

# Vocational Preference Inventory of Korean College Students with Symptoms of Temporomandibular Disorders

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**Purpose:** The purpose of this study was to assess the association of vocational interest and personality with temporomandibular disorders (TMD).

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

**Results:** The percentage of subjects who responded that they had at least one contributing factor for TMD was significantly different among 27 two-letter Holland codes ( $p < 0.05$ ). The two-letter Holland codes of which the first-letter was social (S) (S artistic [A], S investigative [I], S realistic [R], S conventional [C], S enterprising [E]) or C (CE, CS, CA, CI) had tendency of having the relatively higher prevalence of symptoms and contributing factors for TMD. Among 6 one-letter Holland codes, the prevalence of a symptom of frequent fatigue in the jaw and a habit of gum chewing showed the significant difference ( $p < 0.05$ ). E code seemed to have lower prevalence of a symptom of frequent fatigue in the jaw than other codes. S code appeared to use chewing gum more frequently than other codes. High scorers on emotional instability showed the significantly higher prevalence of TMD symptoms ( $p < 0.05$ ) and contributing factors for TMD ( $p < 0.001$ ) than low scorers. Furthermore, high scorers on emotional instability had significantly higher mean scales of the number of positive answers of TMD symptoms ( $p < 0.01$ ) and of contributing factors for TMD ( $p < 0.001$ ) than low scorers.

**Conclusions:** Symptoms and contributing factors for TMD were related to emotional instability. Vocational Preference Inventory L form might be utilized in assessing emotional factors of persons with TMD symptoms.

**Key Words:** Contributing factor for temporomandibular disorders; Emotional factor; Temporomandibular disorders symptom; Vocational Preference Inventory

## INTRODUCTION

Temporomandibular disorders (TMD) are characterized by symptoms that include pain of temporomandibular joint and masticatory muscles, joint sound during mouth opening, limitation of mouth opening.<sup>1,2)</sup>

TMD are caused by occlusal condition, trauma, para-functional activities, deep pain input and emotional stress.<sup>3)</sup> Factors that contribute to initiating or perpetuating TMD

contain a habit of resting the cheek on one hand, a habit of biting lips, cheeks, nails or pencils, gum chewing, unilateral chewing, teeth clenching, teeth grinding, and insomnia, etc.<sup>4)</sup> Epidemiologic studies showed that TMD symptoms occurred mostly in the 20 to 40 years old population.<sup>5-7)</sup>

Vocational Preference Inventory L form is a psychological inventory that leads people at least 18 years old to vocational choice and exploration provided by Korea Employment Information Service. It contains a test of

vocational interests and a personality test. A test of vocational interests includes six scales that represent Holland's RIASEC hexagonal dimensional model of 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 factors which are extraversion, agreeableness, conscientiousness, emotional instability, and openness.<sup>8-11)</sup>

The association of occupations with TMD symptoms has been shown in previous studies.<sup>12-14)</sup> There have been studies on relation of personality factors to TMD as psychosomatic disorder.<sup>15-17)</sup> It was suggested that vocational preference was predictable from personality profile.<sup>18)</sup> Hence, current study has been performed aiming to analyze results of vocational preference inventory of college students with TMD symptoms and to assess the association of vocational interest and personality with TMD.

## MATERIALS AND METHODS

This study is approved by the Institutional Review Board of Shingu College (IRB-2016-101).

### 1. Subjects

Data were collected from 414 college students in Gyeonggi-do, including 57 men and 357 women. Mean age of the subjects was  $19.68 \pm 3.04$  years (Table 1).

