Application of CKPT to Healthy People

Abstract

Object

The purpose is to apply CKPT (Color Kanji Pick-out Test) , which can be classified the decline level in the stage of PCSD (Preclinical Stage of Dementia) or MCI (Mild Cognitive Impairment), to self-proclaimed people with healthy cognitive function over 60 years old as their screening test for dementia, and to select those who were recommended the clinical treatment.

Methods

The tests were conducted in four areas: suburbs of large cities, urban areas of medium-sized cities, small cities, and rural / fishing village areas. The test paper, test environment such as lighting and room temperature, level of testers, ratio of test supervisors, test execution tools, etc. were standardized. Diagnosis was made based on whether the test results corresponded to Exclusion conditions and whether INDEX1 was average-1.5SD or less. For those who corresponded to this, we gave advice to encourage the clinical treatment.

Results

A total of 1325 people were tested. A total of 285 people, 199 who met the Exclusion conditions and 86 who had an INDEX 1 of average-1.5SD or less, were extracted for the clinical treatment. Average extraction ratio was 21.5%.

Conclusions

The extraction ratio of people who were judged to have correct self-proclaimed health of cognitive function decreased as the elderly became older, that is, the older they became, the more likely they seem to become overconfident.

Keywords: CWPT; CKPT; Neuropsychological test; PCSD; MCI; Application to healthy people; Extraction ratio

Introduction

Dementia is a progressive disease that is known to progress to healthy, PCSD, MCI, and Dementia [1]. Initially, as research on dementia, research on diagnostic methods and therapeutic agents after falling into dementia was active. Today, when the limits of therapeutic agents are becoming apparent, research on dementia is shifting to MCI and PCSD. The CKPT used in this study is a Japanese version of the neuropsychological test CWPT [2-7], which was devised for the purpose of detecting a slight cognitive decline in the stage of healthy, PCSD, and MCI. It is a test for which evidence has been obtained [8] and diagnostic criteria [9] have been established.

Objective

The purpose of this study is to conduct screening tests that apply CKPT to people who think that they are healthy in terms of dementia, and to select those who recommend clinical treatment.

Methods

CKPT

CKPT is a neuropsychological test that applies the Stroop effect [10]. In CKPT, Story including color words are shown first like Figure1a. Subjects should read the story memorizing the episode of it, and simultaneously pick-out color words discerning the matching of meaning and printed color of them. If they are matched, the subject puts O on the colored letters, and if they are not matched, puts X on the entered letters. After a certain period of time, the subjects stop the task of determining the color words of Story, and answer Questions (Figure1b) regarding the episode memorized without seeing Story.

Story
Last Sunday, Renate went swimming with her red bag alone. She went up the hill and could see a long gray sandy beach below. There were red, pink, blue and yellow umbrellas like flowers.

Figure1a: *Sample of Story of CWPT.*

Quest ions (select one)
what was Renate going for?
(Shopping, Surfing, Swimming, Forget)
What color was her bag?
(Red, Pink, Yellow, Forget).

Figure1b: *Sample of Questions.*

The CKPT score, INDEX1, is obtained by multiplying the number of correct answers with O or X correctly added to the color words and the correct answer rate of correctly answering the question of the episode of the story [11].

Areas and Environments of the Screening

The screening tests were conducted in four areas: suburbs of a large city, urban areas of medium-sized cities, small cities, and rural / fishing village areas. The test paper, test environment such as lighting and room temperature, level of testers, ratio of test supervisors, test execution tools, etc. were standardized.

Diagnostics (Figure 2)

Diagnosis on screening with CKPT was made based on whether the test results corresponded to Exclusion conditions (Table 1) and whether INDEX1 was average-1.5SD or les (Table 2). For those who corresponded to this, we gave advice to encourage the clinical treatment. For the other people, we provided guidance on good lifestyle-related habits, rehabilitation, and risk factors for dementia to maintain and improve the INDEX1 score.

