

## A MODIFIED VERSION OF “SNIFFIN’ STICKS” ODOR IDENTIFICATION TEST: THE ROMANIAN CULTURAL ADAPTATION

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### Abstract

**Objective.** The cultural adaptation of the Sniffin’Sticks battery test, a well-validated olfactory test in the German speaking population, before using it in the current medical practice in a country with a different cultural background.

**Materials and Methods.** We tested 248 subjects in two stages. The first stage included 50 healthy subjects aged 13 to 79 years who were tested with Sniffin’Sticks odor identification test with the exact translation of the items and descriptors from German to Romanian and searching for the problematic items as to their understandability. In the second stage the modified list with items and descriptors after linguistic adaptation was tested in a representative Romanian population of 198 healthy subjects aged 13 to 79 years. Our results were correlated with a group of 198 Germans of similar age and sex distribution from the German normative data of Sniffin’Sticks.

**Results.** In the first assessment of the Romanian subjects with the original list of items and descriptors the result was an odor identification less than 70% for 5 items (lemon, liquorice, turpentine, apple, anis). The new Romanian list with items and descriptors showed a significantly increased identification percentage for all the problematic items.

The identification ability of the Romanian subjects showed a similar behavior regarding the age and gender differences with the German subjects. Our results show a significant correlation between the both groups.

**Conclusion.** The result of the study provides cultural adaptation of Sniffin’Sticks olfactory identification test for the Romanian population.

**Keywords:** smell, adaptation, olfaction, identification, Sniffin’Sticks.

## O VERSIUNE MODIFICATĂ A TESTULUI DE IDENTIFICARE “SNIFFIN’ STICKS”: ADAPTAREA CULTURALĂ ÎN POPULAȚIA DIN ROMÂNIA

### Rezumat

**Obiective.** Adaptarea culturală a testului de olfacție “Sniffin’ Sticks”, un test validat în populația vorbitoare a limbii germane, înainte de utilizarea acestuia în practica medicală curentă într-o țară cu un fond cultural diferit.

**Material și Metodă.** Am testat 248 de subiecți în două etape. Prima etapă a inclus 50 de subiecți sănătoși cu vârsta cuprinsă între 13 și 79 ani, care au fost evaluați cu ajutorul testului de identificare a mirosului “Sniffin’ Sticks” prin traducerea exactă a descriptorilor din germană în română și identificarea descriptorilor necunoscuți populației române.

În etapa a doua, o listă modificată după adaptare lingvistică cu noii descriptori

*a fost testată într-o populație românească reprezentativă de 198 de subiecți sănătoși cu vârsta cuprinsă între 13 și 79 de ani. Rezultatele noastre au fost corelate cu datele normative germane ale testului "Sniffin' Sticks" pentru un grup de 198 subiecți germani cu aceeași distribuție legată de vârstă și sex.*

**Rezultate.** În prima etapă de evaluare a subiecților români după lista inițială cu descriptori originali rezultatul a relevat identificarea corectă a unui număr de 5 descriptori într-un procent mai mic de 70% (lămâie, lemn dulce, terebentină, măr, anason). Noua listă adaptată populației române, cu descriptori noi au înregistrat un procent de identificare semnificativ crescut pentru toți descriptorii problematici.

Capacitatea de identificare a subiecților din România a demonstrat un pattern similar în ceea ce privește diferențele de vârstă și de sex cu subiecți din populația germană. Rezultatele noastre arată o corelație semnificativă între ambele grupuri.

**Concluzie.** Rezultatul studiului validează adaptarea culturală a testului de identificare a mirosului "Sniffin' Sticks" în populația românească.

