

# Symptoms of Oral Mucosal Diseases and Vocational Preference Inventory

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**Purpose:** The purpose of this study was to assess the association of vocational interest and personality with oral mucosal diseases.

**Methods:** Three hundred and fifty eight college students in Gyeonggi-do completed Vocational Preference Inventory L form and a questionnaire and collected data were analyzed by R program.

**Results:** The prevalence of symptoms of oral mucosal diseases showed no significant difference among six vocational personality types. Compared to subjects with good or fair general health status, a significantly increased percentage of subjects with bad general health status showed herpetic stomatitis ( $p < 0.01$ ), oral malodor ( $p < 0.01$ ), and glossodynia ( $p < 0.0001$ ). Prevalence of taste disturbance increased significantly as the score of emotional instability ( $\beta = 0.0438$ ,  $p = 0.0082$ ), anxiety ( $\beta = 0.038$ ,  $p = 0.0174$ ), angry hostility ( $\beta = 0.0398$ ,  $p = 0.0061$ ), depression ( $\beta = 0.0443$ ,  $p = 0.0035$ ), and impulsiveness ( $\beta = 0.0358$ ,  $p = 0.0186$ ) increased. Subjects who strongly felt oral malodor revealed significantly higher mean scales of scores of anxiety and angry hostility than subjects who did not feel oral malodor ( $p < 0.05$ ). Subjects who strongly felt oral malodor manifested significantly higher mean scales of scores of anxiety than subjects who slightly felt oral malodor ( $p < 0.05$ ).

**Conclusions:** Taste disturbance was affected by emotional instability, anxiety, angry hostility, depression, and impulsiveness. Oral malodor was related to anxiety and angry hostility. Therefore, psychological aspects of taste disturbance and oral malodor could be evaluated by Vocational Preference Inventory L form.

**Key Words:** Oral malodor; Oral mucosal diseases; Personality factor; Taste disturbance; Vocational preference inventory

## INTRODUCTION

Oral candidiasis (thrush) is characterized by the presence of whitish or grayish exudate-like patches covering a varying amount of the oral mucosa. People on certain medications, with reduced immune systems, or certain medical conditions are susceptible to oral thrush when *Candida albicans* grows out of control.<sup>1,2</sup> Herpetic stomatitis is a Herpes simplex viral infection affecting the mouth, which results in formation of blisters followed by ulcers. Emotional or

physical distress might trigger relapses which are characterized by burning skin rash on the lips and around the mouth.<sup>3</sup> Recurrent aphthous ulceration (RAU) occurs in the non-keratinized areas as lips, tongue, buccal mucosa and soft palate usually as painful, shallow round ulcers with an erythematous halo covered by a yellowish-gray fibromembranous layer.<sup>4,5</sup> Its occurrence is related to a range of factors; precipitated factors include stress, physical or chemical trauma, food sensitivity, and genetic predisposition.<sup>6,7</sup> Oral lichen planus (OLP) may present clinically in reticular,

atrophic and erosive form among which atrophic and erosive type are sore.<sup>8)</sup> It is the most commonly found on the buccal mucous membrane and may appear on lips, gingiva, palate, tongue and floor of the mouth.<sup>9)</sup> It is known as a T cell-mediated immune disorder and may be triggered by infection, psychological factor, genetic tendency, and certain medications.<sup>10)</sup> Glossodynia or burning mouth syndrome is defined by the International Association for the Study of Pain as a burning pain in the tongue or other oral mucous membranes associated with normal signs and laboratory findings.<sup>11)</sup> The preferred site for the pain is the anterior portion of the tongue. Glossodynia has many different causes, including infection, mechanical irritation, allergic reaction, chemical irritation, underlying disease, and dry mouth.<sup>12)</sup> Taste disturbance includes hypogeusia, dysgeusia, ageusia, hypergeusia, and phantogeusia.<sup>13)</sup> Factors that affect taste perception are dry mouth, oral mucosal diseases, damage to the nervous system, psychological status, systemic conditions, and certain medications.<sup>14-18)</sup> Oral malodor of oral etiology results from excessive microbial metabolism on the tongue dorsum. In many cases, oral malodor originates from various local physiological causes, certain systemic disease conditions and psychological problems.<sup>19-22)</sup>