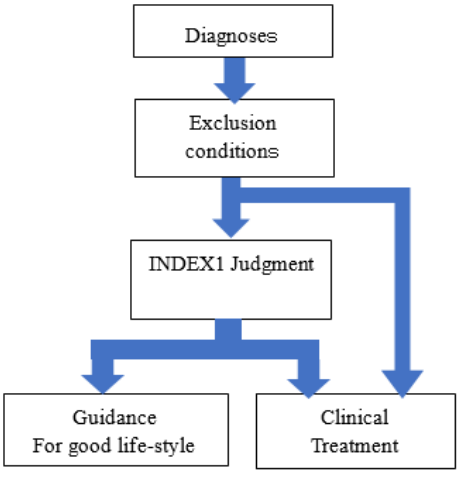


Figure 2: *Diagnoses on screening with CKPT.*

Table 1: *Exclusion conditions [9].*

No.	Items	Conditions
1	Story scoring	Wrong answer. ≧2
2		Oversight ≧4
3		Mistaken answer. ≧1
4		Wrong answer. =1 and Oversight ≧2
5	Questions	No correct answer

Table 2: *INDEX [9].*

Male/Female		Average -1.5SD	Average	Average +1.5SD
Male	Sixties	5.1	11.7	18.3
	Seventies	5.0	10.7	16.2
	Eighties	3.0	8.6	14.2
Female	Sixties	5.9	11.9	17.9
	Seventies	4.6	10.6	16.5
	Eighties	2.3	8.8	15.3

Subjects

The tests were conducted in four areas: suburbs of a large city, urban areas of medium-sized cities, small cities, and rural / fishing village areas. The subjects of the test were recruited who were thinking, "I don't have dementia now, but I'm worried that I will have dementia in the future, so I want to prevent it".

Tools and Environment

The test paper, test environment such as lighting and room temperature, level of testers, ratio of test supervisors, test execution tools, etc. were standardized.

Ethical Consideration

For this paper, all subjects have agreed to use their data while keeping their personal information confidential.

Results

Total Subjects

Table 3 shows the number of subjects who participate in the screening examination, corresponding to the intersections, with the area on the horizontal axis and the male and female in their 60s, 70s, and 80s on the vertical axis. In the end, the total number of subjects was 1325, including 336 males and 989 females.

Subjects Who Need Clinical Treatment

Table 4 shows number of subjects who need clinical treatment. And the ratio is shown in the same table. Hereinafter, the ratio of persons who need clinical treatment will be referred to as an extraction ratio.

Table 3: *Number of Subjects in each area.*

Male: 336 **Female:** 989

	Age	Rural / fishing village area	Small cities (Iwata, Fukuroi, Mishima etc.)	Urban area of middle cities (Hamamatsu, Okayama etc.)	Suburbs of a big city (Tokyo)	Total
Male	Sixties	47	58	26	13	144
	Seventies	34	65	31	9	139
	Eighties	19	14	14	6	53
Female	Sixties	153	224	76	23	476
	Seventies	148	162	85	27	422
	Eighties	27	36	24	4	91
Total		428	559	256	82	1325

Table 4: *Number of people who needs clinical treatment and the extraction ratio.*

	Age	Rural / fishing village area		Small cities (Iwata, Fukuroi, Mishima etc.)		Urban area of middle cities (Hamamatsu, Okayama etc.)		Suburbs of a big city (Tokyo)		Total area	
		Num.	%	Num.	%	Num.	%	Num.	%	Num.	%
Male	Sixties	6	12.8	11	19.0	6	23.1	3	23.1	26	18.1
	Seventies	9	26.5	18	27.7	10	32.3	2	22.2	39	28.1
	Eighties	9	47.4	5	35.7	6	42.9	3	50.0	23	43.4
Female	Sixties	22	14.4	40	17.9	6	7.9	6	26.1	74	15.5
	Seventies	38	25.7	36	22.2	14	16.5	6	22.2	94	22.3
	Eighties	5	18.5	13	36.1	8	33.3	3	75.0	29	31.9

