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An Application of CKPT which can Classify the Slight Decline of the Cognitive Function to the End-of-Life Planning People

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Abstract

Background: The CKPT (Color Kanji Pick-out Test) was devised as a neuropsychological test capable of detecting subtle declines in cognitive function before the onset of dementia. Evidence has been gathered, and diagnostic criteria based on large-scale data have been established. Because the CKPT is an economical screening test that can examine dozens of people in a short time, various applications are being attempted. This time, we applied it to people in Japan who are planning their end-of-life arrangements to explore trends.

Methods: The subjects were members of a funeral mutual aid society who requested the examination because they were concerned about developing dementia. Since the society is located in central Tokyo, all the subjects live in central Tokyo. The number of the subjects is 212. Individual lifestyle self-assessment is applied to the subjects so as to give those comments for the future life style. The CKPT results were evaluated according to the rule in which exclusion is done first then the categorization is done. For each age group is divided into six categories using the average, average ± SD, and average ± 1.5 SD. They are A: excellent, B: very good, C: good, D: fair, E: poor, and F: require a doctor's diagnosis.

Results: The histogram of CKPT should show a normal distribution for each age group, but in this group of people preparing for the end of life, there were 97 subjects ranked F, who were proposed to need doctor's treatment. On the other hand, we confirmed that 89 subjects were ranked C or D, which is within the average ± SD.

Summary: Elderly people planning for the end of their lives know that dementia not only places a mental and physical burden on the individual, but also imposes a longer-term care burden on their family more than other illnesses. Therefore, it is natural for them to recognize the decline in their own cognitive function and consider preventative measures.

Keywords: CKPT; Cognitive function; End-of-life planning people

Introduction

First, I will describe the threat of dementia, which is the background of this research. The descriptions presented here are extracted from the paper written by the author in November 2025 **[1]**, with comments added to reflect the items necessary for this research. The WHO analyzed large-scale global data to derive risk factors for dementia, published in 2019. **Table 1** shows a clear summary of the updated information from 2024 **[2]**. According to this report, eliminating the 14 risk factors listed here suggests that the risk of developing dementia could be reduced by 45%. However, since aging remains the greatest risk factor for dementia, I would like to discuss the risk of dementia based on trends among people aged 65 and over worldwide. Let's look at **Figure 1** showing the trends in presentation of population over 65, in each country **[3]**. The graph on the left shows the trends in Europe and USA, with Japan's trends shown for reference. Japan's high rate stands out. The graph on the right shows the trends in Asian countries. Notable are the rapid changes in China, Singapore, South Korea, and Thailand. South Korea in particular is predicted to overtake Japan and becomes the world's largest aging country, by 2050. Please, recognize that humanity faces the threat of dementia.

Second, let me explain the background to the creation of CKPT. This description presented here is also extracted from the same paper **[1]**. Dementia progresses through healthy individuals, preclinical stages, MCI (Mild Cognitive Impairment), and finally, Dementia **[4] Figure 2**. However, in recent years, research has shifted its focus from Dementia to MCI and the preclinical stages. In other words, primary and secondary prevention of dementia have become the targets of research. Research can be broadly divided into the exploration of causes (pathology), the elimination of causes (treatment and therapy), and diagnosis. However, diagnostic methods in this area rely on expensive equipment such as PET scans **[5]** and invasive techniques such as CSF (Cerebrospinal Fluid) Examination **[6]**, and there were no economical neuropsychological tests available. Even before the concept of MCI was announced, we focused on neuropsychological tests that could be used before the onset of dementia. In 2009, we devised a neuropsychological test (CWPT: Color Words Pick-out Test) **[7-11]** that combined the Stroop effect **[12]** and short-term memory. We worked to accumulate evidences and develop diagnostic criteria, and in 2018, we presented our findings at an international conference **[13]** and completed two papers, one of which presented about evidences **[14]**, the other of which presented about the diagnostic criteria **[15]**. Incidentally, CKPT (Color Kanji Pick-out Test) is the Japanese version of CWPT.

Third, In Japan, becoming a member of a funeral mutual aid association is a common part of end-of-life planning. Now, I'd like to briefly touch upon funeral mutual aid societies in Japan. In Japan, funerals are rarely held at Shinto shrines, Buddhist temples, or Christian churches; most people hold them at funeral halls run by mutual aid societies. These halls are prepared to accommodate people of any religion.