### 2. Vocational Preference Inventory L Form

Vocational Preference Inventory L form of 415 items consists of three parts: a test of vocational interests (204 items), a personality test (166 items), and a biodata test (45 items). The items for a test of vocational interests are occupational activities, competencies, personal inclinations, occupations, and fields for which respondents express preferences. A biodata test includes characteristics of life-history such as

past behaviors and experiences. After marking like, neutral, or dislike to total items, a respondent receives a result sheet representing a two-letter Holland code calculated from the two highest total scores on the items of vocational interests and a list of associated occupations.<sup>8-11)</sup>

### 3. Data Collection

Data were obtained from June to December of 2016. A questionnaire (Appendix 1) was composed of 18 items, among which 10 items (from item number 1 to item number 10) indicated TMD symptoms and 8 items (from item number 11 to item number 18) related to contributing factors for TMD. It was formed referring to a questionnaire<sup>19)</sup> recommended by the American Academy of Orofacial Pain and a method devised by Nilner.<sup>20)</sup> Visiting a classroom, an examiner explained each item of the questionnaire and asked the students to answer it by self-evaluation and retrieved the completed answers at their classroom. Moreover, After Vocational Preference Inventory L form was introduced, the students were asked to complete it through [www.work.go.kr](http://www.work.go.kr) and printed the results of on-line test and also submitted them. Collected response data were recorded in a Microsoft Excel 2013 (Microsoft, Redmond, WA, USA) file.

### 4. Statistical Analyses

All the statistical analyses were performed by R program (ver. 3.3.0; R Foundation for Statistical Computing, Vienna, Austria). The Pearson's chi-square test was used to evaluate the relationship of self-reporting prevalence rate of TMD symptoms and contributing factors for TMD to Holland codes. One way ANOVA was performed to compare mean scales of the number of positive answers of TMD symptoms and contributing factors for TMD according to the range of the score on emotional instability which is a factor of personality test. The significance level was set to 5% ( $p < 0.05$ ).

## RESULTS

Two-hundred and eighty-five subjects (68.84%) in this study showed at least one of TMD symptoms and three-hundred and forty-six subjects (83.57%) had at least one of contributing factors for TMD. Subjects were assigned to a two-letter Holland code based on the top two categories

**Table 1.** Demographics of the subjects

| Sex   | Subject      | Age (y)          |
|-------|--------------|------------------|
| Men   | 57 (13.77)   | $21.84 \pm 5.26$ |
| Women | 357 (86.23)  | $19.34 \pm 2.34$ |
| Total | 414 (100.00) | $19.68 \pm 3.04$ |

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

for which they had the highest and the second highest scale score. This procedure resulted in the following distribution of subjects corresponding to each two-letter Holland code: SA (n=87, 21.01%), SI (n=6, 1.45%), SR (n=12, 2.90%), etc. The percentage of subjects who responded that they had at least one contributing factor for TMD was significantly different among 27 two-letter Holland codes ( $p<0.05$ ). The two-letter Holland codes of which the first-letter was S (SA, SI, SR, SC, SE) or C (CE, CS, CA, CI) had tendency of having the relatively higher prevalence of symptoms and contributing factors for TMD (Table 2).

In the present study 87 of subjects (21.01%) had frequent fatigue in the jaw and 72 subjects (17.39%) had a habit of gum chewing. Concerning a one-letter Holland code for which subjects had the highest scale score, S was

demonstrated by 195 of subjects (47.10%), A by 109 subjects (26.33%), I by 23 subjects (5.56%), R by 13 subjects (3.14%), C by 55 subjects (13.29%), and E by 19 subjects (4.59%). Among 6 one-letter Holland codes, the prevalence of a symptom of frequent fatigue in the jaw and a habit of gum chewing showed the significant difference ( $p<0.05$ ). E code seemed to have lower prevalence of a symptom of frequent fatigue in the jaw than other codes. S code appeared to use chewing gum more frequently than other codes (Table 3).

Subjects were divided into three groups based on the scores on the items of emotional instability which is a factor of personality test, among whom 14 subjects (3.38%) were assigned to the group with scores lower than 40, 270 subjects (65.22%) with scores from 40 to 59, and 130 subjects (31.40%) with scores 60 or more. The percentage of