**Cuvinte cheie:** miros, adaptare, olfacție, test de identificare, Sniffin' Sticks.

## INTRODUCTION

The principle of psychophysical tests consists in a quick assessment of the olfactory function in subjects after they were exposed to an olfactory stimulus; it is a rapid and effective test for the screening of the olfactory dysfunction [1]. Olfaction plays an important role in the quality of life in patients with acute upper respiratory tract infections, nasal polyposis, chronic rhinosinusitis and tumors but sometimes the olfactory disorders are undervalued by doctors and also the patients are often unaware of their smell disorders [1]. Among the subjective test methods to assess the sense of smell the "Sniffin' Sticks" test battery (Burghart, Wedel, Germany) is one of the best-validated psychophysical olfactory tests. It uses a pen-like device for odor identification [2].

The development of this test was initiated by the "Arbeitsgemeinschaft Olfaktologie und Gustologie" from the German Society for Otorhinolaryngology, Head and Neck Surgery in 1994 and the normative values in relation to different age groups were mainly obtained in the German speaking population [3]. A cultural adaptation of the identification test from Sniffin' Sticks Test is recommended in the countries with a different cultural background because of the unfamiliar odours (Asians) [4] or the names of the odors (Greek) [5]. In the field of rhinology the olfactory disorders (hyposmia or anosmia) are important to be evaluated before and after the nasal and endoscopic sinus surgery. In the treatment of sino-nasal pathology medico-legal problems may occur related to the under evaluated possible smell disorders. The assessment the olfactory function is important also in neurology, especially in the neurodegenerative disorders (Alzheimer's disease, Parkinson's disease, etc.) and in endocrine disorders (Kallmann's syndrome, hypothyroidism, diabetes etc.) [2].

The aim of this paper is to evaluate the use of the "Sniffin' Sticks" identification test in the Romanian population regarding the ability of the healthy subjects in identification of the odours items and verbal descriptors. The result of the cultural adaptation was a transformed version of the test items and descriptors in five labels.

## MATERIAL AND METHODS

### Subjects

Testing of the olfactory function was performed in 248 healthy subjects using the Sniffin' Sticks identification test. None of the subjects reported to have a major olfactory dysfunction or other problems like neurological disorders, or nasal pathology. Fifteen subjects were smokers but none of the healthy subjects took medicines affecting olfaction. The study was performed in accordance with the Declaration of Helsinki for research on human subjects and with the Institutional ethics approval. The procedures were explained to the subjects with an informed consent.

### Procedure of the Sniffin' Sticks test

The Sniffin' Sticks odor identification test followed the described standard methodology [6]. The commercially available identification test is made by felt-tip pens with odorants (length: 14 cm, diameter: 1.3 cm). For odor presentation the cap is removed by the researcher for approximately 3 sec and the tip of the pen is placed approximately 2 cm in front of the nostrils for approximately 2 sec before the pen is capped again. Odor identification was assessed using 16 common odors (Table 1). For each odor the tested person is asked to choose the correct item (odor) from a label with 4 descriptors. The identification score ranges from 0 to 16. The interval between odor presentations is 20 sec.

### Language translation

The precise translation of the "Sniffin' Sticks" identification items and descriptors was achieved using the established forward-backward procedure [7]. In the first

stage of translation two independent bilingual physicians performed the forward translations and then other two different physicians translated the provisional Romanian version back into German according to the same method as the physicians in Greece [5]. The cultural adaptation of the labels was carried by the backward translation and no areas of problematic language were found.

#### *First stage with Romanian translated text and its modification*

In order to find out how understandable the Romanian text of the identification test was, 50 healthy subjects (age range between 13-79 years, 19 women and 31 men) were asked to identify the presented odors from the test and to point to the *non familiar* terms of the 16 items and 42 descriptors. The identification ability for each subject was expressed in percentages of correct items. Percentages lower than 70% were considered as not acceptable [8] and the unclear terms of items and descriptors were classified as problematic [5]. Then we replaced the problematic items and descriptors by clearer terms for better recognition of the items.

To understand our modifications on the descriptors and items in the labels, for example when a fruity odor is not identified and the descriptors are similar fruity odours we modified the descriptors with others, totally different (e.g. ham or fish) for an easier identification of the correct item.