Table 1: Risk Factors for Dementia.

Age	Risk reduction rate (%)	Risk Factors
0<Young<18	5	Low education history
18<Middle<65	7	Hearing loss
	7	High LDL cholesterol
	3	Depression
	3	Traumatic brain contusion
	2	Lack of exercise
	2	Diabetes
	2	Smoking
	2	Hypertension
	1	Obesity
	1	Heavy alcohol consumption
65<Old	5	Social isolation
	3	Air pollution
	2	Vision loss
Total	45	None of risk factor

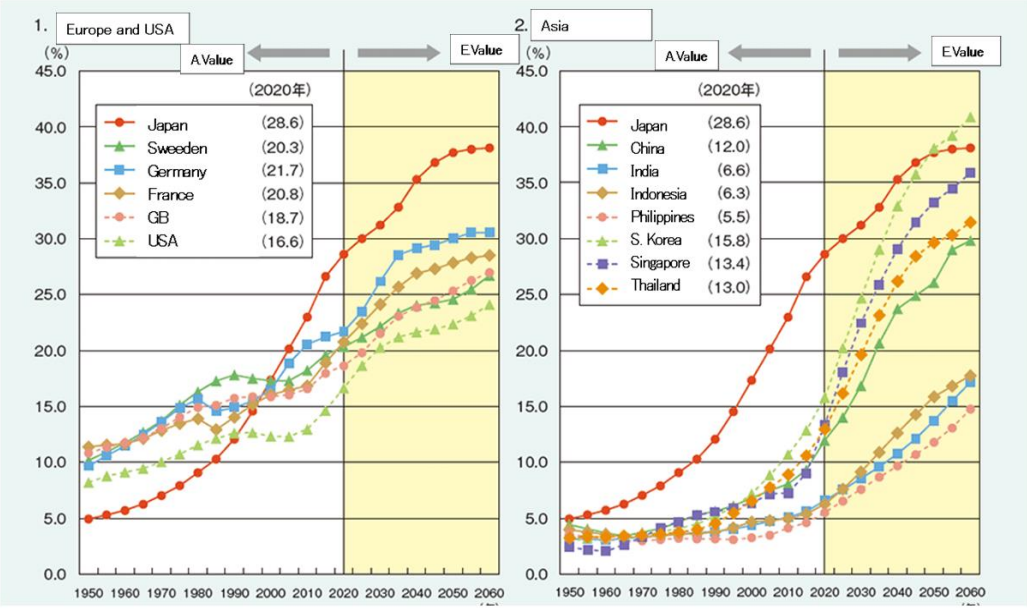

Figure 1: Trends in presentation of population 65 and over worldwide.

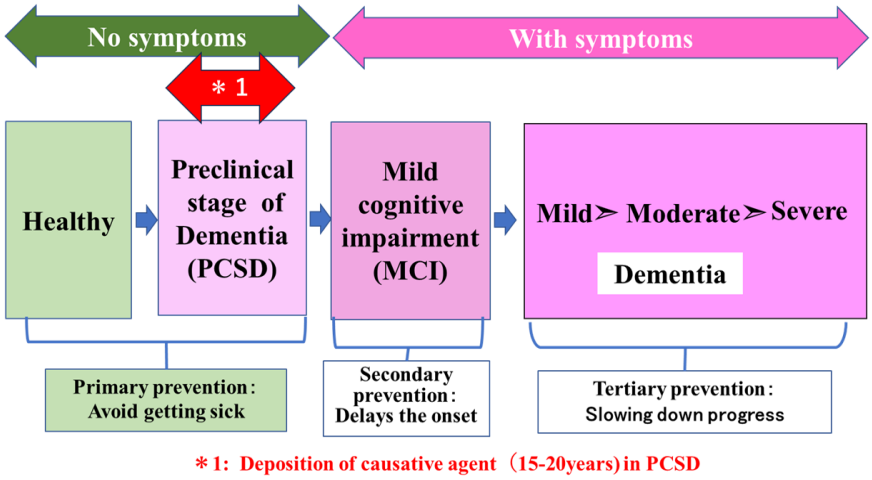

Figure 2: Dementia progression.