Analysis of Results

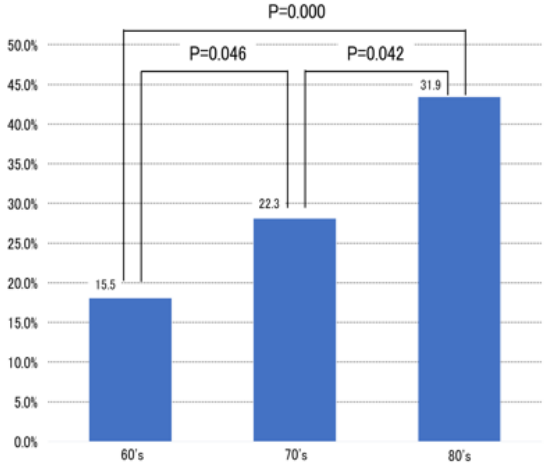
Changes in Extraction Ratio by Age

Table3 and 4 is used to analyze changes in the extraction ratio with age. Next, the details of the "testing method for two ratios" will be described. Figure3a and b show the results of analyzing whether there is any age difference in the average extraction ratio of the subjects who totaled all the regions by age group.

Figure3a shows in the case of male. The extraction ratio in 60's was used as the first sample, and the extraction ratio in their 70's was used as the second sample, and a significant difference test gave p-value of 0.046 between the two. As p-value is within 5%, the null hypothesis that both specimens are equal was rejected by the same method, a significant difference test of the extraction ratio between the 70's and 80's was performed, and p-value=0.042 was obtained so that there was a significant difference between the two. After all, it turned out that the extraction ratio increased as the age progressed.

Figure3b shows in the case of female. P-value obtained are described in the figure. Although there was a significant difference (p-value = 0.010) between the 60's and 70's, there was no significant difference (p-value = 0.052) between the 70's and 80's.

Figure3a: *Extraction ratio by age for male.*



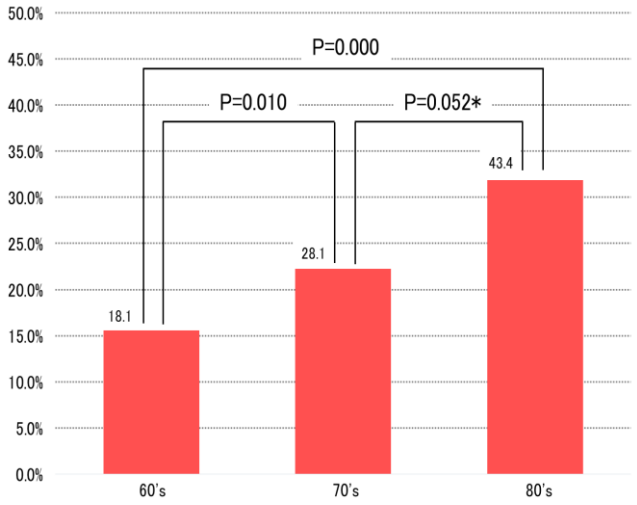


Figure3b: *Extraction ratio by age for female.*

Comparison of Extractor Ratio between Areas

In order to investigate the regional difference in the extraction ratio, a significant difference test was performed using the rural area / fishing village area as sample 1 and the other three areas as sample 2. These tests were performed for each age group, and as a result, the p-value is shown at the intersection of the matrix of Table4 where the vertical axis is the age and the horizontal axis is the area. When the null hypothesis was tested to be rejected when the p-value was less than 5%, it was found in female that only the 80s in large cities differed from rural areas. This intersection is colored with blue.