#### *Second stage with Romanian cultural adapted text*

In the second stage, the modified list of the culturally adapted items and descriptors were tested in 198 healthy subjects (age range between 13-79 years) separated into four age groups: group A under 20 years, group B: 21-40 years, group C: 41-60 years, group D: older than 60 years, because of the changes of olfactory identification ability in relation to age [3,6,8]. Our subjects had the same demographic characteristics regarding age and sex distribution with a sample of 198 subjects from the German normative data of University of Dresden.

**Table 1.** The identification percentage in females and males in all 16 odors. The problematic odors marked with \*.

ODOR	Females % identification		Males % identification		Total % identification	
	pre	post	pre	post	pre	post
Orange	96.0	98.0	87.5	92.0	91.8	95.0
Shoe leather	100.0	100.0	91.7	93.0	95.9	96.5
Cinnamon	88.9	98.0	83.9	83.0	85.7	90.0
Peppermint	100.0	97.0	100.0	95.0	100.0	100.0
Banana	100.0	99.0	95.0	99.0	98.0	99.0
Lemon*	64.0	88.0	58.3	77.0	61.2	97.5
Liquorice*	44.0	87.0	41.7	79.0	42.9	93.0
Turpentine*	48.0	84.0	66.7	89.0	57.1	93.0
Garlic	98.0	97.0	100.0	100.0	100.0	100.0
Coffee	96.0	98.0	95.8	97.0	95.9	97.5
Apple*	52.0	83.0	43.3	73.0	67.3	94.0
Cloves	92.0	97.0	81.7	80.0	91.8	93.5
Pineapple	88.0	93.0	85.8	76.0	91.8	95.0
Rose	96.0	98.0	95.8	99.0	95.9	98.5
Anis*	48.0	88.0	55.0	76.0	61.2	97.0
Fish	96.0	99.0	100.0	100.0	98.0	99.5

#### *Statistical Analysis*

Results were analyzed using SPSS 18.0 for Windows (SPSS, Inc., Chicago, IL).

I used a regression analysis with quantitative variables, dummy variables and interaction effects in order to have a better grasp over of the socio-demographical characteristics of those who identified properly the odors (sex and age). The dependent variable is an additive index of 16 different dichotomous variables, measuring whether an odor was connected properly (1) or not (0) with the label that describes it. Because *pre* and *post-test subjects* were different and had independent responses, we coded the type of response by a dummy variable used as a dummy predictor variable. Gender was also encoded as a dummy variable, 0 for female and 1 for male. Age is measured in years and in order to observe a simple relationship between age and gender.

## RESULTS

#### *First stage of the testing*

After the analysis of the testing in the first stage, 5 items had lower identification percentages than 70%. The odors were lemon, liquorice, turpentine, apple and anise. From these 5 problematic items, 3 of them were replaced by terms more familiar in the Romanian population, namely liquorices by sweet root, turpentine by dissolvent and anise by fennel. The other 2 items, 'apple' and 'lemon' remained the same and we changed only the descriptors. In the first label with item lemon were replaced apple and grapefruit with onion and menthol. In the second label with item apple were replaced peach and orange with cherry and cheese. The descriptors for all the 5 odors from the labels were also changed (Table 2).

In the beginning of the test the examiner told all the subjects to use "*exclusion thinking criteria*" in choosing the good item (odor) in each label during the examination.

All the cultural modifications of the items and descriptors showed a higher percentage of identification (>70%) in the second group of healthy subjects (Table 1).

The analysis of variance indicates (Table 3) that the identification test varied with the sex of the subject - female subjects being more perceptive than the male subjects - and with age group, aging having a negative impact on the capacity of the subjects to identify correctly the test substances. The population had no impact on the identification test, meaning that the transformation which I performed on the labels of the test substances were adequate, suggesting that the Romanian subjects were performing better after the cultural adaptation of the labels than the test group of the German subjects.

