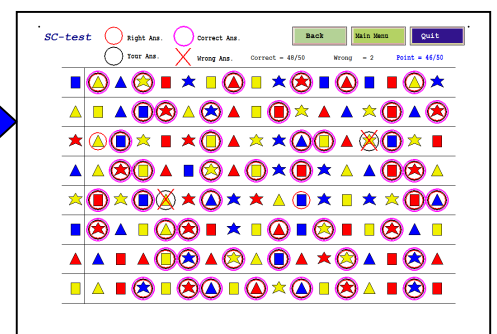
Test



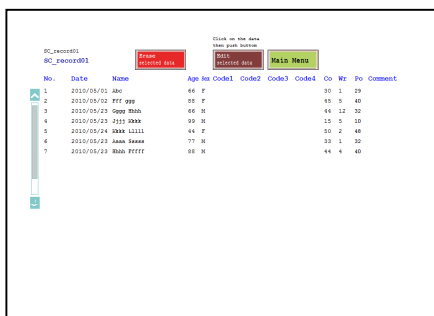
Finish



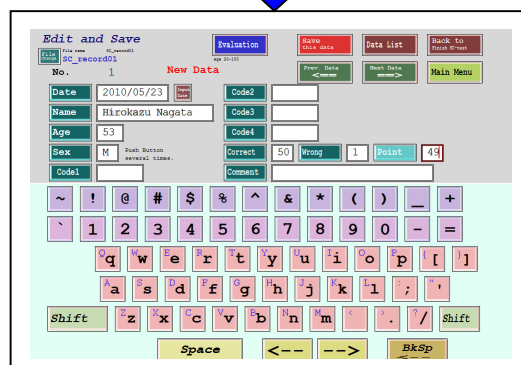
Compare with the answer



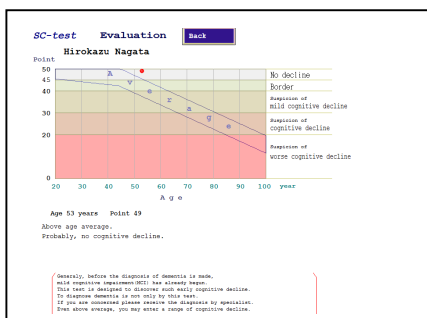
Data list



Edit & Save






Evaluation






The PDF document is also prepared for *SC-test*.

SC-test (Simple Cognitive test) (/ /) Age() Sex(M · F) Name()
Day / Month / Year



















We will prepare for the test.

①    Do you recognize the difference of the shape of the left figures ?



















②    Do you recognize the difference of the color of the left figures ?

③ Please choose the figures in which both of shape and color are different from the figure of the left end of each line, and check by a circle. (Erase wrong circle in a double line.)

Exercise (Please do it yourself.)

























































































































Answer of Exercise (Please ask it, when you do not understand.)

◎ Turn over this paper, when "Start" is said, and start this test immediately.
 Time is for 3 minutes. When time remains, please look over again.

Japan Brain Rehabilitation Association

(/ /) Age() Sex(M · F) Name()

	SC-test (Correct Num.	Wrong Num.	Points													
																
																
																
																
																
																
																
																

Here is the end of this test. Please look over again.

Japan Brain Rehabilitation Association

Already reported information about SC-test

(Nippon Ronen Igakkai Zasshi 2010; 47: 235-242)