Korea Employment Information Service provides Vocational Preference Inventory L form for people at least 18 years old to explore and choose vocations. Vocational Preference Inventory L form which is a psychological inventory consists of a test of vocational interests and a personality test. A test of vocational interests contains six Holland's vocational personality types: realistic (R), investigative (I), artistic (A), social (S), enterprising (E), and conventional (C). A personality test is based on the Big-Five personality dimensions which are extraversion, agreeableness, conscientiousness, emotional instability, and openness to new experiences. Emotional instability of the dimensions is also called neuroticism and is further divided into six facets: anxiety, angry hostility, depression, self-consciousness, impulsiveness, and vulnerability.<sup>23-26)</sup>

It was found that white-collar workers had the higher incidence of oral lesions of lichen planus than the labourers.<sup>8)</sup> It was reported that educational level and occupational status had great impact on the prevalence of RAU.<sup>27)</sup> Minneman et al.<sup>28)</sup> suggested that highly neurotic

individuals would respond to heightened stress with more soft-tissue pathology. Ko et al.<sup>29)</sup> concluded that psychological stressors play an important role in the RAU. Soto Araya et al.<sup>30)</sup> described higher levels of stress and anxiety in patients with OLP and RAU. It was observed that vocational preference was predictable from personality profile.<sup>31)</sup> Hence, this study has been performed aiming at assessing the association of vocational interest and personality with oral mucosal diseases.

## MATERIALS AND METHODS

This study is approved by the Institutional Review Board of Shingu College (IRB-2017-103).

### 1. Subjects

Data were collected from 358 college students in Gyeonggi-do, including 66 men and 292 women. Mean age of the subjects was  $20.34 \pm 4.47$  years (Table 1).

### 2. Data Collection

Data were obtained from June to December of 2017. A questionnaire (Appendix 1) was composed of 8 items related to symptoms of oral mucosal diseases and general health status. Visiting a classroom, an examiner introduced Vocational Preference Inventory L form and asked the students to complete it through [www.work.go.kr](http://www.work.go.kr) and to print and submit the results of on-line test. Moreover, after each item of the questionnaire was explained, the students were asked to answer it by self-evaluation and the completed answers were retrieved at their classroom. Collected response data were recorded in an Microsoft Excel 2013 (Microsoft, Redmond, WA, USA) file.

### 3. Statistical Analyses

All the statistical analyses were performed by using R

**Table 1.** Demographics of the subjects

Sex	Subject	Age (y)
Men	66 (18.44)	$22.41 \pm 5.51$
Women	292 (81.56)	$19.87 \pm 4.07$
Total	358 (100.00)	$20.34 \pm 4.47$

Values are presented as number (%) or mean  $\pm$  standard deviation.

program (R ver. 3.4.1; R Core Team, 2017). The Pearson's chi-square test was used to evaluate the relationship of self-reporting prevalence rate of symptoms of oral mucosal diseases to Holland codes and general health status. Logistic regression analyses were conducted to evaluate impacts of personality factors on symptoms of oral mucosal diseases. One way ANOVA and Tukey post hoc analysis were implemented to compare mean scales of scores of personality factors according to the subjective degree of oral malodor. The significance level was set to 5% ( $p < 0.05$ ).

## RESULTS

In the present study 150 of subjects (41.90%) had the symptom of oral candidiasis, 194 subjects (54.19%) herpetic stomatitis, 158 subjects (44.13%) RAU, 68 subjects

(18.99%) OLP, 90 subjects (25.14%) glossodynia, 55 subjects (15.36%) taste disturbance, 239 subjects (66.76%) oral malodor. Concerning six Holland's vocational personality types for which subjects had the highest scale score, S was demonstrated by 142 of subjects (39.66%), A by 109 subjects (30.45%), C by 52 subjects (14.53%), E by 25 subjects (6.98%), I by 19 subjects (5.31%), and R by 11 subjects (3.07%). Among six Holland's vocational personality types, the prevalence of symptoms of oral mucosal diseases showed no significant difference (Table 2).