The regression analysis (Table 4) suggests that the population has no impact with regard the identification test, but the sex and population variables have a significant impact. Each additional year of life implies a reduction with a fifth of a point from the identification test, and being

**Table 2.** The problematic items are in *italics*, the Romanian names are marked with \*, the original descriptors are underlined and the new one's are in **bold**.

Peach, <i>Apple</i> , <i>Grapefruit</i> , <i>Lemon</i>	Peach, <b>Onion</b> , <b>Menthol</b> , Lemon
<i>Liquorice</i> , <i>Jellies</i> , <i>Peppermint</i> , Cakes	Sweet Root*, <b>Ham</b> , <b>Mint</b> , Cakes
Mustard, <i>Rubber</i> , <i>Menthol</i> , <i>Turpentine</i>	Mustard, Tire, <b>Peppermint</b> , Diluent*
Melon, <i>Peach</i> , <i>Orange</i> , <i>Apple</i>	Melon, <b>Cherry</b> , <b>Cheese</b> , Apple
<i>Anise</i> , Rum, <i>Honey</i> , <i>Spruce</i>	Fennel*, Rum, <b>Cinnamon</b> , <b>Menthol</b>

**Table 3.** Analysis of variance.

	Df		Mean square		F	Sig
	Between Groups	Within Groups	Between Groups	Within Groups		
Sex (0=Female; 1=Male)	1	394	25.99315	4.498864	5.777714	0.017
Age group 1) <20; 2) 21-40; 3) 41-60; 4) 61>	3	392	57.92351	4.144834	13.97487	0.000
Population (0=Romanian; 1=German)	1	394	0.331338	4.563995	0.072598	0.788

**Table 4.** Regression analysis.

Dependent variable: Identification test	b coefficients	$\beta$ coefficients
Constant	13.774	
Age (years)	-0.21*	-0.208*
Sex (0=Female; 1=Male)	-468*	-.110*
Population (0=Romanian; 1=German)	.049	0.012
R <sup>2</sup>	0.058	

\* Significance level  $p < 0.050$

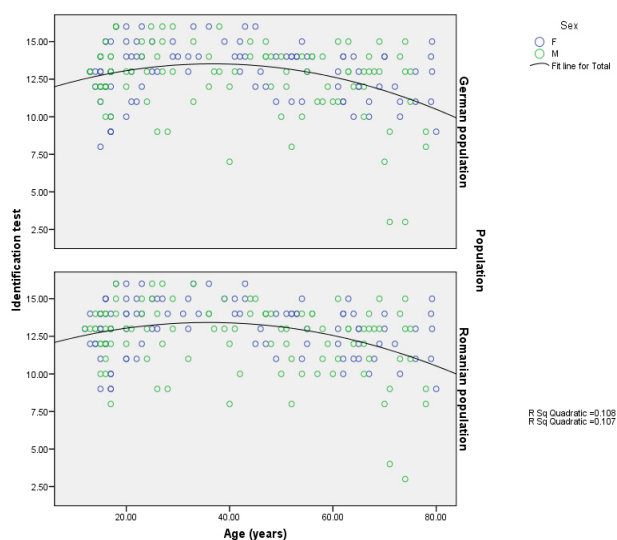
a male means a reduction with almost a half of point from the identification test. However, the regression analysis has a low R<sup>2</sup>: that is the model explains only 5% of the variation of the identification test. This suggests that other variables are at work here and probably other social and physical causes should be factored in for future analysis. Also, the below visual representation suggests that the relation between age and the identification test is not linear.

the nonlinear regression for both the German population and Romanian population. The new regression explains 10.6% and respectively 10.7% of the identification test variation.