**Table 2.** Prevalence of TMD symptoms and contributing factors for TMD according to 27 two-letter Holland codes (n=414)

| Holland code | Subject    | TMD symptoms<br>285 (68.84) | Contributing factors for TMD<br>346 (83.57) |
|--------------|------------|-----------------------------|---|
| SA           | 87 (21.01) | 66/87 (75.86)               | 79/87 (90.80)                               |
| SI           | 6 (1.45)   | 5/6 (83.33)                 | 5/6 (83.33)                                 |
| SR           | 12 (2.90)  | 10/12 (83.33)               | 10/12 (83.33)                               |
| SC           | 56 (13.53) | 38/56 (67.86)               | 46/56 (82.14)                               |
| SE           | 34 (8.21)  | 25/34 (73.53)               | 28/34 (82.35)                               |
| AI           | 3 (0.72)   | 2/3 (66.67)                 | 3/3 (100.00)                                |
| AR           | 5 (1.21)   | 4/5 (80.00)                 | 5/5 (100.00)                                |
| AC           | 18 (4.35)  | 13/18 (72.22)               | 14/18 (77.78)                               |
| AE           | 7 (1.69)   | 3/7 (42.86)                 | 4/7 (57.14)                                 |
| AS           | 76 (18.36) | 49/76 (64.47)               | 63/76 (82.89)                               |
| IR           | 6 (1.45)   | 1/6 (16.67)                 | 2/6 (33.33)                                 |
| IC           | 2 (0.48)   | 2/2 (100.00)                | 2/2 (100.00)                                |
| IE           | 2 (0.48)   | 1/2 (50.00)                 | 1/2 (50.00)                                 |
| IS           | 9 (2.17)   | 7/9 (77.78)                 | 8/9 (88.90)                                 |
| IA           | 4 (0.97)   | 3/4 (75.00)                 | 4/4 (100.00)                                |
| RE           | 2 (0.48)   | 2/2 (100.00)                | 1/2 (50.00)                                 |
| RS           | 5 (1.21)   | 5/5 (100.00)                | 5/5 (100.00)                                |
| RA           | 3 (0.72)   | 1/3 (33.33)                 | 3/3 (100.00)                                |
| RI           | 3 (0.72)   | 1/3 (33.33)                 | 2/3 (66.67)                                 |
| CE           | 7 (1.69)   | 6/7 (85.71)                 | 6/7 (85.71)                                 |
| CS           | 30 (7.25)  | 17/30 (56.67)               | 27/30 (90.00)                               |
| CA           | 15 (3.62)  | 11/15 (73.33)               | 13/15 (86.67)                               |
| CI           | 3 (0.72)   | 2/3 (66.67)                 | 3/3 (100.00)                                |
| ES           | 8 (1.93)   | 3/8 (37.50)                 | 4/8 (50.00)                                 |
| EA           | 5 (1.21)   | 4/5 (80.00)                 | 3/5 (60.00)                                 |
| ER           | 1 (0.24)   | 1/1 (100.00)                | 0/1 (0.00)                                  |
| EC           | 5 (1.21)   | 3/5 (60.00)                 | 5/5 (100.00)                                |
| p-value      |            | 0.2247                      | 0.0184*                                     |

TMD, temporomandibular disorder; S, social; A, artistic; I, investigative; R, realistic; C, conventional; E, enterprising.

Values are presented as number (%).

p-values were completed by chi-square test.

\* $p<0.05$ .

**Table 3.** Prevalence of each TMD symptom and each contributing factor for TMD according to 6 one-letter Holland codes (n=414)