Compared to subjects with good or fair general health status, a significantly increased percentage of subjects with bad general health status showed herpetic stomatitis ( $p < 0.01$ ), oral malodor ( $p < 0.01$ ), and glossodynia ( $p < 0.0001$ ) (Table 3).

Prevalence of taste disturbance increased significantly

**Table 2.** Prevalence of symptoms of oral mucosal diseases according to six Holland's vocational personality types (n=358)

Symptoms of oral mucosal diseases	Subject	Holland code						p-value
		S 142 (39.66)	A 109 (30.45)	I 19 (5.31)	R 11 (3.07)	C 52 (14.53)	E 25 (6.98)	
Oral candidiasis	150 (41.90)	62 (43.66)	44 (40.37)	9 (47.37)	6 (54.55)	19 (36.54)	10 (40.00)	0.8637
Herpetic stomatitis	194 (54.19)	79 (55.63)	61 (55.96)	11 (57.89)	5 (45.45)	25 (48.08)	13 (52.00)	0.9094
RAU	158 (44.13)	62 (43.66)	51 (46.79)	6 (31.58)	5 (45.45)	23 (44.23)	11 (44.00)	0.9075
OLP	68 (18.99)	32 (22.54)	19 (17.43)	3 (15.79)	1 (9.09)	10 (19.23)	3 (12.00)	0.7069
Glossodynia	90 (25.14)	33 (23.24)	31 (28.44)	5 (26.32)	3 (27.27)	14 (26.92)	4 (16.00)	0.8292
Taste disturbance	55 (15.36)	16 (11.27)	18 (16.51)	4 (21.05)	2 (18.18)	9 (17.31)	6 (24.00)	0.5396
Oral malodor	239 (66.76)	96 (67.61)	69 (63.30)	15 (78.95)	8 (72.73)	36 (69.23)	15 (60.00)	0.7402

S, social; A, artistic; I, investigative; R, realistic; C, conventional; E, enterprising; RAU, recurrent aphthous ulceration; OLP, oral lichen planus. Values are presented as number (%).

p-values were completed by chi-square test.

**Table 3.** Prevalence of symptoms of oral mucosal diseases according to general health status (n=358)

Symptoms of oral mucosal diseases	Subject	General health status			p-value
		Good 162 (45.25)	Fair 178 (49.72)	Bad 18 (5.03)	
Oral candidiasis	150 (41.90)	65 (40.12)	76 (42.70)	9 (50.00)	0.6902
Herpetic stomatitis	194 (54.19)	71 (43.83)	111 (62.36)	12 (66.67)	0.0016**
RAU	158 (44.13)	71 (43.83)	81 (45.51)	6 (33.33)	0.6085
OLP	68 (18.99)	30 (18.52)	32 (17.98)	6 (33.33)	0.2796
Glossodynia	90 (25.14)	26 (16.05)	56 (31.46)	8 (44.44)	<0.0001****
Taste disturbance	55 (15.36)	22 (13.58)	29 (16.29)	4 (22.22)	0.5584
Oral malodor	239 (66.76)	92 (56.79)	132 (74.16)	15 (83.33)	0.001**

RAU, recurrent aphthous ulceration; OLP, oral lichen planus.

Values are presented as number (%).

p-values were completed by chi-square test.

\*\* $p < 0.01$ , \*\*\*\* $p < 0.0001$ .

as the score of emotional instability ( $\beta=0.0438$ ,  $p=0.0082$ ), anxiety ( $\beta=0.038$ ,  $p=0.0174$ ), angry hostility ( $\beta=0.0398$ ,  $p=0.0061$ ), depression ( $\beta=0.0443$ ,  $p=0.0035$ ), and impulsiveness ( $\beta=0.0358$ ,  $p=0.0186$ ) increased (Table 4).