Table4a: *P-value for significant differences between areas for male.*
Smple1: Rural area / fishing village area.
Sample2: Areas (A: small cities, B: middle cities, C: a big city).

p-value	60's	70's	80's
A	0.391	0.897	0.503
B	0.255	0.608	0.797
C	0.357	0.795	0.412

Table4b: *P-value for significant differences between areas for female.*
Smple1: Rural area / fishing village area.
Sample2: Areas (A: small cities, B: middle cities, C: a big city).

p-value	60's	70's	80's
A	0.371	0.476	0.126
B	0.158	0.104	0.226
C	0.152	0.704	0.016

Considerations

Characteristics of the Subject

Figure 4 shows the summary of the pamphlet used when recruiting subjects. As shown in the pamphlet, a cognitive function screening test and a dementia prevention course were held at the same time.

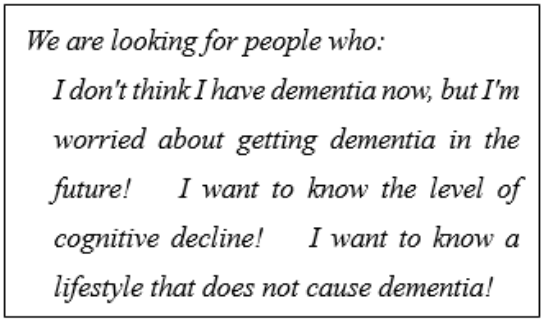


Figure4: *The pamphlet used for recruiting.*

Subjects in a big city (Tokyo) participated by public transport, and in the other areas the subjects participated by car. However, few people in their 80s participated alone, and most of them were taken by an attendant.

Age Difference in Extraction Rate

As shown in Figure 3a and Figure 3b, the fact that the extraction rate of those who require clinical treatment increases as they get older is considered to be consistent with the characteristics of dementia. However, in the case of female, the extraction rate seems to be increasing from 22.3% in the 70s to 31.9% in the 80s, but it cannot be said that there is a significant difference as a result of the 5% significant difference test. Please note that it is a judgment. In Japan, it is common to retire from work around the age of 60-70, and after the age of 70, physical fitness is weakened, forcing restrictions on a good lifestyle that maintains cognitive function, and after the age of 80, physical fitness is restricted. The decline becomes even worse, and people move away from active social life. In the case of female, many people live a life that contributes to their homes and society even if they retire from the front lines. This fact seems to reflect the overall low extraction rate compared to male and the lack of significant difference in extraction rates between the 70s and 80s.

Regional Area Difference in Extraction Rate

Testing for differences in regional extraction rates was performed by age group. As a result, the p-values are shown in Tables 4a and 4b. At this time, the extraction rates of the rural and fishing village areas were placed in the sample 1, and the extraction rates of the other areas were regarded as the sample 2, and the test was performed. There were no significant differences between rural / fishing village areas and the other areas in all age groups, except in the large city for female in their 80s. However, it should be noted that the sample size of female in their 80s in the large city is extremely small. In Japan, female in rural areas and fishing village's area over the age of 80 generally help her family work and have a habit of not reaching retirement age. The low extraction rates shown in Table 3 reflect this.

Conclusions

CKPT was performed for the purpose of detecting a slight decrease in cognitive function in healthy subjects aged 60 to 89 years who are

considered not to have dementia. The overall extraction rate of Subjects who were identified as having cognitive decline and requiring clinical treatment increased to 21.5%. There was a tendency for the extraction rate to increase with age. In addition, a comparison of the extraction rates of rural / fishing village arias and other areas suggested that there was a significant difference only in female in their 80s in large cities. It was surprising that there was no difference from other areas.

Additional Remarks

CWPT is a neuropsychological test that can classify minor cognitive declines focusing on color character judgment and episodic memory, so it can be easily translated into any country's language. This paper shows the results using Japanese version named CKPT, but English version issues and implementation tools are ready [11], so please email the first author if you are interested in collaboration with us.

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