

A Study on Student's Academic Stress and Psychological Characteristics Due to the Experience of Pseudo Halitosis

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Abstract

This study of purpose was to compare and analyze college students' academic stress and psychological characteristics according to their experience of pseudo-halitosis, excluding genuine halitosis cases. Data were analyzed using IBM SPSS ver. 25.0 (IBM Co., Armonk, NY, USA), and the Independent t-test was applied according to the experience of pseudo halitosis. The significance level of the statistical test was set to 0.05. As a result, those who had no experience of halitosis had a high awareness of subjective oral health ($p < 0.05$). Those who had experienced pseudo-halitosis scored 117.64 points on academic stress, which was significantly higher than those who had not experienced it ($p < 0.05$). The scores of those who had experienced pseudo-halitosis were significantly higher in depression ($p < 0.05$), anxiety ($p < 0.001$), tension ($p < 0.05$), and hostility ($p < 0.05$). The quantitative distribution of the tongue coating of the participants ($N=41$) was found to be quantitatively higher in participants who had experienced pseudo-halitosis but not statistically significant ($p > 0.05$). Pseudo-halitosis adversely affects stress and psychological factors, and future treatment will require psychological support and encouragement. Along with the tests on stress levels and psychological factors; the characteristics and differences between the genuine halitosis and pseudo-halitosis groups need to be analyzed further.

Keywords: academic stress; bad breath; pseudo halitosis; psychological characteristics; tongue coating.

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Date of Submission :22-08-2020

Introduction

Halitosis is an unpleasant oral malodor caused due to physiological or various pathological factors (Porter et al., 2006), such as tongue coating, poor oral hygiene status, food residue, reduced saliva secretion, xerostomia, dental caries, periodontal diseases, excessive microbial deposition on the tongue, and oral cancer. Pseudo-halitosis has no objective symptoms, unlike genuine halitosis that can be identified by oral examination. It is a case in which an individual feels his/her own oral malodor, that is not perceived by others around him/her (Yaegaki et al., 2000). The mouth serves as a home to millions of species of bacteria that live on various foods. These bacteria feed on proteins, especially compounds that have digested proteins, containing odorous substances. While halitosis is not caused by a single factor, it can be said that volatile sulphur compounds (VSCs), produced by metabolism between intraoral bacteria and tongue coating, are the main culprits (Suzuki et al., 2008). It is difficult to pinpoint the exact cause of halitosis in many of the patients complaining of oral malodor. When affected by halitosis, the problem of oral malodor can act as a daily stressor, resulting in symptoms such as anger, depression, anxiety, and obsessive compulsive disorders (Queiroz et al., 2002). In addition, people who feel their own oral malodor may experience diminished self-confidence or suppressed social interaction, as they believe others have negative opinions of them, which may adversely affect their self-esteem and self-body image (McKeown, 2003). In adolescents, halitosis is closely related to low self-esteem and causes psychological confusion. Its negative perception suppresses social interaction and degrades the quality of life (Rani et al., 2016). The fact that halitosis entails negative attitudes is an important issue to be considered in its prevention and treatment. This study classified healthy college students into the categories of genuine halitosis and pseudo-halitosis. Its purpose was to compare and analyze college students' academic stress and psychological characteristics according to their experience of pseudo-halitosis, excluding genuine halitosis cases. Furthermore, its aim was to examine the quantitative distribution of the tongue coating by investigating college students' intraoral tongue condition.

Materials and Methods

Participants

The study was conducted in December 2019 on healthy college students (22-year-old women) who understood its purpose and method, had no systemic problems, and had not taken any medication in the preceding week. The required sample size was 40 individuals, calculated using G*power 3.1.9.2 (Statistical Power Analyses for Windows and Mac) software. All the participants voluntarily signed the informed consent form prior to participation. The study was

