

# Results of Comparison of Two Types of Olfactory Recognition Tests Performed on 112 Peoples. -34 High School Students, 55 University Students, and 23 Middle-Aged ResultsofCompar- isonofTwoTypesofOlfactoryRecognitionTestsPer- formedon112Peoples34HighSchoolStudents55UniversityStudentsand23Middle

Naomi Katayama, Syoko Kondo, Yui Ando, Youko Ashihara, Nene Kawano, Mrika Shibuya, Misaki Nanao, Inori Mase, Minami Abe, Marina Kouno, Yuuna Narimoto<sup>1</sup>

<sup>1</sup> Nagoya Women's University

*Received: 16 December 2019 Accepted: 4 January 2020 Published: 15 January 2020*

## Abstract

The olfactory cognitive test is not commonly used. Still, it required in the future because it reported that and olfactory disorder appears as an initial symptom of Alzheimer's dementia or COVID-19 infection. There are several types of odor inspection kits used for testing, but in Japan, there are odor sticks, open essences, TT olfactometry, etc. This time, we report that we conducted an olfactory cognitive test using Odor Sticks and Open Essence on healthy 112 peoples (34 high school students, 55 university students, and 23 middle-aged). The Open Essence (made by FUJIFILM) has the smell as same as the Odor Stick Identification Test (OSIT-J). The odor Stick (made by Daiichi Pharmaceutical industry Co., Ltd.) and the open essence include the aromas as curry,perfume, Japanese cypress, India ink, menthol, rose, wood, stynkysocks/sweat, roasted garlic, condensed milk, gas for cooking, and Japanese mandarin aromas. This 12 different odorants perception is not necessarily culture-free; the Japanese version employed.

**Index terms**— olfaction test, odor stick, open essence, cognition, age.

## 1 Introduction

Recent years, many researchers have reported odor research, but few reports by age in healthy people. Also, since odors are closely related to daily life, there are differences in odors that are often contacted from birth to death in each country. Therefore, each country had its odor inspection kit (smell related to the life of the country). This time, I decided to conduct the Japanese odor test using the Japanese odor kit (Odor Stick: Daiichi Pharmaceutical industry Co., Ltd., and Open Essence: FUJIFILM). The Odor Stick Identification Test (OSIT-J) was used to assess odor perception for many years for our study. This test possesses high reliability and validity 1). The procedure resembles that of the San Diego Odor Identification Test 2). The aromas used in the OSIT-J includes curry, perfume; Japanese cypress, India ink, menthol, rose, wood, stinky socks/sweat, roasted garlic, condensed milk, gas for cooking, and Japanese mandarin aromas 2). This 12 different odorants perception is not necessarily culture-free, the Japanese version was employed 3, 4). Each fragrance enclosed in microcapsules made of melamine resin3,4). Therefore, in this study, I recruited high school students in their teens, university students in their 20s, and middle-age in their 30s to 40s, and compared the data by conducting two kinds of olfactory cognitive tests.

## II.

### 3 Materials and Methods

#### 4 a) Participants

The participants were 34 high school students and 55 university students and 24 middle-age (n=112) who voluntarily participated in olfactory tests (Table 1). The average age of high school students was  $17.03 \pm 10.67$ , university students were  $20.46 \pm 0.54$ , and middle-ages were  $47.14 \pm 2.61$ .

#### 5 b) Assessment of odor identification

In this test, two kinds of olfactory recognition tests performed on the same participant. The test kit used is the Odor Stick (Daiichi Pharmaceutical industry Co., Ltd.) and Open Essence (FUJIFILM). There two types of olfactory cognitive test kits consist of 12 types of odors. This test possesses high reliability and validity 1). The basic procedure resembles that of the San Diego Odor Identification Test 2). Both kit includes curry, perfume, Japanese cypress, India ink, menthol, rose, wood, stinky socks/sweat, roasted garlic, condensed milk, gas for cooking, and Japanese mandarin aromas. This 12 different odorants perception is not necessarily culture-free; the Japanese version was employed 3,4). Each fragrance enclosed in microcapsules made of melamine resin 3,4). Each correct answer was scored as one point with the total performance score ranging from 0 to 12 points 5,6). We defined it as follows: normal range as more than 6 points, borderline as 3 to 5 points, and abnormal as less than 2 points 5,6). All of these methods are the same as in the previously reported paper 5,6).