| TMD symptoms and contributing factors for TMD | Subject     | Holland code        |                     |                   |                   |                    |                   | p-value |
|---|-------------|---------------------|---------------------|-------------------|-------------------|--------------------|-------------------|---------|
|   |             | S<br>195<br>(47.10) | A<br>109<br>(26.33) | I<br>23<br>(5.56) | R<br>13<br>(3.14) | C<br>55<br>(13.29) | E<br>19<br>(4.59) |         |
| Jaw joint pain in opening mouth wide          | 120 (28.99) | 56 (28.72)          | 29 (26.61)          | 9 (39.13)         | 5 (38.46)         | 17 (30.91)         | 4 (21.05)         | 0.7456  |
| Jaw joint locking                             | 98 (23.67)  | 55 (28.21)          | 18 (16.51)          | 6 (26.09)         | 5 (38.46)         | 12 (21.82)         | 2 (10.53)         | 0.114   |
| Jaw pain during speech or chewing             | 121 (29.23) | 64 (32.82)          | 27 (24.77)          | 7 (30.43)         | 5 (38.46)         | 15 (27.27)         | 3 (15.79)         | 0.4698  |
| Jaw joint sound                               | 154 (37.20) | 79 (40.51)          | 37 (33.94)          | 8 (34.78)         | 6 (46.15)         | 18 (32.73)         | 6 (31.58)         | 0.755   |
| Frequent fatigue in the jaw                   | 87 (21.01)  | 44 (22.56)          | 16 (14.68)          | 9 (39.13)         | 5 (38.46)         | 12 (21.82)         | 1 (5.26)          | 0.0262* |
| Pain in ear, temple, or cheek                 | 69 (16.67)  | 33 (16.92)          | 18 (16.51)          | 2 (8.70)          | 4 (30.77)         | 8 (14.55)          | 4 (21.05)         | 0.6437  |
| Frequent headache                             | 159 (38.41) | 84 (43.08)          | 40 (36.70)          | 5 (21.74)         | 5 (38.46)         | 18 (32.73)         | 7 (36.84)         | 0.3687  |
| Jaw stiffness in the morning                  | 72 (17.39)  | 39 (20.00)          | 20 (18.35)          | 3 (13.04)         | 3 (23.08)         | 4 (7.27)           | 3 (15.79)         | 0.3534  |
| Acute malocclusion                            | 56 (13.53)  | 25 (12.82)          | 15 (13.76)          | 3 (13.04)         | 2 (15.38)         | 9 (16.36)          | 2 (10.53)         | 0.9853  |
| Previous treatment of jaw                     | 28 (6.76)   | 13 (6.67)           | 6 (5.50)            | 4 (17.39)         | 2 (15.38)         | 3 (5.45)           | 0 (0.00)          | 0.1888  |
| Previous trauma in head, neck, or Jaw         | 5 (1.21)    | 3 (1.54)            | 1 (0.92)            | 0 (0.00)          | 0 (0.00)          | 0 (0.00)           | 1 (5.26)          | 0.5513  |
| Teeth clenching                               | 75 (18.12)  | 32 (16.41)          | 18 (16.51)          | 6 (26.09)         | 0 (0.00)          | 16 (29.09)         | 3 (15.79)         | 0.1104  |
| Teeth grinding                                | 86 (20.77)  | 41 (21.03)          | 22 (20.18)          | 3 (13.04)         | 3 (23.08)         | 13 (23.64)         | 4 (21.05)         | 0.9466  |
| Unilateral chewing                            | 188 (45.41) | 84 (43.08)          | 50 (45.87)          | 12 (52.17)        | 6 (46.15)         | 28 (50.91)         | 8 (42.11)         | 0.8989  |
| Gum chewing                                   | 72 (17.39)  | 47 (24.10)          | 13 (11.93)          | 3 (13.04)         | 0 (0.00)          | 6 (10.91)          | 3 (15.79)         | 0.0228* |
| Resting the cheek on one's hand               | 259 (62.56) | 126 (64.62)         | 72 (66.06)          | 10 (43.48)        | 9 (69.23)         | 35 (63.64)         | 7 (36.84)         | 0.0715  |
| Biting lips, cheeks, nails, or pencils        | 157 (37.92) | 80 (41.03)          | 36 (33.03)          | 5 (21.74)         | 5 (38.46)         | 22 (40.00)         | 9 (47.37)         | 0.3817  |
| Insomnia                                      | 178 (43.10) | 88 (45.13)          | 45 (41.28)          | 9 (39.13)         | 5 (38.46)         | 24 (43.64)         | 7 (36.84)         | 0.9589  |

TMD, temporomandibular disorder; S, social; A, artistic; I, investigative; R, realistic; C, conventional; E, enterprising.

Values are presented as number (%).

p-values were completed by chi-square test.

\*p<0.05.

subjects who responded that they had at least one TMD symptom was significantly higher in the group with high score ( $\geq 60$ ) than in the group with low score ( $\leq 39$ ) ( $p < 0.05$ ). The significantly higher percentage of subjects in the group with high score ( $\geq 60$ ) than with low score ( $\leq 39$ ) reported at least one contributing factor for TMD ( $p < 0.001$ ).

