Indexes for Early Detection of Alzheimer's Disease

Tetsuya MURAOKA

Department of Industrial Electronics Engineering, Polytechnic University in Tokyo
(Tel : +81-42-341-3331; E-mail: muraoka@tokyo-pc.ac.jp)

Abstract: A new instrument for early detection of Alzheimer's disease is constructed from the investigative items with both the investigation of living environment, and the functional tests of the sense, the physiology, and the left and right brains.   This paper describes the indexes obtained from the results of test using a new instrument for early detection of Alzheimer's disease.   The indexes for early detection of Alzheimer's disease were obtained from the investigations of the living environment and the social adaptability, the functional tests of the sight and the hearing in the five senses, and the functional tests of left hemispheres in brain.

Keyword: Alzheimer's disease   Index of the dementia

1. INTRODUCTION

Two kinds of the typical dementia are the Alzheimer's disease and the vascular dementia.   The cerebral infarction due to the thrombus of vascular dementia can be correctly diagnosed on a lot of medical data, and it is eliminated by the bypass operation.   Case of vascular dementia will be gotten well if the medical treatment does quickly perform to him/her [1], [2].

Alzheimer's disease goes on increasing from the youths to the elderly.   Alzheimer's disease is occurred by the accumulation of beta amyloid [3].   When the medical doctor has diagnosed his/her illness as Alzheimer's disease using DSM-III-R, the indication of demented patient is hopeless [4].   Then, the indication of a demented patient only takes a turn for the worse.   Alzheimer's disease does not have a recollection about that matter if he/she has given the care assistant so much trouble.   And so the Alzheimer's disease is almost impossible to keep the ordinary lifestyle [5].   Alzheimer's disease will make slow progress by the medical treatments if it can be early detected.   Accordingly, the authors had made on a new instrument for early detection of Alzheimer's disease, and it was published in the international conference on control, automation, and systems (ICCAS 2003) held in Gyeongju, Korea [6].   Early case of Alzheimer detected by a new instrument can be kept the ordinary lifestyle to the end of his/her life.

The investigated items in a new instrument for early detection of Alzheimer's disease are as follows.

(1) Both the living environment and the social
    adaptability of the subject are objectionably investigated.
(2) The functions of sight and hearing in the five senses are
    tested.
(3) The functions of left and right hemispheres in brain are
    tested.

The indexes for early detection of Alzheimer's disease have obtained from the evaluation results based on above-mentioned tests.

2. TEST FOR DETECTION OF INDEXES IN ALZHEIMER'S DISEASE

The indexes for early detection of Alzheimer's disease are obtained from the experimental results using the question and answer style's new instrument, i.e., the investigations on both the living environment and the social adaptability, the functional tests on both the sight and the hearing in the five senses, and the functional tests of left and right hemispheres in brain [7], [8].   The subjects for the present study have selected from both the residents of the elder home in Gunma, Japan and the cooperators.   They have divided to the five groups by the age bracket, i.e., 20 up to 35 of age, 35 up to 45 of age, 45 up to 55 of age, 55 up to 65 of age, and upper 65 of age.   A subject's group is each twenty people.

3. EXPERIMENTAL RESULTS FOR DETECTION OF INDEXES

The indexes for early detection of Alzheimer's disease have obtained from experimental results of the question and answer style [7], [8].

3.1 Living environment and social adaptability

Fig. 1 shows the investigative results of the five groups by the age bracket on both the living environment and the social adaptability.   The three remarkable characteristics were appeared on both the physiological function and the contemplative faculty of the subjects.   They are as follows:

(1) Single life.
(2) Don't have any hobby.
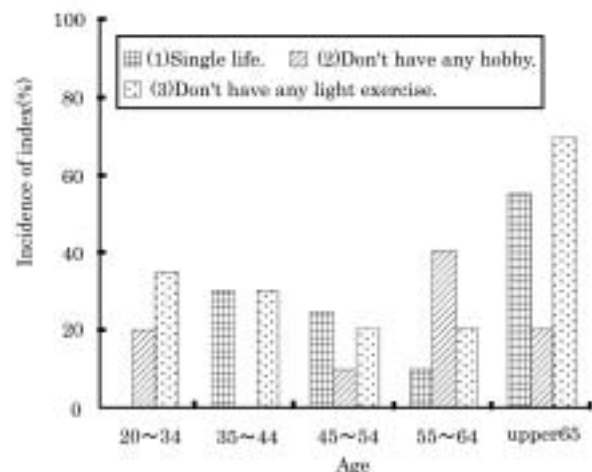(3) Don't have any light exercise.

Fig.1 Investigative results in living condition

Both (1) and (3) increase with age, and indicate the maximum values in upper 65 of age.   So (1) is 55% because of the local depopulation, and (3) is 70% [9].   The people of 35 up to 55 of age take 30% in (1) because of the active life.

In 55 up to 65 of age, (2) is 30%. Because they are unable to do them level best for both working and parenting in middle age.

The residents of the elder home are classified by the two kinds, i.e., the elderly using a family and the elderly living alone. Sometimes elderly using a family have a talk with a family. Noteworthy, the elderly living alone lead a solitary life without a conversation everyday. Then, they fall Alzheimer's disease.