A simple cognitive test which detects early decline in cognitive function

Yasuo Yamamoto, Ryuichi Sakaguchi, Hirokazu Nagata

Social welfare corporation Akeainosatokai

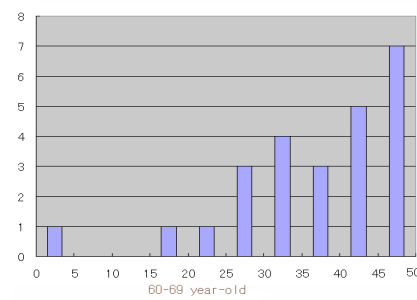
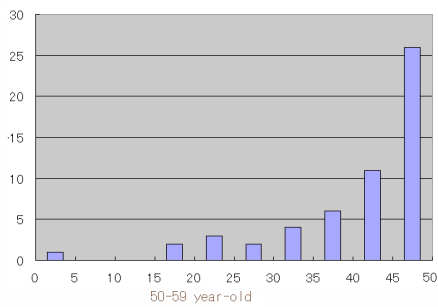
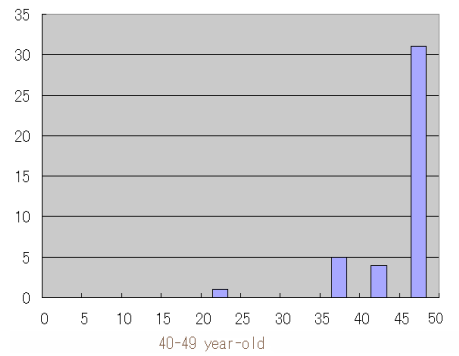
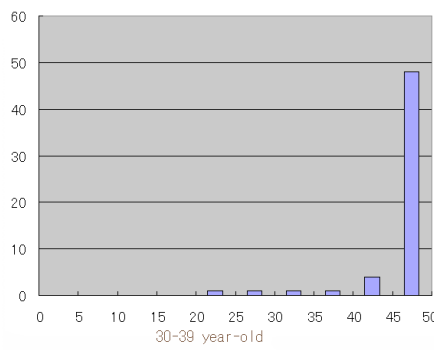
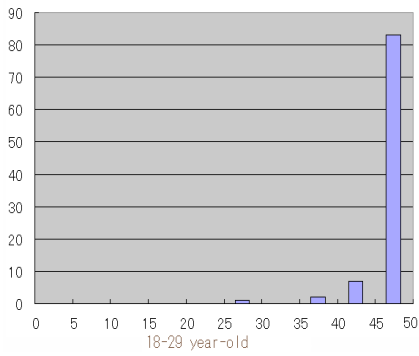
Abstract

Aim: The aim of this study was to examine our new cognitive test which detects early decline in cognitive function.

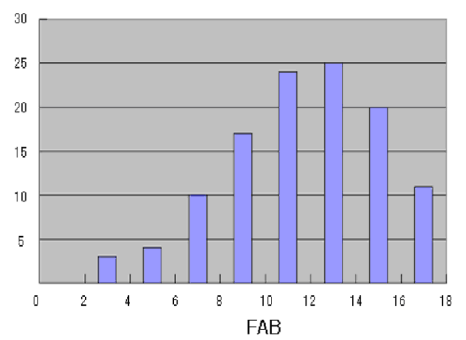
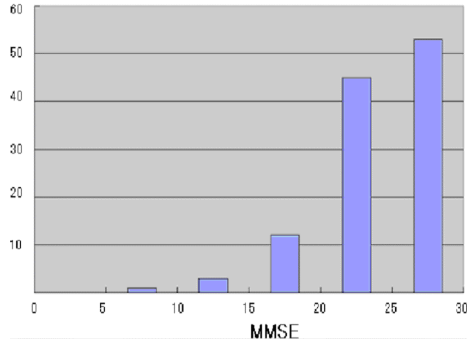
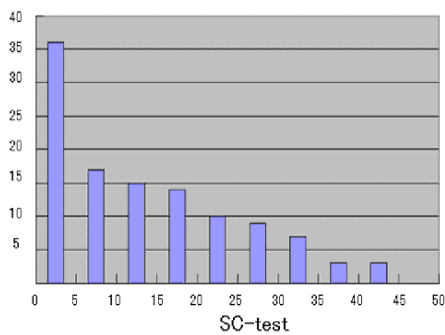
Methods: Our newly developed Simple Cognitive test (SC-test) takes 3 minutes, during which participants choose the figures in which both the shape and color are different from the figure on the left end of each line. The top score is 50 points. In a normal control study, the SC-test was given to 271 nursing home staff. We gave the Mini Mental State Examination (MMSE), Frontal Assessment Battery (FAB) and SC-test, to 114 participants in day-rehabilitation (Day group).