designed to select participants without genuine halitosis. Hence, participants were screened and their halitosis was measured using the Twin Breasor II (iSenLab Inc Gyeonggi-do, Korea) in Figure 1. Twin Breasor II is a system for measuring halitosis by numerically and graphically analyzing both hydrogen sulfide (H₂S) and methyl mercaptan (CH₃SH). The time required for inspection and analysis is 2 minutes and 30 seconds, and the measurement method is presented in Figure 2. By comparing the amounts of these two gas components, it was possible to detect not only the halitosis levels but to also diagnose whether the halitosis was physiologic or pathologic. All subjects were brushed after lunch before measuring, and were measured in order between 3 PM and 5 PM after 2 hours after brushing considering the smell of toothpaste. The results of the halitosis analysis are presented in Figure 3. The genuine halitosis measured by Twin Breasor II revealed normal results; thereby confirming that the students did not have pathologic halitosis. This study was thereafter conducted on 41 of these students, who consented to participate in the study as shown in Table 1.

Table 1: The effect of pseudo-halitosis experience on oral health behavior (Mean±SD)

	N	Mean±SD
H ₂ S	41	7.37±20.15
CH ₃ SH	41	0.83± 1.36



Figure 1: Twin Breasor II (iSenLab Inc, Gyeonggi-do)

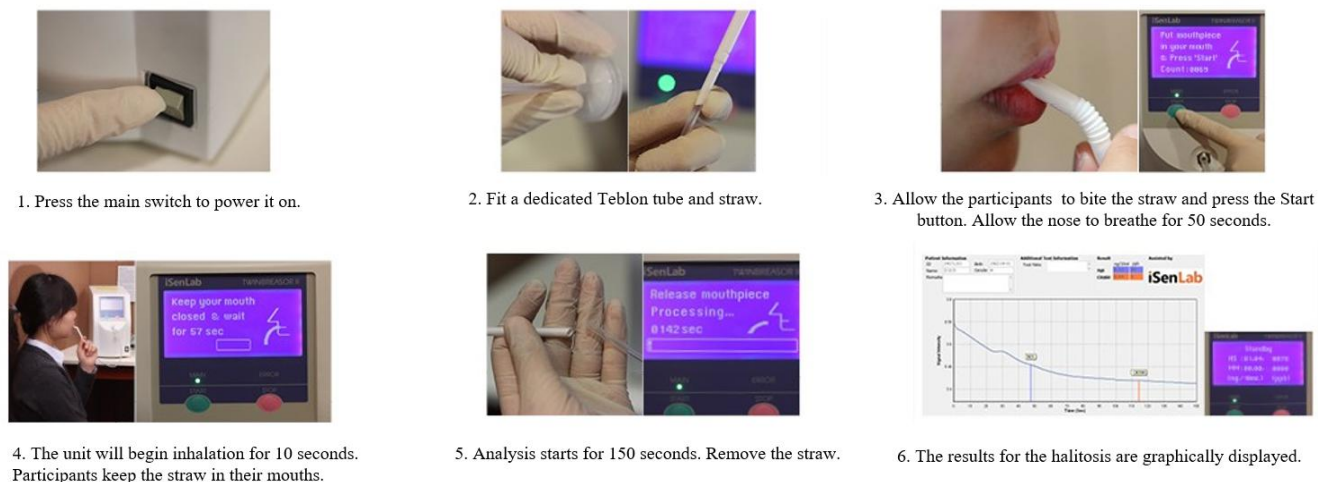


Figure 2: Twin Breasor II 's inspection procedure

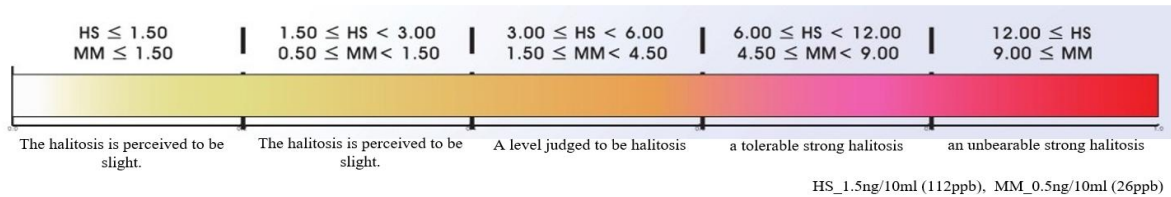


Figure 3:Twin Breasor II 's halitosis analysis results (Tonzetich, Ng, 1976)

Experience of pseudo-halitosis

Based on their response to the question, “Have you experienced unpleasant bad breath in the last year?” the participants were divided into “Experienced” and “Without experience”.