Accordingly, the solitude with age is one of the strong indexes of Alzheimer's disease.

3.2 Sensing and physiological functions

It is difficult for the elderly to hear the high-frequency sounds in the audible range. Nine kinds of tones, i.e., 200Hz, 315Hz, 500Hz, 800Hz, 1kHz, 1.25kHz, 2kHz, 3.15kHz, and 8kHz have made for the investigation of the relations between the frequency and the hearing information. Their sound pressures are 40 to 50dB. The standard stimuli are 3 kinds of the typical audio-frequency, i.e., 200Hz of comfortable tone, 3.15kHz of maximum hearing sensitivity, and 8kHz of high frequent noise, and the compared stimuli are 9 kinds of above tones including the standard stimuli. One of the standard stimuli is heard to the subject during 5 seconds. Then, the same tone with the standard stimulus is choice in 9 kinds of the compared stimuli by the subject. The experimental results are shown in Fig. 2. It is impossible for 35% of people in upper 55 age to hear the sound of higher limit in audio frequency, i.e., 8kHz.
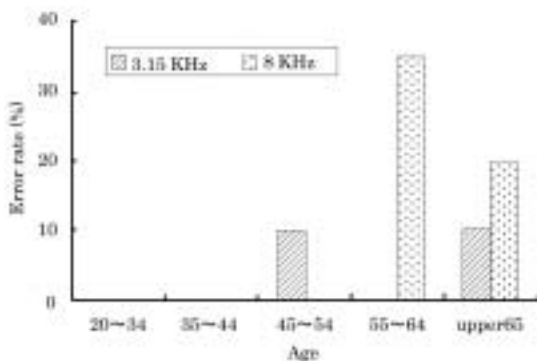

Fig.2 Hearing function of 8 kHz.

Then, the blood pressure in physiological function is able to measured. World Health Organization defines the indication of blood pressure as Table 1. The indications of hypertension are as follows:

(1)Body feels tired easily.
(2)Body feels dull.

Table.1 Indication of blood pressure

Indication	Systolic blood pressure	Diastolic blood pressure
Hypotension	Under 110 mmHg	Under 89 mmHg
Normal	Under 139 mmHg	Under 95 mmHg
Hypertension	Under 160 mmHg	

The indications of hypertension are a fatal disease. From the measurement result shown in Fig. 3, 65% of the elderly in upper 65 of age have an indication of hypertension. They have a lot of salty foods in their eating habit everyday. So Gunma Prefecture living the elderly is the chilly area.
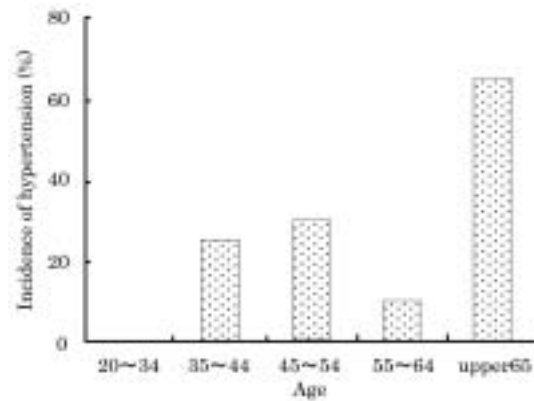

Fig.3 Occurrence of hypertension

Accordingly, both the hearing function with the sound of 8kHz and the indication of hypertension will be able to apply the indexes for early detection of Alzheimer's disease.

3.3 Function of left hemisphere in brain

The reduction at the function of left hemisphere in brain has investigated. By the experimental results, both the memory of five random figures and the calculation of two figures are too hard for the demented patient.

Five random figures in Arabic numerals, i.e., 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 have each put on the center of a frame at one second intervals. Then, the subject can be made a reproduction of five random figures order. Relations between the fixation of impression and the defects of memory have investigated from the experimental results shown in Fig. 4. In the elderly upper 65 of age, the reproductive error of five random figures are 35% in first test, 40% in second test, and 70% in third test. And other people are mere forgets. Accordingly, the reproductive error of five random figures increase with age, and it will be got a strong index for early detection of Alzheimer's disease.
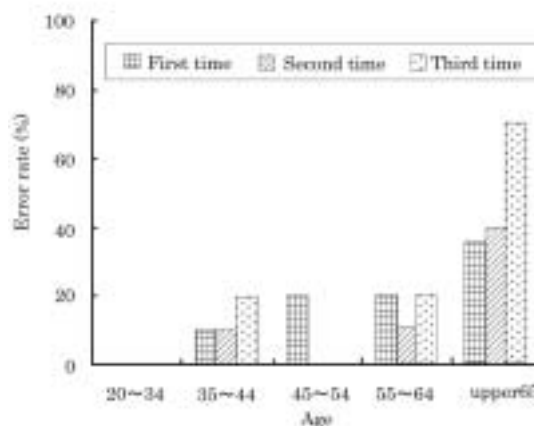