Results: For the normal candidates, most young participants obtained nearly full marks. The average mark of those aged 18 to 29 was 48.1 (± 3.40) points, while that for those 60 to 69 was 36.2 (± 11.6) points. The average age of the Day group was 80.2 (± 6.2), the MMSE average score was 23.8 (± 4.3) points, the average FAB score was 11.2 (± 3.5) points and the average on the SC-test was 13.1 (± 11.5) points. The correlation coefficient between the SC-test and MMSE was $r=0.569$ ($p=4.17 \times 10^{-11}$), while that of the FAB was $r=0.664$ ($p=6.661 \times 10^{-16}$). In the 3-dimensional scatter chart of the three tests, despite near full marks on MMSE, people who obtained low scores on the FAB test also had low scores on the SC-test.

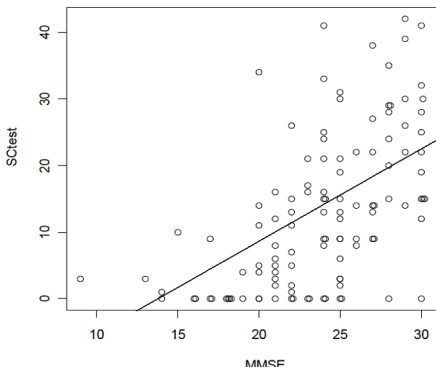
Conclusions: The SC-test is very simple to use, and it has very high sensitivity and specificity regarding early decline in cognitive function, especially frontal lobe function.



The histogram of SC-test according to age in normal candidates.
 (A horizontal axis is point and vertical axis is the number of people.)

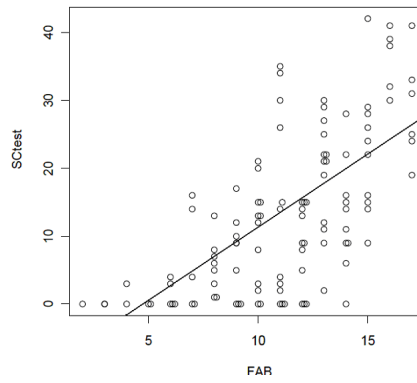


The histogram of SC-test, MMSE and FAB in Day group.
 (A horizontal axis is point and vertical axis is the number of people.)



