



## RESEARCH ARTICLE

### COMPARISON OF TWO TYPES OF ODOUR TEST RESULTS IN 59 ELDERLY MALE

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#### ABSTRACT

There are two types of odour tests that use 12 types of odours familiar to Japanese people in their daily lives as screening: odour sticks and open essence. In this study, we performed these two types of olfactory tests on the same male over 60 years old, and compared the results to clarify whether there were any differences. Twelve different smells are India ink, wood, perfume, menthol, mandarin oranges, curry, household gas, roses, cypress, sweaty socks, condensed milk, fried garlic. The participants were 59 male aged 60 years or older who received an explanation of the study and signed a subject consent form. Participants performed the open essence test, followed by a 10-minute break and then the odour stick test. In both tests, participants smelled the odour and then wrote the number they thought was correct from six options in the answer box. Options 1 through 4 were various specific odour names. Options 5 were for when there was an odour (detection) but it was unclear what it was, and option 6 was for when there was no odour at all (odorless). The results of the two tests performed on the same subjects were compared statistically (chi-square test). The results showed that there was no statistically significant difference in the number of correct answers ( $P=0.579$ ). However, when comparing each odour individually, there were statistically significant differences between the odours of India ink ( $P=0.009^{**}$ ), mandarin orange ( $p=0.002^{**}$ ), curry ( $P=0.012^*$ ), and fried garlic ( $P=0.008^{**}$ ). The results showed that the smells of India ink and curry were easier to identify using the open essence than using the odour stick, while the smells of mandarin oranges and fried garlic were easier to identify using the smelly stick than using the open essence. There were no statistically significant differences among the other eight odours. Even if the tests use the same 12 types of odours that are familiar to Japanese people, the results obtained will differ for each individual odour, so it can be said that the results cannot be combined or added together. A series of the studies must be conducted using the same method.

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## INTRODUCTION

It has been shown that olfactory test results deteriorate with age. It has also been reported that olfactory test results become worse in males than in females after the age of 60<sup>1-12</sup>. The odors used in the olfactory test are chosen from those that are closely related to our daily lives and that we have surely smelled several times between the time we are born and the time we die. For this reason, the odors used in the olfactory test vary from country to country. In Japan, a sniff test is used to test 12 different smells (ink, wood, perfume, menthol, mandarin oranges, curry, household gas, roses, cypress, sweaty socks, condensed milk, fried garlic). There are two types of sniff test: open essence and odour stick. Although the tests use the same 12 odorants, there have been few studies examining whether the data obtained from each test kit is consistent for the same subjects. Therefore, the purpose of this study was to compare the results of two types of odour tests in the same subjects.

## MATERIALS AND METHODS

The participants in this study were 59 elderly male aged between 60 and 92 years (mean age  $\pm$  standard deviation: 71.3  $\pm$  5.8) who had attended a health class. (This study was reviewed and approved by the Ethics Committee of Nagoya Women's University. This experiment was conducted only with participants who had received an explanation of the study and signed and stamped the subject consent form). First, participants tested 12 different smells using the open essence smell test kit and wrote down the results in the answer column. After a ten minute break, participants tested 12 different smells using the odour stick smell test kit and wrote down the results in the answer column. Smell sticks are manufactured by Daiichi Pharmaceutical Industry Co., Ltd., and participants are asked to open a smell-soaked filter paper in front of their nose while looking at the answer options. On the other hand, the open essence is a laminated card-type product manufactured by Fujifilm, with a system where the answer options for the odour are revealed when you open the card.

To compare the results of the two types of odour tests, the number of correct and incorrect answers for each of the 12 odours was statistically compared using the chi-square test.

## RESULTS

The 59 elderly male aged between 60 and 92 years (mean age  $\pm$  standard deviation: 74.0  $\pm$  6.3) (See Table 1).

Table 1. Age distribution of 109 elderly male

	60s	70s	80s	90s
Male	11	34	13	1

All 59 elderly male who participated took two types of odour tests and wrote their results in the answer column (See Table 2).

Table 2. Number of people by number of correct answers (Elderly male) (n=59)

Number of Correct Answer	Number of Correct Answer						
	0 point	1 point	2 points	3 points	4 points	5 points	6 points
Open Essence	1	3	5	5	3	11	7
Odour Stick	3	3	3	6	6	4	10
Number of Correct Answer	Number of Correct Answer						
	7 points	8 points	9 points	10 points	11 points	12 points	
Open Essence	11	8	2	0	2	1	
Odour Stick	6	5	9	2	1	1	

The results of the chi-square test for the number of correct answers and incorrect answers in the two types of odour tests are shown in Table 3.

Table 3. Comparison of the results of two types of odour tests (n=59)

The maximum score is 12 points	(P=0.579)	
	Less than Six correct answers	Six or more correct answers
Open Essence	28	31
Odour Stick	25	34

There was no statistically significant difference between the results of the two odour tests (P=0.579).

