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Dementia Prevention, It's Background and Technologies

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Abstract

Dementia is the most troublesome disease that humanity will have to deal with in the future, and many studies have been proposed regarding post-onset care methods, both drug and non-drug, with many reports of the results. Recently, there has been growing recognition of the importance of primary prevention, which is preventing the onset of dementia before it actually occurs.

This paper warns that, based on global demographic trends, the risk of dementia will hit developing countries in the future, and that the rapid aging rates in South Korea, South Korea, Thailand, and Singapore in Asia will cause social problems.

Dementia prevention techniques can be broadly divided into therapy techniques and techniques for assessing their effectiveness. Therapy techniques can be further divided into therapies related to daily lifestyle habits and therapies that directly stimulate the brain. Each of these techniques will be introduced in this article.

Next, we will discuss the CKPT, an economic neuropsychological test used to assess the effectiveness of therapy, in comparison with the MMSE.

Finally a practical result for dementia prevention using CKPT which is applied to the persons over 60 years old working at a concrete product maker is shown.

Keywords: Dementia prevention, Therapy, Assessment of therapy effectiveness, CKPT.

Object

The purpose of this paper is to first describe future trends in dementia worldwide, then summarize therapy techniques for pre-onset dementia and techniques for assessing their effectiveness. Ultimately, it aims to provide a guidepost for the future of dementia prevention.

Back Ground of Dementia

Specificity of Dementia

Figure 1 shows the general progression of dementia. Dementia progresses from Healthy to Preclinical Stage of Dementia (PCSD), Mild Cognitive Impairment (MCI) and Dementia. At Healthy and PCSD, there are no symptoms, and symptoms only appear when the causative agents are deposited to a point of near saturation during 15-20 years (Sperling et al., 2011). Therefore, Dementia is a difficult disease to recognize one's disorder of brain by oneself and to start therapy. The border between MCI and Dementia is when cognitive impairment progresses to the point where it interferes with daily life and the condition is called dementia.

There are three types of prevention in dementia care, and today's target is healthy people and those in PCSD, which is strictly speaking called primary prevention, but when we talk about prevention today, we are referring to primary prevention.

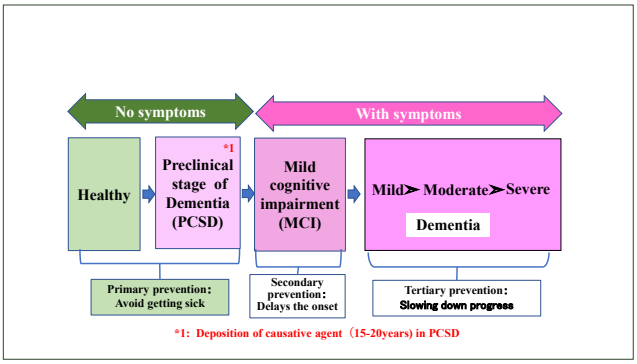

Figure 1: Progression of Dementia and Its Prevention

Demographics

Focus on Table 1 (United Nations [UN], 2019). The first line shows the trend in global population. Since the biggest risk factor for dementia is aging, the next line shows the trend in the population of people over 65 years old. Please note that between 2015 and 2060, the number of people in developed regions will remain almost flat, while the number of people in developing regions will rapidly increase. This suggests that addressing dementia will become a social issue in developing countries in the future.

Table 1: Background around Dementia

Developed regions include Europe, Northern America, Japan, Australia, and New Zealand. Developing regions include Africa, Asia (excluding Japan), Latin America, Melanesia, Micronesia and Polynesia.

	1950 year	In 2015	2060 *Median projection
Total Population	2,536 Million	7,380 Million	10,152 Million
Population over 65 years old			
Total	129 Million	608 Million	1,810 Million
Developed Regions	63 Million	221 Million	357 Million
Developing Regions	66 Million	387 Million	1,453 Million
Percentage of population over 65 years old			
Total	5.1 %	8.2 %	17.8 %
Developed Regions	7.7 %	17.6 %	28.2 %
Developing Regions	3.8 %	6.3 %	16.4 %
Life Expectancy			
Male	45.49 years	68.53 years	76.29 years
Female	48.49 years	73.31 years	80.64 years

Next, let's look at the trends in presentation of population over 65, in each country. In Fig.2, the graph on the left shows the trends in Europa 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.