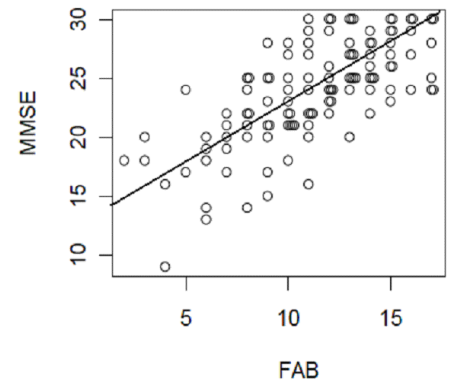
$$(SC\text{-test})=1.51*(MMSE)-22.8$$

$$r=0.569 (p=4.17*10^{-11})$$



$$(SC\text{-test})=2.21*(FAB)-11.7$$

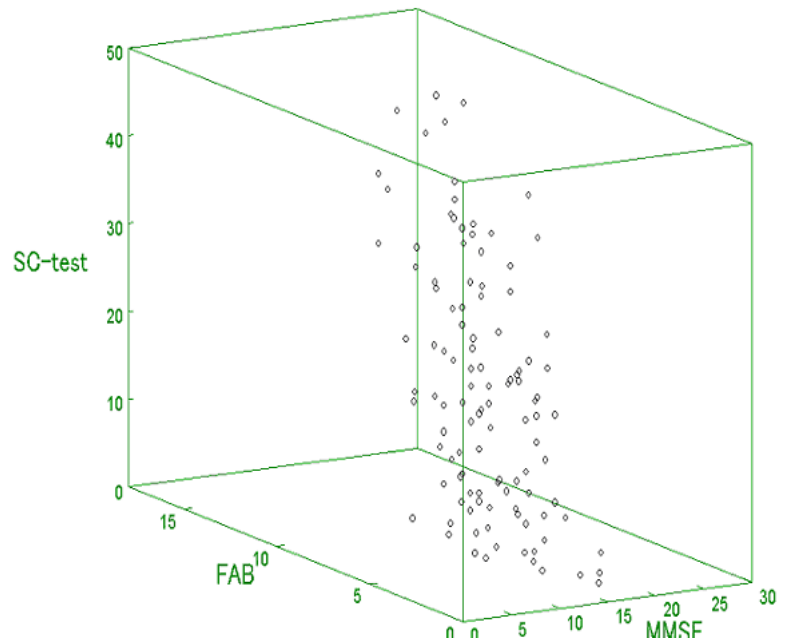
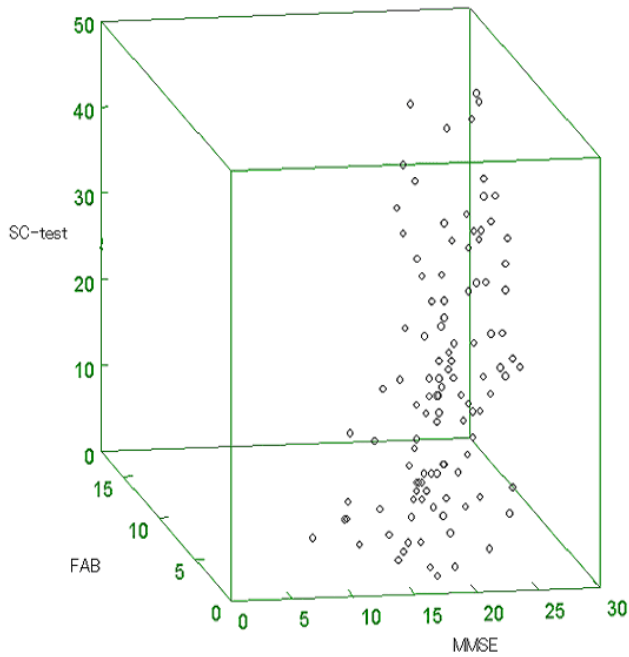
$$r=0.664 (p=6.66*10^{-16})$$



$$(MMSE)=0.872*(FAB)+14.0$$

$$r=0.695 (p=2.20*10^{-16})$$

The two-dimensional scatter chart between each test in Day group.



$$(SC\text{-test})=0.550*(MMSE)+1.74*(FAB)-19.4$$

$$R=0.681, \text{ adjusted } R=0.674 (p=9.9*10^{-16})$$

The three-dimensional scatter chart of three tests in Day group.

		Age	18-29	30-39	40-49	50-59	60-69
Whole	Number of data		93	57	41	55	25
	Average of age		24.7	33.5	45.3	54.9	63
	Average of SC-test		48.1	47.5	45.7	40.4	36.2
	Standard deviation		3.4	5.22	5.52	10.2	11.6
Male	Number of data		32	30	4	6	4
	Average of age		25.4	32.6	42.3	55.7	65
	Average of SC-test		48.9	47	48.8	43.7	39.3
	Standard deviation		1.83	6.01	1.64	5.93	7.56
Female	Number of data		61	27	37	49	21
	Average of age		24.3	34.6	45.6	54.8	62.6
	Average of SC-test		47.8	48.1	45.4	40	35.6
	Standard deviation		3.92	4.09	5.69	10.5	12.1
Man-and-woman difference of SC-test	Welch t-test p-value		0.067	0.41	0.027	0.257	0.503

Analysis of SC-test according to sex and to age in normal candidate.

	Allotment	Average	Average/Allotment	Correlation coefficient	p-value
M-1	5	3.97	0.794	0.327	3.87×10^{-4}
M-2	5	4.12	0.824	0.466	1.71×10^{-7}
M-3	3	2.98	0.993	0.014	8.83×10^{-1}
M-4	5	2.53	0.506	0.418	3.70×10^{-6}
M-5	3	2.14	0.713	0.267	4.11×10^{-3}
M-6	2	1.96	0.980	0.231	1.33×10^{-2}
M-7	1	0.877	0.877	0.155	9.88×10^{-2}
M-8	3	2.71	0.903	0.169	7.21×10^{-2}
M-9	1	0.921	0.921	0.246	8.42×10^{-3}
M-10	1	0.711	0.711	0.274	3.22×10^{-3}
M-11	1	0.842	0.842	0.326	4.06×10^{-4}

Correlation with SC-test and low rank item of MMSE in Day group.