Table 5.  $\chi^2$  Test Comparison of the results of two types of odour tests (Timber)

Timber	Elderly male (P=0.094)		
	Correct answer	Incorrect answer	Total
Open Essence	30	29	59
Odour Stick	21	38	59
Total	51	67	118

Table 6.  $\chi^2$  Test Comparison of the results of two types of odour tests (Perfume)

Perfume	Elderly male (P=0.581)		
	Correct answer	Incorrect answer	Total
Open Essence	31	28	59
Odour Stick	28	31	59
Total	59	59	118

Table 7.  $\chi^2$  Test Comparison of the results of two types of odour tests (Menthol)

Mentho	Elderly male (P=1.000)		
	Correct answer	Incorrect answer	Total
Open Essence	33	26	59
Odour Stick	33	26	59
Total	66	52	118

Table 8.  $\chi^2$  Test Comparison of the results of two types of odour tests

Mandarin Orange	(Mandarin Orange) Elderly male (P=0.002**)		
	Correct answer	Incorrect answer	Total
Open Essence	6	53	59
Odour Stick	20	39	59
Total	26	92	118

The results of the chi-square test comparing the results of the 12 different types of odour test are shown in Tables 4 to 15.

Table 9.  $\chi^2$  Test Comparison of the results of two types of odour tests (Curry)

Curry	Elderly male (P=0.012*)		
	Correct answer	Incorrect answer	Total
Open Essence	45	14	59
Odour Stick	32	27	59
Total	77	41	118

Table 10.  $\chi^2$  Test Comparison of the results of two types of odour tests

Household Gas	(Household Gas) Elderly male (P=0.139)		
	Correct answer	Incorrect answer	Total
Open Essence	23	36	59
Odour Stick	31	28	59
Total	54	64	118

Table 11.  $\chi^2$  Test Comparison of the results of two types of odour tests (Rose)

Rose	Elderly male (P=0.128)		
	Correct answer	Incorrect answer	Total
Open Essence	18	41	59
Odour Stick	26	33	59
Total	44	74	118

Table 12.  $\chi^2$  Test Comparison of the results of two types of odour tests (Cypress) Elderly

Cypress	male (P=0.350)		
	Correct answer	Incorrect answer	Total
Open Essence	37	22	59
Odour Stick	32	27	59
Total	69	49	118

Table 13.  $\chi^2$  Test Comparison of the results of two types of odour tests

Stinky Socs / Sweaty	(Stinky Socs / Sweaty) Elderly male (P=0.176)		
	Correct answer	Incorrect answer	Total
Open Essence	35	24	59
Odour Stick	42	17	59
Total	77	41	118

Table 14.  $\chi^2$  Test Comparison of the results of two types of odour tests

Condensed Milk	(Condensed Milk) Elderly male (P=0.853)		
	Correct answer	Incorrect answer	Total
Open Essence	27	32	59
Odour Stick	26	33	59
Total	53	65	118

Moreover, only the chi-square test results for the 12 different types of odours are shown in Table 16. Of the 12 different odours, there was a statistically significant difference between the results of the open essence and the odours of India ink (P=0.009\*\*), mandarin orange (p=0.002\*\*), curry (P=0.012\*), and fried garlic (P=0.008\*\*).

Table 15.  $\chi^2$  Test Comparison of the results of two types of odour tests (Fried Garlic)

Fried Garlic	Elderly male (P=0.008**)		
	Correct answer	Incorrect answer	Total
Open Essence	15	44	59
Odour Stick	29	30	59
Total	44	74	118

Table 16. Comparison of the results of two types of odour tests ( $\chi^2$  Test Results)

Elderly women (n=109)	$\chi^2$ Test Results
India Ink	P=0.009**
Timber	P=0.094
Perfume	P=0.581
Mentho	P=1.000
Mandarin Orange	P=0.002**
Curry	P=0.012*
Household Gas	P=0.139
Rose	P=0.128
Cypress	P=0.350
Stinky Socs / Sweaty	P=0.176
Condensed Milk	P=0.853
Fried Garlic	P=0.008**

\*=P<0.05, \*\*=P<0.01

The results showed that the smells of India ink and curry were easier to identify using the open essence than using the smelly stick, while the smells of mandarin oranges and fried garlic were easier to identify using the smelly stick than using the open essence. There were no statistically significant differences among the other eight odours.

## DISCUSSION

In this study of elderly male, there was no statistically significant difference in the number of correct answers in the two types of odour tests. However, when comparing 12 different odours, the results showed that for the odours of mandarin orange and fried garlic, the open essence was statistically significantly less detectable than the odour stick. And the results showed that for the odours of India ink and curry, the odour Stick was statistically significantly less detectable than the open essence. In previous studies, males performed not well on olfactory tests than females<sup>1-10</sup>, with a statistically significant decline in olfactory perception with increasing age<sup>1-12</sup>. These results suggest that the results of two tests using the same 12 odorants cannot be combined and should be compared across studies using only the same odour test. Since it has been reported that awareness of smell is related to lifestyle habits, it may be necessary to compare it with the results of questionnaire surveys on lifestyle habits in the future<sup>13-16</sup>. Also, in recent years, there have been reports of cases showing abnormalities in the sense of taste and smell due to the COVID-19 epidemic<sup>17-27</sup>. On the other hand, there have been reports of the results that indicate that COVID-19 had no impact in regional cities<sup>28-29</sup>. In the future, I hope to increase the number of test results and shed light on odours that become harder to detect with age.

## CONCLUSION

The results of two types of olfactory tests using the same twelve types of odours were compared for the same subjects (59 males over 40 years old). As a result, there was no statistically significant difference in the number of correct answers. However, when the results of the two types of olfactory tests using each individual odor were compared, a statistically significant difference was found for the odour of India ink, mandarin oranges, curry, and the odor of roasted garlic. When comparing test results by age group or subject, the test methods must be standardized even if the same 12 types of odour are used.

**Ethics statement:** The studies involving human participants were reviewed and approved by the Ethics Committee of Nagoya Women's University (approval number 2019-26). The participants provided their written informed consent to participate in this study.

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