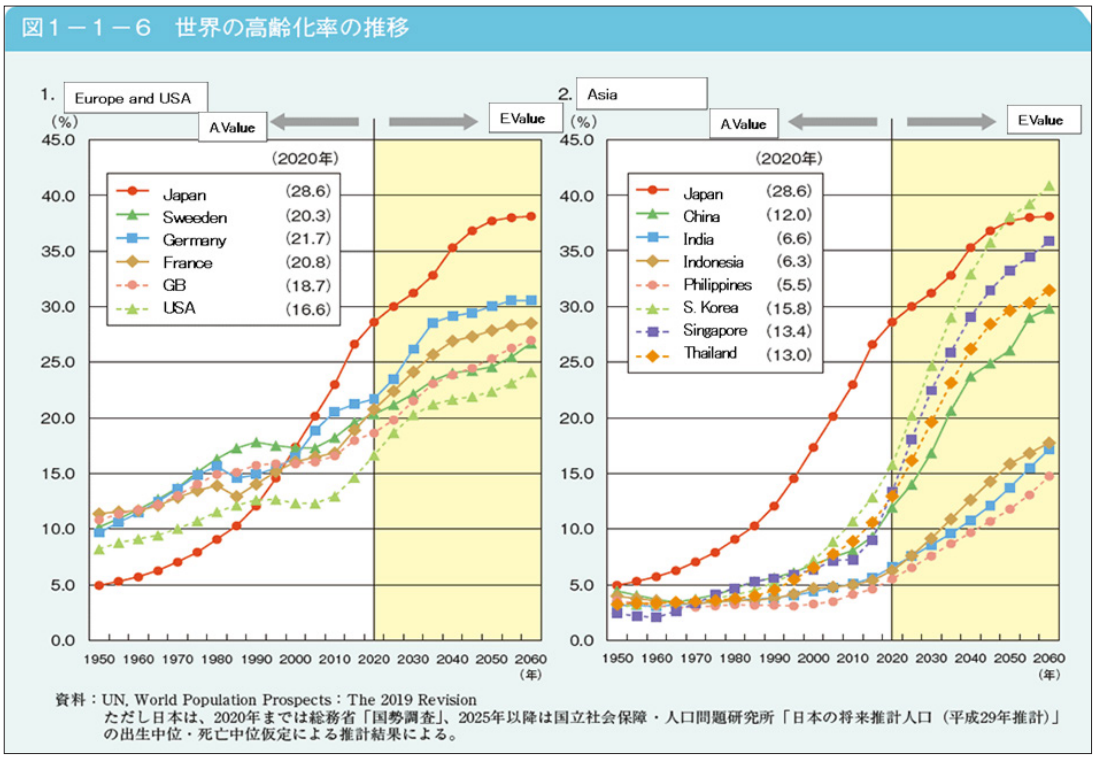

Figure 2: Changes in the world's aging rate in Actual value and Estimated value

Dementia prevention techniques (Figure 3)

Dementia prevention techniques can be broadly divided into therapy techniques and techniques for assessing their effectiveness. Therapy techniques can be further divided into therapies related to daily lifestyle habits and therapies that directly stimulate the brain. Each of these techniques will be introduced in this article.