Subjects were divided into three groups based on the

subjective degree of oral malodor. Mean scales of scores of anxiety and angry hostility were significantly different among subjects who did not feel, slightly felt, and strongly felt oral malodor ( $p<0.05$ ) (Table 5).

Tukey post hoc analysis was implemented to study

**Table 4.** Logistic regression analysis of personality factors on symptoms of oral mucosal diseases (n=358)

Personality factor	Symptoms of oral mucosal diseases, n (%)					
	Oral candidiasis 150 (41.90)	Herpetic stomatitis 194 (54.19)	RAU 158 (44.13)	OLP 68 (18.99)	Glossodynia 90 (25.14)	Taste disturbance 55 (15.36)
<b>Emotional instability</b>						
$\beta$	-0.0008	0.0129	0.0036	0.0242	0.0159	0.0438
SE	0.0116	0.0116	0.0116	0.0149	0.0134	0.0165
OR	0.9992	1.0129	1.0036	1.0245	1.016	1.0447
95% CI	0.9766-1.0223	0.9903-1.0365	0.9811-1.0268	0.9953-1.0552	0.9899-1.0433	1.0118-1.0798
p-value	0.9455	0.2678	0.7534	0.1044	0.2350	0.0082**
<b>Anxiety</b>						
$\beta$	-0.0122	0.0095	0.0021	0.0095	0.0175	0.038
SE	0.0109	0.0108	0.0108	0.0139	0.0127	0.016
OR	0.9878	1.0095	1.0021	1.0096	1.0176	1.0388
95% CI	0.9668-1.0091	0.9884-1.0312	0.9811-1.0237	0.9828-1.0378	0.993-1.0436	1.0074-1.0728
p-value	0.2611	0.3807	0.8460	0.4920	0.1680	0.0174*
<b>Angry hostility</b>						
$\beta$	0.0047	0.0092	-0.0098	0.0186	0.012	0.0398
SE	0.0106	0.0105	0.0105	0.0132	0.012	0.0145
OR	1.0047	1.0092	0.9903	1.0188	1.012	1.0406
95% CI	0.9841-1.0258	0.9887-1.0304	0.9698-1.0109	0.9927-1.0457	0.9885-1.0362	1.0116-1.0711
p-value	0.6579	0.3818	0.3532	0.1592	0.3185	0.0061**
<b>Depression</b>						
$\beta$	0.0013	0.0165	0.0061	0.0136	0.0234	0.0443
SE	0.0108	0.0108	0.0107	0.0136	0.0124	0.0152
OR	1.0013	1.0166	1.0061	1.0137	1.0237	1.0453
95% CI	0.9803-1.0228	0.9955-1.0386	0.9852-1.0277	0.9871-1.0412	0.9992-1.0491	1.0151-1.0776
p-value	0.9048	0.1264	0.5682	0.3171	0.0592	0.0035**
<b>Self-consciousness</b>						
$\beta$	0.0035	0.0092	0.0142	0.0142	0.0021	0.0186
SE	0.011	0.0109	0.0111	0.0142	0.0125	0.0155
OR	1.0035	1.0093	1.0143	1.0143	1.0021	1.0188
95% CI	0.982-1.0255	0.9879-1.0313	0.9927-1.0368	0.9869-1.0434	0.9779-1.0274	0.9888-1.0511
p-value	0.7535	0.3973	0.1983	0.3168	0.8656	0.2306
<b>Impulsiveness</b>						
$\beta$	-0.0032	0.0142	0.0000	0.0159	0.0111	0.0358
SE	0.0107	0.0107	0.0106	0.0136	0.0122	0.0152
OR	0.9968	1.0143	1.0000	1.016	1.0112	1.0365
95% CI	0.9761-1.0179	0.9934-1.0359	0.9793-1.0211	0.9895-1.0438	0.9873-1.036	1.0064-1.0685
p-value	0.7642	0.1828	0.9982	0.2431	0.3645	0.0186*
<b>Vulnerability</b>						
$\beta$	0.006	-0.0038	0.007	0.0159	0.0141	0.0024
SE	0.0113	0.0112	0.0113	0.0142	0.0129	0.0155
OR	1.006	0.9962	1.0071	1.016	1.0142	1.0024
95% CI	0.9839-1.0287	0.9744-1.0184	0.9851-1.0297	0.9881-1.0449	0.9889-1.0403	0.9723-1.0333
p-value	0.5968	0.7340	0.5316	0.2640	0.2744	0.8751

RAU, recurrent aphthous ulceration; OLP, oral lichen planus; SE, standard error; OR, odds ratio; CI, confidence interval.

