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Gagging and its associations with dental care–related fear, fear of pain and beliefs about treatment

Cameron L. Randall, MS; Grant P. Shulman, BS; Richard J. Crout, DMD, MS, PhD; Daniel W. McNeil, PhD

Gagging is thought to be a relatively common oral health issue.¹ Gagging is a behavioral response, and it is based on an innate biological mechanism (that is, the pharyngeal reflex) that prevents choking.² Although the response can be provoked in virtually all humans, the level and type of stimulation necessary to evoke gagging behavior varies across people.³ If stimulation is prolonged or severe, gagging may lead to vomiting.¹ In addition to tactile stimulation in the oral cavity, gagging also can be induced by visual, auditory or olfactory stimuli.⁴ Although gagging can be elicited reflexively, the type of gagging that often is encountered by dental professionals probably can be viewed most accurately as a behavioral response (that is, an action that is the product, at least in part, of psychological variables).^{5,6} This behavioral response can be induced by stimulating only the anterior parts of the oral cavity, suggesting that conditioning (that is, behavioral learning) and other psychological factors are an important part of the etiology of frequent or overactive

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ABSTRACT

Background. Gagging is a behavioral response that interferes with oral health care and may be related to dental care–related fear. Little is known, however, about the epidemiology of gagging during dental treatment.

Methods. To explore this phenomenon, the authors recruited participants from the waiting area of an oral diagnosis clinic. Participants completed a gagging behavior questionnaire, the Dental Fear Survey, the Fear of Pain Questionnaire—9, the Revised Dental Beliefs Survey and a demographics questionnaire.

Results. Almost one-half of the 478 participants reported gagging on at least one occasion during dental visits, and 7.5 percent of participants reported almost always or always gagging. With higher frequency of problems with gagging, patients were more likely to have greater levels of dental care–related fear, fear of pain and more negative beliefs about dental professionals and dental treatment. Furthermore, participants who gagged more readily had greater dental care–related fear than did participants who had less of a propensity to gag.

Conclusions. Gagging in the dental office is a prevalent problem, and dental care–related fear and fear of pain are associated with more frequent gagging.

Practical Implications. Given the prevalence of patients reporting problems with gagging, it may be helpful for providers to assess patients' propensity for gagging, which can be a barrier to treatment. By targeting dental care–related fear, fear of pain and negative beliefs about dental care in patients who often gag when receiving dental care, clinicians may be able to help reduce gagging in frequency or intensity, potentially making treatment more comfortable for patients and easier for dental care providers.

Key Words. Pharyngeal reflex; gagging; dental care–related fear and anxiety; pain; behavioral sciences.

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gagging.⁷ Gagging, especially when it occurs frequently, can be problematic for some people in the context of receiving dental care. However, there are a limited number of studies that specifically have addressed the extent to which gagging interferes with treatment.

For oral health care professionals and their patients, gagging episodes may interrupt dental procedures, and if these episodes are severe or frequent, they may even lead to postponement of dental care.¹ Patients who frequently gag can be difficult to treat and may require special care or extra time for procedures. Although it remains unknown why some patients gag and others do not, there are plausible explanations for the variation across patients. Many patients will gag if they receive sufficient stimulation of the posterior pharynx (and glossopharyngeal nerve), which is uncommon in routine dental care. Other patients with gagging difficulties, however, will gag owing to sights, sounds and odors that do not involve stimulation of any of the classic anatomical areas commonly associated with triggering a gag reflex. It is likely that variation among patients in the frequency of gagging during dental care is the result of individual differences in psychological variables. Dental care-related fear is one of those variables and warrants special consideration.

Many people experience some level of dental care-related fear. Forty-five percent of adult dental patients in the United States have reported having at least moderate fears about receiving dental treatment.⁸ Thus, dental care-related fear and anxiety are common problems that most dental professionals frequently encounter. The literature suggests that many patients with dental care-related fear and anxiety seek dental care only when orofacial pain is unbearable instead of seeking preventive dental care.⁹ Fear about pain and negative beliefs about dental treatment and dental professionals, both of which are associated with dental care-related fear and anxiety, also contribute to the underuse of dental care.^{10,11} Between 5 and 10 percent of people in the United States avoid going to the dentist because of their anxiety and fear.¹² This behavior has crucial public health importance, which was reflected in the surgeon general's report on oral health that emphasized the impossibility of having good overall health without having good oral health.¹³ People who avoid dental treatment may be at greater risk of having associated problems such as cardiovascular disease and diabetes, as well as other oral and systemic health conditions.¹⁴

Gagging is relevant in all aspects of dental treatment, although little research exists regarding the etiology and epidemiologic aspects of the phenomenon. We conducted a study to examine the frequency and severity of gagging related to oral health care. In addition, our primary research question was whether there was a relation between gagging and dental care-related fears and beliefs. Given the possible relation between fear of dental

care and gagging, we hypothesized that dental patients who experienced problems with gagging during treatment would report higher levels of dental care-related fear, greater fear regarding pain and more negative beliefs about dental professionals and dental treatment than would patients who did not gag or who gagged less frequently.