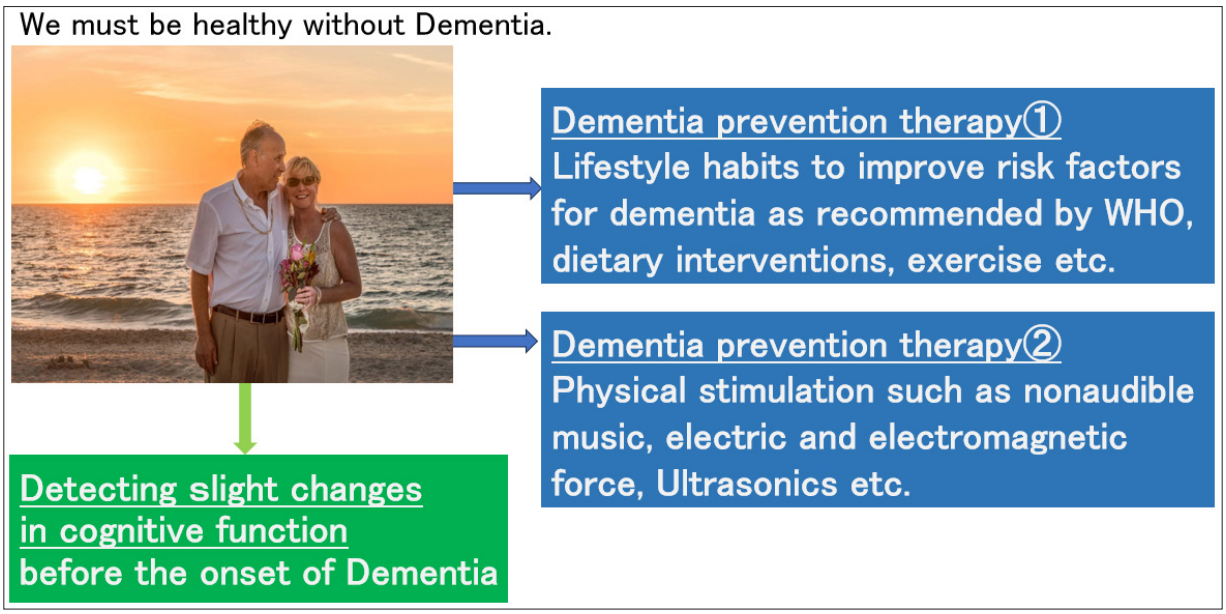

Figure 3: Technologies for preventing primary prevention

Therapy Techniques

Technologies Rerated to Daily Life

Most effective one is related to daily lifestyle habits. Since 2019, when WHO first published guidelines on reducing the risk of dementia from the Lancet, it has been updated in 2020 and 2024. Table. Livingston et al. (2024) is the latest one. It says that risk factors exist in three stages: Young, Middle, and Old, and that the total risk factor is 45%. WHO's risk reduction guidelines have provided researchers with a foothold in dementia prevention. In addition to the WHO's comprehensive guidelines for dementia prevention through lifestyle, there are also numerous studies on individual therapies such as related to dietary interventions (Table3) (Rebecca et al., 2024), exercise (Verghese et al., 2003; Lautenschlager et al., 2008; Scherder et al., 2005; Van Uffelen et al., 2008; Baker et al., 2010; Oohashi et al., 2000).

Table 2: Risk Factors for Dementia (WHO)

Age	Reduction Rate	Risk Factors
0<Young<18	5%	Low education history
18<Middle<65	7%	Hearing loss
	7%	High LDL cholesterol
	3%	Depression（うつ病）
	3%	Traumatic brain contusion（外傷性脳挫傷）
	2%	Lack of exercise
	2%	Diabetes（糖尿病）
	2%	Smoking
	2%	Hypertension（高血圧）
	1%	Obesity（肥満）
	1%	Heavy alcohol consumption
65<Old	5%	Social isolation
	3%	Air pollution
	2%	Vision loss（視力喪失）
Total	45%	None of risk factors

14 Eliminating risk factors reduces dementia by 45%!

Table3: Dietary Interventions

Blue-green fish, green and yellow vegetables, and fruits
• These are rich in unsaturated fatty acids such as DHA, which are believed to help maintain cognitive function, as well as vitamins and folate.
Soy Products
• They contain lecithin, which helps in the production of brain nerve cells and is involved in the production of neurotransmitters related to memory.
Nuts and Olive Oil
• These contain unsaturated fatty acids, which are considered beneficial for preventing dementia, and polyphenols (in olive oil) with antioxidant properties.
Green Tea and Red Wine
• These contain polyphenols, and studies have shown their potential to prevent cognitive decline.

Technologies using Physical Stimulation

The other group is therapies which directly stimulate the brain. Nonaudible music with high frequency components (Oohashi et al., 2000; Nishiguchi et al., 2003; Nishiguchi & Hamasaki, 2005) will be effective for dementia prevention.

The method of transcutaneously stimulating the brain by attaching electrodes to the scalp is called either magnetic stimulation (Ying-Hui et al., 2020) or electrical stimulation (Sun et al., 2025), and research has shown that it may be effective in preventing dementia, with cohort studies being conducted.

Ultrasonic stimulation is added, which is Ultrasound stimulation is classified into pulsed and continuous wave stimulation. Pulsed wave stimulation has been shown to be effective in treating Alzheimer's disease (Shinzato et al., 2024; Wojtecki et al., 2024), while continuous wave stimulation has been shown to be effective in treating dementia with Lewy bodies (Yoshio & Meizo, 2023; Manabe, 2024). Therefore, I believe that it may be effective in the prevention stage before the onset of the disease.

In the future, Heat Frash and Light Frash may be added for effective stimulation for the brain.