\* $p<0.05$ , \*\* $p<0.01$ .

**Table 5.** Comparison of mean scales of scores of personality factors among three groups divided by the subjective degree of oral malodor (n=358)

Personality factor	No oral malodor 119 (33.24)	Slight oral malodor 232 (64.80)	Strong oral malodor 7 (1.96)	p-value
Emotional instability	53.40±8.61	54.49±9.36	60.43±12.57	0.1157
Anxiety	56.29±9.56	57.17±9.97	66.86±5.84	0.0213*
Angry hostility	48.55±10.15	50.02±10.08	58.14±9.05	0.0364*
Depression	51.01±9.94	51.71±9.92	58.43±8.90	0.1531
Self-consciousness	56.37±9.28	57.11±9.82	61.57±14.55	0.3587
Impulsiveness	53.51±9.30	54.02±10.32	62.43±10.80	0.0736
Vulnerability	51.10±9.55	52.08±9.43	59.00±7.44	0.088

Values are presented as number (%) or mean ± standard deviation.

p-values were completed by one way ANOVA.

\*p<0.05.

**Table 6.** Tukey post hoc analysis on pairwise differences among three groups divided by the subjective degree of oral malodor according to anxiety and angry hostility (n=358)

	Difference	Lower limit	Upper limit	p-value
Anxiety				
No oral malodor-slight oral malodor	0.878	-1.718	3.474	0.706
No oral malodor-strong oral malodor	10.563	1.610	19.517	0.016*
Slight oral malodor-strong oral malodor	9.685	0.853	18.516	0.028*
Angry hostility				
No oral malodor-slight oral malodor	1.471	-1.206	4.148	0.400
No oral malodor-strong oral malodor	9.597	0.362	18.832	0.040*
Slight oral malodor-strong oral malodor	8.126	-0.984	17.235	0.091

\*p<0.05.

pairwise differences on anxiety and angry hostility. Subjects who strongly felt oral malodor revealed significantly higher mean scales of scores of anxiety and angry hostility than subjects who did not feel oral malodor (p<0.05). Subjects who strongly felt oral malodor manifested significantly higher mean scales of scores of anxiety than subjects who slightly felt oral malodor (p<0.05) (Table 6).

## DISCUSSION

Holland's theory suggests that most people can be classified as one of six vocational personality types (R, I, A, S, E, and C) based on their distinctive patterns of abilities, attitudes and interests.<sup>32)</sup> In the current study, among six vocational personality types most was S (39.66%), followed by A (30.45%), C (14.53%), E (6.98%), I (5.31%), R (3.07%), in order, though in a study of legislative staff in National Assembly Secretariat of Korea most was S (37.0%), followed by C (30.7%), A (11.8%), R (11.8%), I (6.3%), E (2.4%), in

order.<sup>33)</sup> The present result that the prevalence of symptoms of oral mucosal diseases showed no significant difference among six vocational personality types reflects the previous report that occupational diseases of the oral mucosa are relatively uncommon.<sup>34)</sup>