Oral health behavior

The perception of subjective oral health is rated on the Likert 5-point scale, and the higher the score, the higher the perception. We checked the number of tooth brushing during the day and after lunch that could affect halitosis. In addition, the frequency of the interdental cleaning and the tongue cleaning was checked.

Academic stress

In addition, the frequency of the interdental cleaning and the tongue cleaning was checked. The academic stress scale was modified and supplemented for use. A total of 42 questions were graded on a 5-point Likert scale, with higher scores indicating higher academic stress levels(Oh et al.,1994).

Psychological factors

To measure the college students' psychological condition, the survey used questions with comprehensive psychological response indicators. The items used were depression (3 items), anxiety (2 items), tension (2 items), and hostility (4 items) (Park et al., 2016).

Q-raycampro and TB01 1.05

Q-raycampro is a dental diagnostic test device made by AIOBIO (Seoul, Korea) to detect red fluorescence generated from a metabolite called porphyrins that is secreted by intraoral bacteria. Plaques that have remained for a longer period show clearer red fluorescence (Kim, 2011), and thus serve as effective visual aids during patients' training. Q-raycam pro was used to locate the participants' tongues in the extraoral position and to acquire images for quantitative distribution of tongue coatings in separate sections in Figure 4. The tongue's loaded image was quantitatively analyzed for the amount of tongue coating in six separate sections using TB01 1.05 in Figure 5.

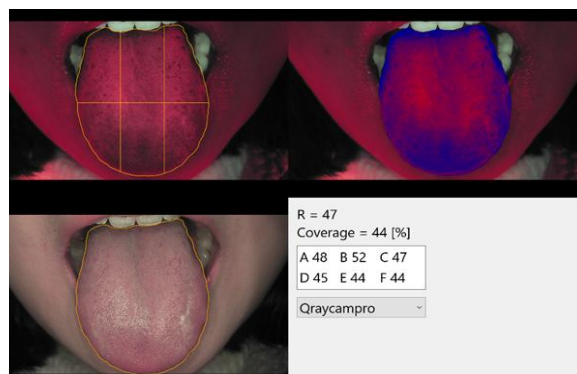


Figure 4: Q-raycampro (AIOBIO, Seoul, Korea) Figure 5: TB01 1.05 (Analyzer program)

Statistical Analysis

Data were analyzed using IBM SPSS ver. 25.0 (IBM Co., Armonk, NY, USA), Oral health behaviors, academic stress, and psychological health were compared by independent T-test according to the group with and without experience of pseudo halitosis. The significance level of the statistical test was set to 0.05.

Results and Discussion

Those who had no experience of halitosis had a high awareness of subjective oral health ($p < 0.05$). Although not statistically significant, the frequency of daily brushing, brushing after lunch, and interdental cleaning was higher in those who had no halitosis experience, while the tongue cleaning frequency was higher in those who had experienced halitosis in Table 2.

Table 2: The effect of experiencing pseudo-halitosis on oral health behavior (Mean±SD)

Variables	Pseudo halitosis experience within one year		t	p
	Inexperienced (N=30)	Experienced (N=11)		
Subjective oral health	2.93 ± 0.74	2.36 ± 0.68	2.234	0.031*
Daily brushing frequency	2.87 ± 0.63	2.73 ± 0.65	0.624	0.536
Frequency of brushing after lunch	3.00 ± 0.79	2.82 ± 0.75	0.663	0.511
Interdental cleaning	2.03 ± 0.67	1.82 ± 0.75	0.884	0.382
Tongue cleaning	2.97 ± 0.18	3.00 ± 0.00	-0.601	0.552

*By independent t-test, $p < 0.05$

Those who had experienced pseudo-halitosis scored 117.64 points on academic stress, which was significantly higher than those who had not experienced it in Table 3 ($p < 0.05$).