Objective

The applications of CKPT, which can detect minor changes in cognitive function before the onset of dementia, are wide-ranging. These can be broadly categorized into two types: assessment of cognitive function status and evaluation of the effectiveness of dementia prevention measures. The former involves a single test to understand one's cognitive state and provide a starting point for reviewing daily life habits, while the latter involves regular, ongoing testing and includes applications such as evaluating the effectiveness of dementia prevention lifestyle improvements, assessing the effectiveness of dementia prevention therapy, and determining the continued employment of older adults. The subjects in this study are elderly individuals who consider end-of-life planning a personal challenge and have taken concrete steps such as becoming members of funeral mutual aid associations. They are aware that dementia places a significant financial and care burden on their families, and therefore, they took the CKPT test with the aim of extending their independent lifespan through dementia prevention.

Methods

Protocol

Figure 3 shows the protocol of this examination. First, we will give a lecture titled "Understanding Dementia and Tips for Prevention." Following that, we will conduct a CKPT test and a lifestyle self-assessment. We take the CKPT test sheets and lifestyle self-assessment sheets home, add comments in the reports, and return them to the subjects at a later date.

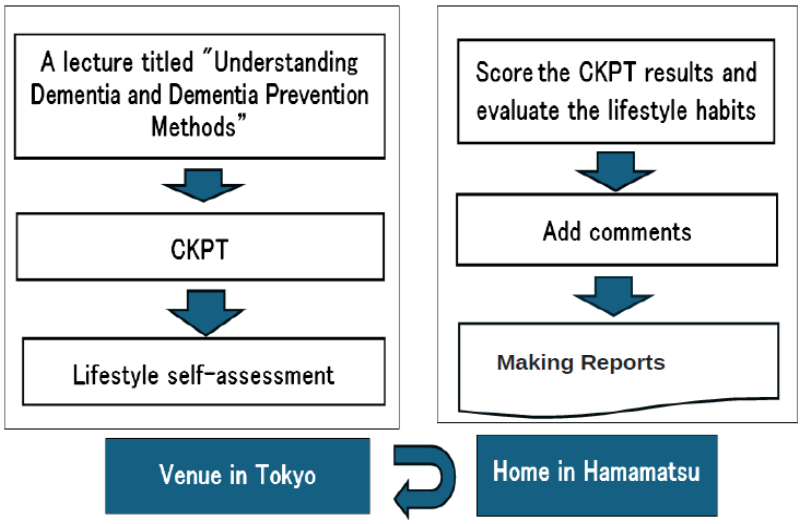

Figure 3: Protocol of the examination.

Subjects

The subjects were members of a funeral mutual aid society who requested the examination because they were concerned about developing dementia. Since the society is located in central Tokyo, all the subjects live in central Tokyo. The number of the subjects is 212.

Cognitive function evaluation using CKPT

The diagnostic procedure using CKPT is shown in **Figure 4**. The score of the CKPT called Index 1, excluding exclusion criteria, are characterized by exhibiting a normal distribution for each age group. This is used to create a diagnostic map, as shown in **Figure 5**, which presents the cognitive function of the subjects. In the map, the vertical axis represents Index 1, and the horizontal axis represents the age at which the test was taken. The five lines represent average, average ± SD, and average ± 1.5 SD. The six regions separated by these lines are diagnosed as Excellent, Very good, Good, Fair, Poor, and "Requires physician's diagnosis" from top to bottom.

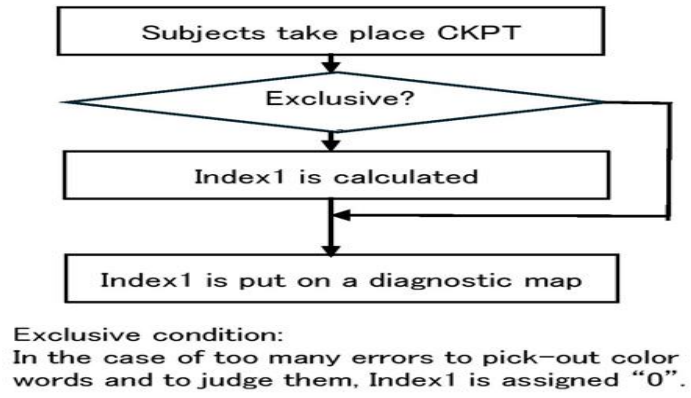

Figure 4: Diagnostic Criteria.