Fig. 4 Reproductive error of five Random figures

The subjects have tried two times the addition and subtraction of two figures respectively. Fig. 5 shows the experimental result. The elderly of 10 to 20% in upper 65 of age cannot confirm to take a figure up one place at the

addition of two figures and to take a figure down one place at the subtraction of two figures. And other people are mere careless mistakes. Accordingly, both the figure up one place at the addition and the figure down one place at the subtraction of two figures will be got the indexes for early detection of Alzheimer's disease.
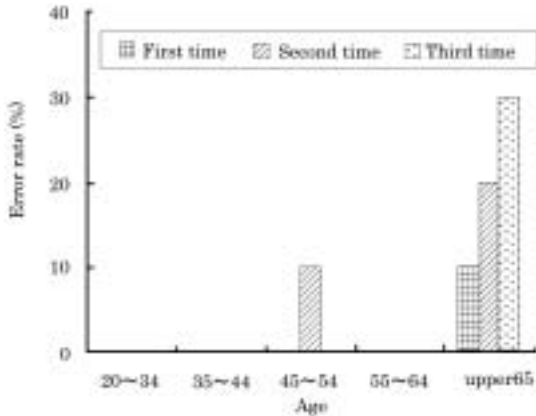

Fig. 5 Addition and subtraction of two figures

3.4 Function of right hemisphere in brain

The function of right hemisphere in brain has investigated obtained from the results of mental test using a new instrument for early detection of Alzheimer's disease. The experimental items investigating the function of right hemisphere in brain are the identification of random pattern, the presumption of finished model, and the occurred cause of abstract sound. But the indexes for early detection of Alzheimer's disease were not obtained from the functional tests of right hemisphere in brain. Because the Alzheimer's disease is one of the cases at the life style related disease.

4. CONCLUSION

The indexes for early detection of Alzheimer's disease have obtained from the experimental results used to the question and answer style's new instrument, i.e., the investigations on both the living environment and the social adaptability, the functions on both the sight and the hearing in the five senses, and the functions of left and right hemispheres in brain. The subjects have divided to the five groups by the age bracket, i.e., 20 up to 35 of age, 35 up to 45 of age, 45 up to 55 of age, 55 up to 65 of age, and upper 65 of age. Both the living environment and the social adaptability have investigated. From the experimental results, the three remarkable characteristics were appeared on both the physiological function and the contemplative faculty of the subjects.

(1)Single life.
(2)Don't have any hobby.
(3)Don't have any light exercise.

Both the hearing function with the sound of 8kHz and the indication of hypertension are able to apply the indexes for early detection of Alzheimer's disease. Then, both the figure up one place at the addition and the figure down one place at the subtraction of two figures will be got the indexes for early detection of Alzheimer's disease. But the index of dementia was not obtained from the functional tests of right hemisphere in brain.

Fig. 6 shows the seven indexes for early detection of Alzheimer's disease divided in to 4 groups. Sometimes the indexes of Alzheimer's disease shown in Fig. 6 are checked by the mental test used to the question and answer style's new instrument. If the index of dementia finds in the experimental result, hereafter you may have Alzheimer's disease. If the indexes find in the experimental result, you have the early case of Alzheimer's disease. Early patient of Alzheimer's disease can be kept the ordinary lifestyle to the end of his/her life if the early case of Alzheimer's disease will make slow progress by the medical treatments.
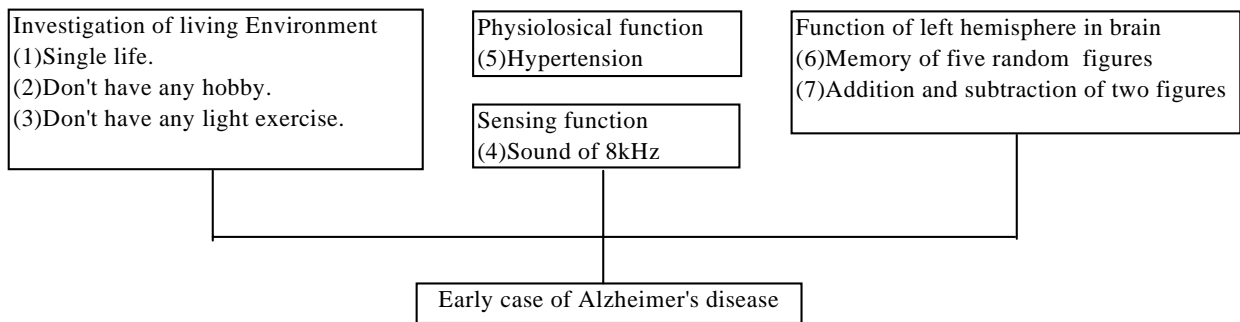
Investigation of living Environment
(1)Single life.
(2)Don't have any hobby.
(3)Don't have any light exercise.

Physiolosical function
(5)Hypertension

Sensing function
(4)Sound of 8kHz

Function of left hemisphere in brain
(6)Memory of five random figures
(7)Addition and subtraction of two figures

Early case of Alzheimer's disease

Fig.6 Indexes for early detection of Alzheimer's disease

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