Table 3: The effect of experiencing pseudo-halitosis on academic stress

	Pseudo halitosis experience	N	Mean±SD	t	p
Academic stress	Experienced	11	117.64±16.82	-2.232	0.031*
	Inexperienced	30	103.80±17.84		

*By independent t-test, $p < 0.05$

The scores of those who had experienced pseudo-halitosis were significantly higher in depression ($p < 0.05$), anxiety ($p < 0.001$), tension ($p < 0.05$), and hostility in Table 4 ($p < 0.05$).

Table 4: The effect of experiencing pseudo-halitosis on psychological health

Psychological	Pseudo halitosis experience	N	Mean±SD	t	p
Depression	Experienced	11	7.55±2.12	-2.161	0.031*
	Inexperienced	30	6.03±1.94		
Anxiety	Experienced	11	5.73±1.42	-3.800	0.000**
	Inexperienced	30	3.77±1.48		
Tension	Experienced	11	4.73±1.95	-2.607	0.013*
	Inexperienced	30	3.40±1.22		
Hostility	Experienced	11	6.82±3.22	-2.206	0.033*
	Inexperienced	30	5.13±1.66		

*By independent t-test, * $p < 0.05$, ** $p < 0.001$

The quantitative distribution of the tongue coating of the participants (N=41) was done using Q-raycam pro (AIOBIO, Seoul, Korea) as shown in Figure 6. It was found to be quantitatively higher in participants who had experienced pseudo-halitosis but not statistically significant ($p > 0.05$). Mainly, the posterior part of the tongue was more coated than the anterior part. The largest and the least distributions of tongue coating were shown in sections B and F, respectively.

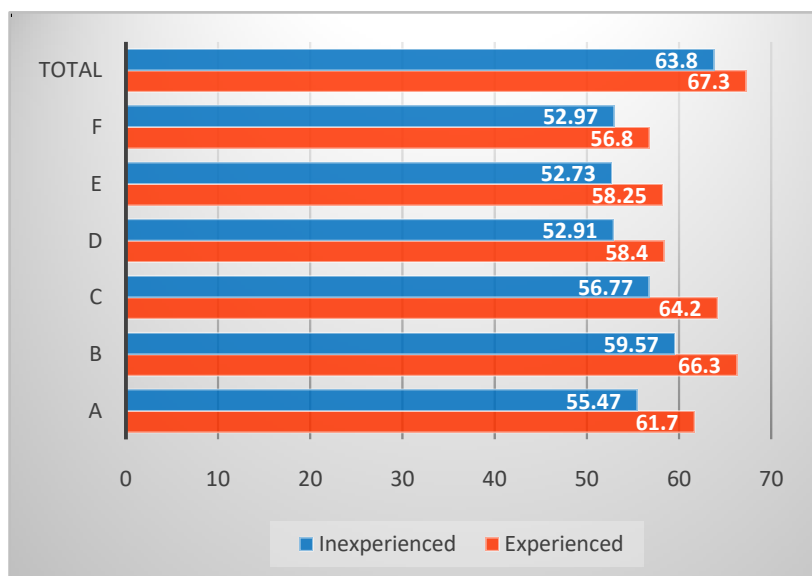
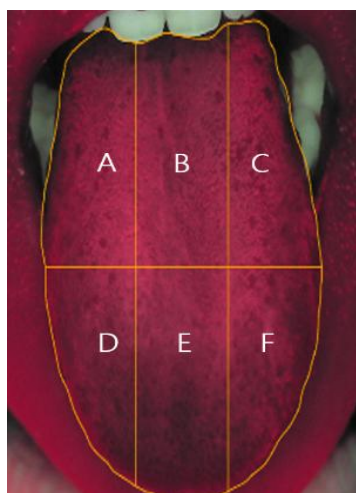


Figure 6: Quantitative distribution of the tongue coating using Q-raycampro(AIOBIO, Seoul, Korea)