#### 6 c) Statistical processing

The test results were confirmed to be normal distribution by F-test. Data that distributed compared with Student-t without correlation of parametric test. The data that was not distributed compared without correlated Mann-Whitney test of the non-parametric test. In comparing the taste test and the olfactory test result performed on the same participant, with correlated Wilcoxon test of the non-parametric test.

#### 7 d) Ethical review board

This study conducted with the approval of the Ethical Review Board (Nagoya women's university 'hitowomochi-itakennkyuunikansuruiinnkai'). The approval number is 30-11.

## III.

### 9 Results

#### 10 a) Odor identification (number of the correct answers)

Tables 2, 3, and 4 show the results of two types of olfactory cognitive tests for high school students, university students, and middle-age. Tables 5 and 6 show the average and standard deviation of the number of olfactory cognition in each group for each olfactory cognitive test. No one had less than two olfactory cognition sat any age. There is no difference in the number of olfactory cognition among the groups in each olfactory cognitive test. However, there are differences when looking at the two types of test results in university students and middle-aged people.

#### 11 b) Statistical comparison

Tables 7, 8 and 9 show a comparison of the olfactory cognitive test results using statistical methods. There were no statistically significant differences between the two olfactory cognitive test results in high school students. However, there was a statistically significant difference between the two types of olfactory cognitive test results between university students and middle-aged, and the odor stick had a higher degree of recognition than Open Essence. Furthermore, when comparing between groups, the Open Essence olfactory cognition test showed a statistically significant difference between all groups. However, there was a statistically significant difference between university students and other groups in the Odor Stick.

#### 12 c) Odor identification (percentage of each smell)

Next, Tables 10, 11, and 12 show the results of individually examining each of the 12 odors. Curry was the smell that high school students, university students, and middle-age showed the highest olfactory perception.

When odors examined individually, all data showed that menthol and stinky socks/ sweaty had a recognition rate of 80% or higher. And odors examined individually; all data showed that India Ink had a recognition rate of less than 70%. The odors that differed in the number of cognition in the two olfactory cognition tests were the Stir-fried garlic, and the odor stick was better than the open essence. IV.

---

## 13 Numver of recognition±Standard

## 14 Discussion

The result of the elderly reported by Katayama et al. In the past showed that the olfactory cognitive test results gradually decreased in both males and females after the '50s. This time, I reported the results of olfactory cognition tests in the teens, 20s, and 30s to 40s. The results of olfactory cognition tests were almost the same in the younger age group, and most of them recognized eight or more of 12 odors. The results of the olfactory cognition test using open essence showed no statistically significant difference in the cognitive results among high school students, university students, and middle-age. However, there was a statistically significant difference between the results of university students and middle-age in the odor stick compared to high school students. When odors examined individually, all data showed that menthol and stinky socks/ sweaty had a recognition rate of 80% or higher. And odors were examined individually; all data showed that India Ink had a recognition rate of less than 70%. The odors that differed in the number of cognition in the two olfactory cognition tests were the Stir-fried garlic, and the odor stick was better than the open essence. Also, since the results of the olfactory cognition test in the younger generation are a small number, I would like to continue the test and collect the data for re-examination.

V.

## 15 Conclusions

This time, we report that we conducted an olfactory cognitive test using odor sticks and open essence on healthy 112 peoples (34 high school students, 55 university students, and 23 middle-aged). The Open Essence (made by FUJIFILM) has the smell as same as the odor Stick Identification Test (OSIT-J).

The average  $\pm$  standard deviation of the number of olfactory recognition using open essence was  $8.4 \pm 2.0$  for high school students,  $8.4 \pm 1.5$  for university students, and  $7.8 \pm 2.2$  for middle-age. The result of the odor stick was  $8.8 \pm 1.7$  for high school students,  $9.9 \pm 1.5$  for university students, and  $9.1 \pm 1.9$  for middle-age. There were no significant differences between the two olfactory cognitive tests in high school students. However, the university students and the middle-age had a statistically significant difference in the cognitive score between open essence and Odor Stick. The Odor Stick score is better than the Open Essence. When odors examined individually; all data showed that menthol and stinky socks/ sweaty had a recognition rate of 80% or higher. And odors examined individually; all data showed that India Ink had a recognition rate of less than 70%. The odors that differed in the number of cognition in the two olfactory cognition tests were the Stir-fried garlic, and the odor stick was better than the open essence. In the future, I would like to increase the number of participants and report the results of participants and report the results of olfactory cognition tests by age and sex.