The mean scale of the number of symptoms to which subjects answered positively among 10 items (from item number 1 to item number 10) indicating TMD symptoms on the questionnaire (Appendix 1) was  $2.33 \pm 2.51$ . The mean scale of the number of factors to which subjects responded positively among 8 items (from item number 11 to item number 18) related to contributing factors for TMD was  $2.46 \pm 1.64$ . Mean scales of the number of positive answers of TMD symptoms were significantly higher in the group with high score ( $\geq 60$ ) than in the group with low score ( $\leq 39$ ) ( $p < 0.01$ ). Subjects with high score ( $\geq 60$ ) exhibited significantly higher

mean scales of the number of positive answers of contributing factors for TMD than subjects with low score ( $\leq 39$ ) ( $p < 0.001$ ) (Table 4).

## DISCUSSION

In the current study 68.84% of subjects showed at least one TMD symptom and 83.57% had at least one contributing factor for TMD. This is higher than the respective 41% and 74% reported in a study of young people aged 15-18 in Sweden.<sup>20)</sup> Among two-letter Holland codes in the present study, most was SA (21.01%), followed by AS (18.36%), SC (13.53%), in order, while among one-letter Holland codes, most was S (47.10%), followed by A (26.33%), C (13.29%), I (5.56%), E (4.59%), R (3.14%), in order. Among two-letter Holland codes in a study of university students in Chungcheongnam-do most was SE (13.7%), followed by

**Table 4.** Prevalence and mean scales of positive answers of TMD symptoms and contributing factors for TMD according to the range of the score on emotional instability (n=414)

| TMD symptoms and contributing factors for TMD                   | Subject     | Emotional instability  |                               |                           | p-value                 |
|---|-------------|------------------------|-------------------------------|---------------------------|-------------------------|
|   |             | Low score<br>14 (3.38) | Moderate score<br>270 (65.22) | High score<br>130 (31.40) |                         |
| Subjects with TMD symptoms                                      | 285 (68.84) | 6 (42.86)              | 180 (66.67)                   | 99 (76.15)                | 0.0162 <sup>a,*</sup>   |
| Subjects with contributing factors for TMD                      | 346 (83.57) | 6 (42.86)              | 229 (84.81)                   | 111 (85.38)               | 0.0002 <sup>a,***</sup> |
| Mean scales of positive answers of TMD symptoms                 | 2.33±2.51   | 1.00±1.62              | 2.14±2.37                     | 2.86±2.76                 | 0.0033 <sup>b,**</sup>  |
| Mean scales of positive answers of contributing factors for TMD | 2.46±1.64   | 1.00±1.41              | 2.38±1.59                     | 2.80±1.67                 | 0.0001 <sup>b,***</sup> |

TMD, temporomandibular disorder.

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

Low score, ≤39; Moderate score, 40-59; High score, ≥60.

<sup>a</sup>p-values were completed by chi-square test for prevalence. <sup>b</sup>p-values were completed by one way ANOVA for mean scales.

\*p<0.05, \*\*p<0.01, \*\*\*p<0.001.

SA (11.6%), AS (10.8%), in order, though among one-letter Holland codes, most was S (34.3%), followed by E (23.8%), A (23.5%), C (8.7%), R (6.0%), I (3.7%), in order.<sup>21)</sup>

Occupational preference is an expression of an individual's motivation, personality, knowledge and ability. Occupational behaviours are influenced by the interaction between environment and personality.<sup>22)</sup> According to Holland's theory, both people and environments are categorized into six interest types which correspond to six Holland interest codes: R, I, A, S, E, and C. S code represents traits associated with sociability, femininity, passivity, problem solving by means of feelings rather than thinking and tends to be inclined toward counseling, mentoring, or teaching of others.<sup>23,24)</sup> It was suggested that verbal communication work including consultations and lectures might affect TMD symptoms.<sup>25)</sup> These findings explain the current result that the two-letter Holland codes of which the first-letter was S (SA, SI, SR, SC, SE) had tendency of having the relatively higher prevalence of symptoms and contributing factors for TMD and that gum chewing habit seemed to occur more frequently in S code than other codes.