Intraoral bacteria feed on proteins, especially chemical compounds that have digested proteins, including odorous substances. VSCs are the main elements of oral malodor and their foul odor is produced by the metabolism of bacterium, which are the main culprits (Singh et al., 2015; Hu et al., 2007) Factors related to taste and smell could potentially be related to the development of oral odor (Falcao et al., 2012). Among various types of intraoral microorganisms, the most

representative microbes involved in the development of halitosis are Gram-negative anaerobes that break down proteins and amino acids. Gram-negative bacteria make up most of the constituents of subgingival and supragingival plaques, and tongue coatings associated with intraoral periodontal diseases (Hu et al., 2007). This study excluded genuine halitosis patients and investigated college students with pseudo-halitosis. Twin Breasor II was used to screen participants who genuinely had halitosis and their halitosis was measured by numerically and graphically analyzing hydrogen sulfide (H_2S) and methyl mercaptan (CH_3SH), respectively. In this study, participants with no experience of halitosis had a high level of awareness on subjective oral health ($p < 0.05$). Although not statistically significant, the frequency of: daily brushing, brushing after lunch, and interdental cleaning were higher in those who had no halitosis experience, while tongue cleaning frequency was higher in those with halitosis experience. Those without self-perceived oral malodor might have been performing disciplined oral care, which is believed to have led to their high awareness on oral health. On examining the academic stress of students according to their experience of pseudo-halitosis, it was found that those with pseudo-halitosis experience had significantly higher academic stress with 117.64 points ($p < 0.05$). In addition, depression ($p < 0.05$), anxiety ($p < 0.001$), tension ($p < 0.05$), and hostility ($p < 0.05$) were significantly higher in those with a pseudo-halitosis experience, which was similar to findings of other researchers. Halitosis is a frustrating condition that can lead to significant discomfort, negative social and psychological effects, including suppression of social interaction and diminution of self-confidence (Azodo et al., 2019). It appears that psychological factors, such as anxiety, depression, and stress (Wang et al., 2018). The visual evaluation method of tongue coating includes estimation of the total bacteria count on the tongue surface (Shimizu et al., 2007). However, it is difficult to rule out the observer's subjective biases and prejudices in this type of visual inspection, thus making it difficult to obtain objective and reproducible results in the tongue coating evaluation. Under UV light, the tongue's dorsum appears red or orange due to the fluorescence generated during the porphyrins metabolism of intraoral microorganisms (Kim, 2011). Porphyrins are produced in the breakdown of hemoglobin by bacteria, and intraoral microbes exhibit various fluorescence phenomena, including porphyrins metabolism (Choi et al., 2012). Q-raycam used in this study displayed more prominent red fluorescence for plaque that had remained longer (Kim, 2011) which was effective in motivating patients to pursue oral healthcare education. In particular, the photographs of the tongue helped in explaining the status and importance of taking care of tongue coating. The major sites where bacteria break down food residues and saliva-derived proteins, are at the posterior part of the tongue, and the large part of the tongue provides a unique environment of tongue coating due to the

accumulation of oral residue and microorganisms. This is a direct cause of bacteria in the tongue and halitosis (Jung et al., 2008). Tongue coating is the major cause of halitosis in young people (Miyazaki et al., 1995), while periodontitis and reduced saliva secretion are the major causes of tongue coating that is used as a measure of oral hygiene care (Ishikawa et al., 2008). The tongue coating distribution was quantitatively higher in participants with a pseudo-halitosis experience, but the difference was not statistically significant ($p > 0.05$). Mainly, the posterior part of the tongue was more coated than the anterior part. The largest distribution of tongue coatings was in section B, while the least distribution was shown in section F. It is necessary to provide a variety of ways to reduce oral malodor, as well as to develop new products for significantly reducing intraoral VSC levels, in addition to the chewing gum or candies that can quickly remove the malodor when it is a case of pseudo-halitosis. Moreover, it will be necessary to develop a program that would help to manage the tongue coating through tongue image acquisition.

Conclusion

The above findings indicate that although the halitosis measurement results were normal, yet when subjects experienced halitosis symptoms, it had a negative impact on their academic stress and psychological health. Pseudo-halitosis adversely affects stress and psychological factors, and future treatment will require psychological support and encouragement. Along with the tests on stress levels and psychological factors; the characteristics and differences between the genuine halitosis and pseudo-halitosis groups need to be analyzed further.

Acknowledgment

We thank for material support of AIOBIO Co., Ltd.

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