1

Figure 1: Table 1 :

2

Figure 2: Table 2 :

3

Figure 3: Table 3 :

119

4

	Age	Height	Weight
	Average $\pm$ S D	Average $\pm$ S D	Average $\pm$ S D
High school students (n=34)	17.03 $\pm$ 0.67	157.17 $\pm$ 5.12	48.27 $\pm$ 6.60
University students (n=55)	20.46 $\pm$ 0.54	157.76 $\pm$ 6.20	50.35 $\pm$ 4.48
Middle-age (n=23)	47.14 $\pm$ 2.61	159.71 $\pm$ 8.43	54.94 $\pm$ 10.10
SD=Standard Deviation			

Figure 4: Table 4 :

5

Figure 5: Table 5 :

6

Figure 6: Table 6 :

7

Figure 7: Table 7 :

8

Figure 8: Table 8 :

9

Figure 9: Table 9 :

						Deviation
High school students (n=34)				8.4±2.0		
University students (n=55)				8.4±1.5		
Middle-age (n=23)				7.8±2.2		
						)
		Numver of recognition±Standard Deviation				
High school students (n=34)				8.8±1.7		
University students (n=55)				9.9±1.5		
Middle-age (n=23)				9.1±1.9		
Odor idetification		High school students (n=34)		University students (n=55)		Middle-ag
Open essence		Odor stick		Open essence		Open essence
Average number of recogni- tion±Standard Deviation		8.4±2.0	8.8±1.7	8.4±1.5	9.9±1.5	7.8±2.2
F test		P=0.154		P=0.443		
Paired Student-t test		P=0.309		P=0.0001**		P=0.005*
Mann-Whitny test						
( g		y	y	g	g g	)
		Open essence		Open essence		Open essence
		P=1.00		P=0.031*		
		P=0.999				
				P=0.129		
Odor idetification		Odor stick		Odor stick		Odor stick
Hight school students		University students	University students			Middle-age
						Middle-ag
Average number of recogni- tion±Standard Deviation		8.8±1.7	9.9±1.5	9.9±1.5	9.1±1.9	9.1±1.9
F test		P=0.154		P=0.103		
Paired Student-t test		P=0.001*		P=0.026*		
Mann-Whitny test						

Figure 10: Odor idetification Hight school students University students University students Middle-age Middle-age Hight school students Average number of recognition±Standard Deviation 8.4±2.0 8.4±1.5 8.4±1.5 7.8±2.2 7.8±2.2 8.4±2.0 F test Paired Student-t test Mann-Whitny test

10

Figure 11: Table 10 :

11

Figure 12: Table 11 :

12

Figure 13: Table 12 :

## .1 Acknowledgements

This study was supported by the research aid of Choju-iryo-kenkyu-kaihatsuhi 30-14 and the Japanese Society of Taste Technology, 2019.

[Kobayashi et al. ()] ‘A new clinical olfactory function test: cultural influence’. M Kobayashi , E R Reiter , J L Dinardo , M R Costanzo . *Arch. Otolaryngol-Head Neck Surg* 2007. 133 (4) p. .

[Kobayashi et al. ()] ‘Cross-cultural comparison of data using the Odor Stick Identification Test for Japanese (OSIT-J)’. M Kobayashi , S Saito , T Kobayakawa , Y Deguchi , R M Costanzo . *Chem. Senses* 2006. 31 (4) p. .

[Katayama et al. ()] *Odour and Salt Taste Identification in Older Adults*, N Katayama , S Kondo , H Ootake . 2018.

[Murphy et al. (ed.) ()] *Psychophysical assessment of chemosensory disorders in clinical populations*, C Murphy , A J Anderson , S Markinson . K. Kurihara, N. Suzuki, & H. Ogawa (ed.) 1994. Tokyo; Tokyo: Springer Verlag. p. . (Olfaction and Taste)

[Kobayashi ()] ‘The odor Stick Identification Test for the Japanese (OSIT-J): Clinical suitability for patients suffering from olfactory disturbance’. M Kobayashi . *Chemical Senses* 2005. 30 p. . (Suppl 1)