## DISCUSSIONS

The odorants from a well-validated odor identification test must be highly familiar to the subjects in each country because of the different cultural background [4,6]. Sniffin' Sticks odor identification test is based on a multiple-forced choice technique [4] and is validated in Northern Europe. The cultural adaptation of the odors regarding the linguistic and familiarity aspects is required before using the test in the Central Europe. To obtain normative data in each country the cultural adaptation is recommended [4,5]. After the first testing with the identification test the number of problematic items showed that for a good diagnosis of hyposmia, an adaptation of the items and descriptors is required. A non-adaptation of this screening odor identification test [8] decreases dramatically the validity of the test.

In the literature the cultural adaptation is described in two parts, first is the assessment of conceptual and linguistic equivalence and second the evaluation of measurement proprieties [5,9]. In our study the linguistic changes were necessary, like in the Greek population [5] and the Asian population [4], unlike in the Italian population without linguistic changes [9]. The Greek study used the same identification test like our own investigation (Sniffin' Sticks, 16 odors) and the results showed that the subjects were not familiar with 6 odors [5], compared with 5 odors



**Fig. 1.** Scatter plot and quadratic regression.

The relation between age and the identification test is not linear, but shows a slight quadratic form as shown by



in our study. Like our study and the Greek one, another Italian study with a different screening test validated in the American population [10] showed no familiarity in 6 odors. Our study confirms that a non-adaptation of the odor identification test from "Sniffin'Sticks" Extended Test can produce a wrong diagnosis of hyposmia in a normosmic subject because of the problematic items [5].

Similar olfactory identification ability to the German population was present in the both described studies after the cross-cultural adaptation [5,11]. All the studies [4,5,12] suggest that the cultural adaptation is influenced by the items included in the test and the cultural particularities of each country. In each country the odors are influenced by everyday life, food preparation, immigrants and neighboring countries [5].

The Romanian population showed quite similar olfactory identification ability as the German subjects after the comparison of the both groups.

Comparing to the Greek population [5], our results showed sex-related differences in the perception of odours. The females have an increased olfactory sensitivity compared with men [11] because of various factors: congenital factors [12], verbal skills [13] and hormonal effects [14].

The Sniffin'Sticks test is used in numerous clinics throughout Europe [15] but also outside the "old continent" like in Taiwan were the cross-cultural adaptation showed a low identification percentage in "leather", "cinnamon" and "liquorice" [4]. Our study had a low identification percentage in 5 items and after the cultural adaptation the 3 items were replaced by more familiar names for Romanians, namely liquorice by sweet root, turpentine by dissolvent and anis by fennel and the descriptors were replaced in the all problematic items. In the Taiwan study [4] the descriptors were changed with more familiar names in 13 cards compared with the Greek study [5] where 3 items had new familiar names and the descriptors were replaced in 4 cards. Our study confirms the importance of changing the descriptors and the use of familiar names for some items in the odor identification tests used in populations with different cultural background. The "exclusion criteria" are important in choosing the correct items and descriptors [4].

The age is an important factor for olfactory loss which is well established [6], the incidence of major olfactory impairment is high (>80%) at the age of 65-80 years [4,5,12] like in our study. The test-retest coefficient of our data was 0.78, close to the 0.73 in healthy German population [6] and to the 0.76 of the Taiwan identification data [8] who used the same test. Our data is similar to another identification test, the 12-item CC-SIT [16], but different in comparison with a well known test: the data for UPSIT (using 40-items) is 0.92 [12]. An odor identification test can detect malingering using an important number of items (16 odors for "Sniffin'Stick Test) but more difficult

[17] for those who use a small number of items (12 odors for CC-SIT).

The number of items and contrasts of items have a clear influence on odor identification scores and contributed to a better identification of odors like in our study [17,18].

After the cultural adaptation, the "Sniffin'Stick" identification test can be used as a screening test for odor dysfunction, e.g. in the medico legal situation together with threshold and discrimination tests for a complete assessment of olfactory function [6].

In conclusion, our study ensures the cultural adaptation of "Sniffin'Stick" odor identification Test in the Romanian population and this test can be an effective tool for assessment of olfactory function in our current medical practice.

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