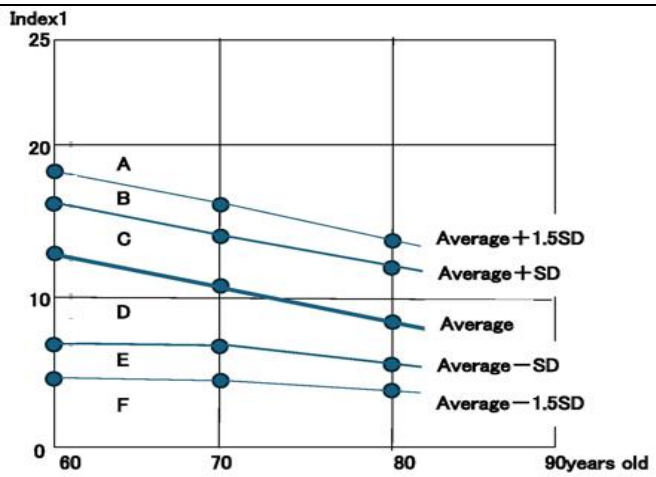

Figure 5: Diagnostic map for male.

A: Excellent, B: Very good, C: Good, D: Fair, E: Poor, F: Require a doctor's diagnosis.

Lifestyle self-assessment

A self-assessment sheet for lifestyle habits was developed to help subjects recognize their own lifestyle habits and to add comments to their CKPT results. The assessment sheet **(Table 2)** presents 10 sessions, eight of which are those identified by the WHO as risk factors for dementia, while the remaining two sessions are based on the author's experience in dementia care at a dementia nursing home, where he has practiced for 15 years. Each session includes questionary items, and subjects are required to reflect on their own lives and answer those questions honestly.

Table 2: Lifestyle self-assessment sheet.

Sections	Questionary items	
Exercise	Multitasking Aerobic exercise Exercise duration Exercise frequency	* 1
Smoking	Smoking or not smoking Number of cigarettes smoked Year quitting smoking	* 1
Diet	Regular meals Balanced diet Obesity Weight loss	* 1
Alcohol consumption	Alcohol intake Frequency	* 1
Solo brain training （Math drills, crossword puzzles, etc.）	Whether or not you think it is effective	* 2
Social activities	Role Frequency	* 1
Blood pressure management	High blood pressure or not Regular medical checkups Receiving medication Dietary control	* 1
Diabetes	Diabetes or not Regular medical checkups Receiving medication Dietary control	* 1
Hearing	Hearing loss or not Hearing aids	* 1
Daily lifestyle indicators	Motivation Autonomous behavior Communication with people	* 2

* 1: Derived from the risk factors for dementia identified by the WHO.

* 2: Derived from the author's 15 years of experience providing care at a dementia care home.

Results

Table 3 shows CKPT results for the end-of-life planning elderly. It is noteworthy that there were many F-rank results, with 53% of all male subjects and 43% of all female subjects receiving an F-rank. Furthermore, the proportion of F-rank individuals in each age group tended to increase with age. This is consistent with previous results from a large, randomized study of subjects **[16]**. This suggests that the subjects in this study, who are planning their end-of-life arrangements and live in Tokyo, are not particularly exceptional in terms of cognitive function.

The individual results were returned as a report to serve as a guide for future lifestyle choices. In this report, the CKPT results were recorded on the diagnostic map shown in **Figure 4**, with rankings from A to F clearly indicated. Furthermore, the CKPT results were compared with the self-assessment of lifestyle shown in Table 1, and comments regarding future lifestyle habits were added.

Table 3: CKPT results for the end-of-life planning elderly.

		A	B	C	D	E	F	Total
Male	90's			1			4	5
	80's	2	1	3	3	2	18	29
	70's			5	6	1	11	23
	60's				3			3
Total		2	1	8	12	3	29	55
Female	90's				1	1	3	5
	80's			4	23	8	33	68
	70's	1	2	17	12	3	29	64
	60's		3	9	3	2	4	20
Total		1	5	30	39	14	68	157

Summary

This examination was significant because it revealed that elderly participants were motivated to improve their lifestyles after learning about dementia prevention methods, their current cognitive function and having problems with their lifestyle habits pointed out.

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