In this study 54.19% of subjects experienced herpetic stomatitis. This is higher than 33.2% of men and 28.0% of women reported in a survey of young adults on six continents.<sup>35)</sup> The study that weak immune system can increase the likelihood of viral infection<sup>3)</sup> explains the current result that herpetic stomatitis was significantly more prevalent in subjects with bad general health status (p<0.01). The prevalence rate of oral malodor in this study was 66.76% which was higher than that noted in the investigation of Sulser et al.<sup>36)</sup> in which 56% of sample population had offensive breath. The report of the relationship between systemic diseases and oral malodor<sup>37)</sup> supports this finding that oral malodor occurred significantly more frequently in subjects with bad general health status (p<0.01). In the present study

the prevalence rate of glossodynia was 25.14% while that ranged from 0.6% to 15% in the previous study.<sup>38)</sup> The finding that the subjects with glossodynia reported a significantly higher prevalence of anemia, gastrointestinal problems and nonspecific health complaints<sup>39)</sup> is similar with the result that glossodynia was significantly more prevalent in subjects with bad general health status ( $p < 0.0001$ ). The prevalence of perceived taste disturbance in the studied population was 15.36% though 7.2% of an adult Swedish population had metallic, salty, or bad taste.<sup>40)</sup> Taste disturbance was significantly associated with emotional instability ( $p < 0.01$ ), anxiety ( $p < 0.05$ ), angry hostility ( $p < 0.01$ ), depression ( $p < 0.01$ ), and impulsiveness ( $p < 0.05$ ). This result is supportive of earlier studies in which individuals with perceived taste disturbances had high levels of anxiety and depression,<sup>41)</sup> affective disturbances have been associated with altered taste perception,<sup>42)</sup> and the attenuation of sweet taste perception due to acute stress was stronger in participants with high trait negative affect.<sup>43)</sup> Similarly, Blazer et al.<sup>44)</sup> found that taste disturbance level of the bulimia nervosa patients with high impulsivity scale was significantly higher than that of the controls, in support of my result.

As in other subjective perceptions, the personal perception of odor is highly affected by emotional variables.<sup>45)</sup> Using the Revised Symptom Checklist 90 (SCL-90-R) and the Minnesota Multiphasic Personality Inventory (MMPI-2), Rocca et al.<sup>46)</sup> demonstrated that the subjective halitosis patients showed high levels of anxiety, hostility, and depression. Lee et al.<sup>22)</sup> reported significantly higher T-scores of anxiety and hostility estimated by SCL-90-R in oral malodor patients compared with controls. The study of Eli et al.<sup>47)</sup> indicated that hostility plays a significant role in self-perception of halitosis. These findings coincides with the present result that subjects with strong oral malodor showed significantly higher mean scales of scores of anxiety and angry hostility than subjects without oral malodor ( $p < 0.05$ ). In contrast, Ham et al.<sup>48)</sup> found no significant difference between halitosis patients and normal group in scales of anxiety and hostility from SCL-90-R. Jung et al.<sup>49)</sup> suggested that there was no relationship between halitosis and anxiety scale from Beck Anxiety Inventory and State-Trait Anxiety Inventory.

In conclusion, taste disturbance was affected by emotional

instability, anxiety, angry hostility, depression, and impulsiveness. Oral malodor was related to anxiety and angry hostility. Therefore, psychological aspects of taste disturbance and oral malodor could be evaluated by Vocational Preference Inventory L form.

## CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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**Appendix 1.** Form and contents of questionnaire.**QUESTIONNAIRE**

Name of College :

Name of Department :

Grade :

Name :

Gender :

Please answer the following questions by checking the one answer which describes you.

1. Have you ever had thick white or cream-colored deposits on your tongue, inner cheeks or roof of the mouth?  
1) Yes            2) No
2. Have you ever experienced blisters developing, bursting and changing into ulcers on the margin of the lips or in the mouth?  
1) Yes            2) No
3. Have you ever suffered painful, shallow, round, yellowish-gray colored ulcers on lips, tongue, or inner cheeks?  
1) Yes            2) No
4. Have you ever suffered an widely excoriated surface which is extremely tender on inner cheeks or gingiva?  
1) Yes            2) No
5. Have you ever felt unusual sensation or the pain in the anterior portion of the tongue?  
1) Yes            2) No
6. Have you ever felt diminished, unpleasant, or altered sense of taste of food?  
1) Yes            2) No
7. Do you feel your bad breath?  
1) No            2) Slightly feel            3) Strongly feel
8. How would you evaluate your general health status?  
1) Good            2) Fair            3) Bad

Thank you for your cooperation.