Therapy Effectiveness Assessment Technologies

The only technologies available for diagnosing PCSD stages before the onset of dementia symptoms are expensive equipment such as PET (Small et al., 2006), MRI (Mansfield & Maudsley, 1977), and SPECT (Ronald, 2006), or invasive techniques such as CSF (Strozk et al., 2003). Because these are too expensive to assess the effectiveness of therapy, we focused on inexpensive neuropsychological tests. However, the MMSE (Folstein et al., 1975), CDR (Rockwood et al., 2000) and FAB (Dubois et al., 2000), etc. which are world-widely used as a comprehensive dementia test, cannot be suitable for this assessment because the shape of the histogram leans towards high scores (Fig.4). For example, MMSE score in PCSE is between 30, 29, and 28 in PCSD stages, as shown in Fig.5, making it unsuitable for detailed assessment of therapy effectiveness.

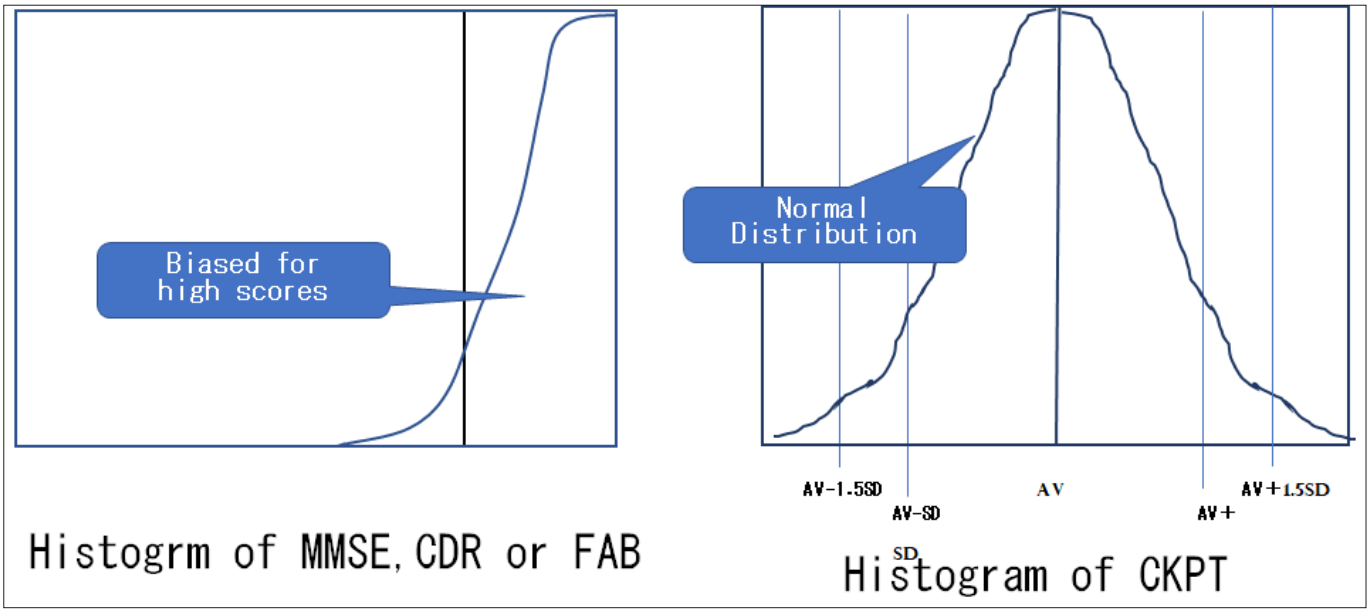

Figure 4: Histogram comparison of CKPT and conventional neuropsychological tests applied to healthy and preclinical subjects