C code tends to be productive and effective in well-structured tasks and prefers organizational, clerical or computational activities.<sup>23,24)</sup> It was found that TMD was more prevalent among office workers than in the general population.<sup>26)</sup> These findings support the present result that the two-letter Holland codes whose the first-letter was C (CE, CS, CA, CI) appeared to have the relatively higher prevalence of symptoms and contributing factors for TMD. E code tends to be

extroverted and optimistic and inclined to lead others.<sup>24)</sup> It was reported that contributing factors for TMD including teeth clenching and stressful state occurred less frequently in extroverts than introverts.<sup>27)</sup> Clenching activity may be associated with tenderness or fatigue in the jaw muscles.<sup>28)</sup> These findings are supportive of the result that a symptom of frequent fatigue in the jaw tended to occur less frequently in E code than in other codes.

Personality test of Vocational Preference Inventory L form is based on the big-five personality factors which account for the basic structure behind all personality traits. Emotional instability of the big-five personality factors is also called neuroticism and refers to the tendency to experience negative emotions. It is made up of six facets: anxiety, anger, depression, self-consciousness, impulsiveness, and vulnerability to stress. Those who score high on emotional instability are characterized as tense, anxious, and vulnerable to stress, whereas people who score low tend to be even-tempered and emotionally resilient.<sup>11,29)</sup>

In the present result high scorers on emotional instability showed the significantly higher prevalence of TMD symptoms (p<0.05) and contributing factors for TMD (p<0.001) than low scorers. Furthermore, high scorers on emotional instability had significantly higher mean scales of the number of positive answers of TMD symptoms (p<0.01) and of contributing factors for TMD (p<0.001) than low scorers (Table 4). In conclusion, symptoms and contributing factors for TMD were related to emotional instability. These findings are consistent with the previous studies reporting the

association of emotional factors with TMD.<sup>30-33)</sup> To evaluate emotional factors in clinical practice, the Minnesota Multiphasic Personality Inventory,<sup>34)</sup> the Symptom Checklist-90-Revised<sup>35)</sup> and the Social Readjustment Rating Scale<sup>36)</sup> have been used with cost. Vocational Preference Inventory L form is free of charge available. Most high-school and college students use it for the career counsel. Therefore, Vocational Preference Inventory L form might be utilized in assessing emotional factors of students with TMD symptoms without additional time or cost.

## 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 pain in your jaw joint when you opened your mouth wide?  
1) Yes                      2) No
2. Has your jaw ever been caught or locked during certain jaw movements?  
1) Yes                      2) No
3. Have you ever felt pain or discomfort in your jaw during speech or chewing?  
1) Yes                      2) No
4. Do you hear sound in your jaw joint when you open or close your mouth?  
1) Yes                      2) No
5. Do you frequently feel stiffness or fatigue in your jaw?  
1) Yes                      2) No
6. Do you have pain in your ear, temple, or cheek?  
1) Yes                      2) No
7. Do you suffer from frequent headache?  
1) Yes                      2) No
8. Has your jaw ever been stiff or painful when you woke up in the morning?  
1) Yes                      2) No
9. Do you find it uncomfortable to bite your teeth hard together?  
1) Yes                      2) No
10. Have you ever been treated for jaw problem?  
1) Yes                      2) No
11. Have you ever experienced trauma in head, neck, or jaw?  
1) Yes                      2) No
12. Do you habitually clench your teeth?  
1) Yes                      2) No
13. Have you ever ground your teeth during sleep or heard that you were a bruxer?  
1) Yes                      2) No
14. Do you usually chew food only on one side?  
1) Yes                      2) No
15. Do you use chewing gum frequently?  
1) Yes                      2) No
16. Do you habitually rest the cheek on your hand?  
1) Yes                      2) No
17. Are you in the habit of biting lips, cheeks, nails, or pencils?  
1) Yes                      2) No
18. Have you difficulty initiating or maintaining sleep at night or nonrestorative sleep?  
1) Yes                      2) No

Thank you for your cooperation.