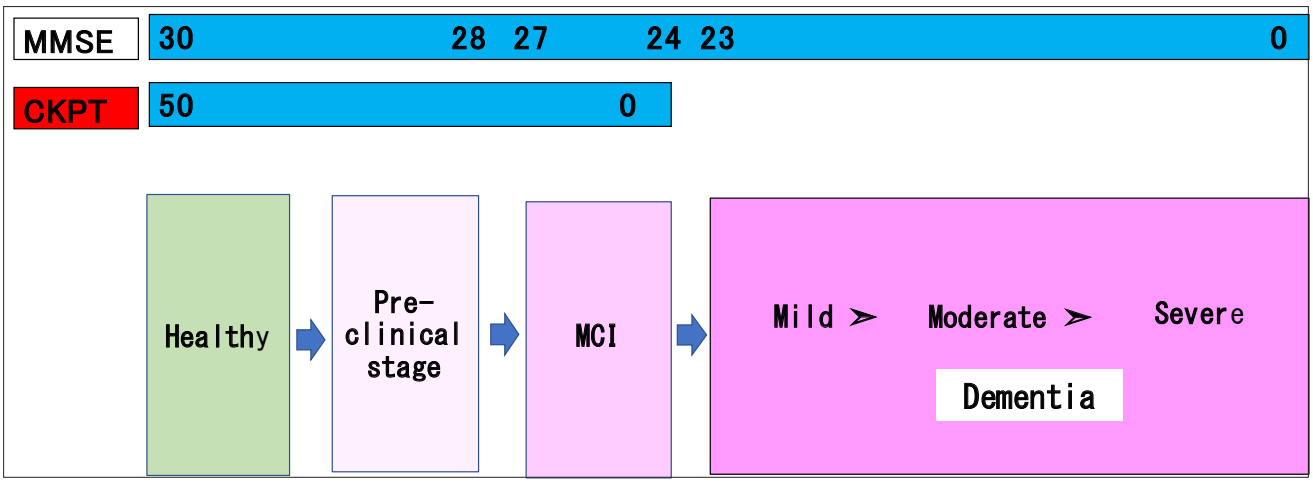

Figure 5: Dementia progression and MMSE and CKPT scores

CKPT we invented shows a normal distribution by age group when applied to healthy individuals and individuals with PCSD, so classification can be performed using the mean, mean ± SD, or mean ± 1.5 SD, making it possible to detect subtle changes (Shimura et al., 2009; Shimura et al., 2019; Shimura et al., 2020). The distribution parameter is shown on Table4. Recently, PCDA for dementia prevention using CKPT has been introduced (Shimura, 2025).

Table 4: Distribution parameter of CKPTusing 1367 subjects

Male	**Average - 1.5SD**	**Average - SD**	**Average**	**Average + SD**	**Average + 1.5SD**
Sixties	5.1	7.3	11.7	16.1	18.3
Seventies	5.1	7.0	10.7	14.4	16.2
Eighties	3.0	4.9	8.6	12.3	14.2
Female	**Average - 1.5SD**	**Average - SD**	**Average**	**Average + SD**	**Average + 1.5SD**
Sixties	5.9	7.9	11.9	15.9	17.9
Seventies	4.6	6.6	10.6	14.6	16.5
Eighties	2.3	4.5	8.8	13.1	15.3

Average-1.5SD or less: 0.067, Average-SD or less: 0.159

Practical Result

Dementia prevention using CKPT is beginning to be implemented in various settings, but this time we will introduce an example where it is being implemented with the agreement of both a company and employing elderly people aged 60 or over.

Table 5: Practical effect of dementia prevention using CKPT

Subjects	Sex	Job Details	Age	CKPT Score	Congitive Evalution Code
a	M	Driving Manual Labour	75	0	1
b	M	Driving Manual Labour	75	0	1
c	M	Driving Office Work	63	14	4
d	M	Driving Manual Labour	60	19	5
e	F	Driving Office Work	60	17	5
f	M	Driving Manual Labour	62	0	1
g	M	Driving Manual Labour	63	9	3

Cognitive Evaluation Code

1: Individual Consulting is available, 2:Slight Decline, 3:Normal below average,
4: Normal above average, 5:Good, 6. Excellent.

Table5 is a result which is examined in a concrete product maker. The maker is a company that pours concrete into molds to make gutters, pipes, wave breakers, etc. Therefore, the job types can be broadly divided into those in manufacturing and those in office. The state of cognitive function is derived from the CKPT score and is expressed as a code from 1 to 6. These results are given to the individual and the company's top management and can be used to help with self-management to prevent dementia and for company employee benefits.

Summery

- ased on the world's demographic trends, I pointed out that humanity will face the threat of dementia in the near future.
- Dementia prevention is the key to overcoming this problem, and I have detailed dementia prevention techniques, dividing them into therapy techniques and therapy evaluation techniques.
- As a therapy evaluation technique, CKPT is pointed out.
- Finally a practical result using CKPT to the people over 60 year's old who are still working at a concrete product maker is introduced.
- Since CKPT can be easily translated to other languages, ask me to do it using e-mail (tshimura@tuba.ocn.ne.jp). English version of CKPT is ready to use. It is free for your research or feasibility study.

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