METHODS

Procedure. We recruited participants from the waiting area of the oral diagnosis clinic at the School of Dentistry at West Virginia University, Morgantown. Most of these patients sought care for a dental emergency (some of them in clinically significant pain and others not), and the remaining patients were there for new patient screenings. After being approached by a research assistant, volunteering and providing informed consent, these patients answered demographic questions (that is, sex, age, race or ethnicity) and completed a gagging behavior questionnaire, the Dental Fear Survey (DFS), the Fear of Pain Questionnaire—9 (FPQ-9) and the Revised Dental Beliefs Survey (RDBS) before their dental examinations in that order. On completing the battery of questionnaires, participants received \$5 as compensation for their time. We collected data with the understanding and written consent of each participant in accordance with the Declaration of Helsinki¹⁵ and with approval from the West Virginia University Institutional Review Board. We maintained participant anonymity during data collection and analysis.

Measures. Gagging behavior questionnaire. We asked participants questions about their gagging behavior by using a gagging behavior questionnaire, a measure we designed for this study. The questionnaire is provided in the appendix, which can be found in the supplemental data to the online version of this article (found at <http://jada.ada.org/content/145/5/452/suppl/DC1>). Other than for those items prompting for specific examples of triggers, participants responded by using a five-point rating scale that included the following options: “never,” “rarely,” “sometimes,” “frequently” and “almost always or always.” Initially, we assigned participants to one of three groups on the basis of their responses to the gagging questionnaire item related to frequency of gagging during dental treatment. We classified participants who indicated “almost always or always” gagging during dental treatment as having a high frequency of gagging in the clinic. We classified those who indicated “sometimes” or “frequently” gagging during dental treatment as having a moderate frequency of gagging in the clinic. Finally, we classified participants who indicated “never” or “rarely” gagging during dental treatment as having a minimal

ABBREVIATION KEY. DFS: Dental Fear Survey. FPQ-9: Fear of Pain Questionnaire—9. RDBS: Revised Dental Beliefs Survey.

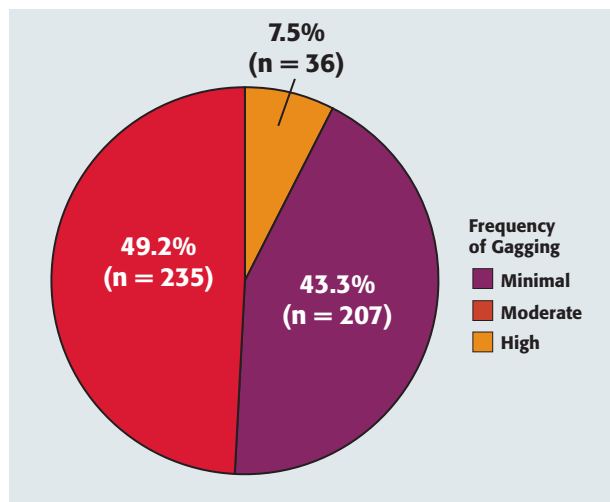


Figure 1. Percentages of participants with minimal, moderate and high frequency of gagging (N = 478).

frequency of gagging in the clinic. We used responses to the other items on the gagging behavior questionnaire to assess additional aspects of gagging.

DFS. The DFS is a 20-item self-report measurement tool used to assess fear of specific dental care-related stimuli.¹⁶ The DFS has a five-point rating scale, in which 1 represents “no reaction or fear” and 5 represents “great fear or reaction.” The results of a factor analysis have revealed that there are three categories of dental care-related fear that can be assessed by using this instrument: dental avoidance and anticipatory anxiety (for example, fear of receiving dental care has caused the patient to put off making an appointment), fear of specific dental stimuli or procedures (for example, feeling the needle being injected, being seated in the dental chair) and physiological arousal associated with dental treatment (for example, breathing rate increases, heart beats faster).¹³ A total score can be calculated, with possible scores ranging from 20 through 100. Higher scores indicate greater levels of dental care-related fear. The DFS has high internal consistency and test-retest reliability (r , 0.74), is highly correlated with another validated and widely-used measure of dental care-related fear (r , 0.92) and has been translated from English into numerous languages.¹⁷⁻¹⁹

FPQ-9. The FPQ-9 is a nine-item self-report measurement tool used to assess fear of potentially painful experiences across three subscales: fear of severe pain, fear of minor pain and fear of medical or dental pain.²⁰ The FPQ-9 has a five-point rating scale, with possible scores ranging from three to 15 per subscale and total scores ranging from nine to 45. Higher scores indicate greater levels of fear of pain. Versions of the Fear of Pain Questionnaire have exhibited high internal consistency in the standardization sample (Cronbach α , 0.92), as well as test-retest reliability (r , 0.72).²⁰

RDBS. The RDBS is a 28-item self-report measure-

ment tool used to assess participants’ perceptions of dentistry and dental care professionals.²¹ The RDBS comprises three subscales: professionalism, communication and lack of control. Items have a five-point rating scale, and total possible scores range from 28 to 140. Higher scores indicate negative views toward dentists and dental care in general. The RDBS has high internal consistency (Cronbach α , 0.95) and test-retest reliability (r , 0.88).^{22,23}

Statistical analyses. After assigning participants to one of three gagging frequency groups, we analyzed demographic variables across the groups by means of one-way analysis of variance (ANOVA). We used multivariate analysis of covariance (MANCOVA) to address the primary research question and three specific hypotheses that frequency of gagging during dental procedures is associated with higher levels of dental care-related fear (DFS total score), greater fear of pain (FPQ-9 total score) and more negative beliefs about dental professionals and dental treatment (RDBS total score). The independent variable was gagging group (that is, high, moderate or minimal frequency of gagging). Given that sex and age have well-established associations with dental care-related fear, we entered them into the analysis as covariates.²⁴ We conducted follow-up ANOVAs and Scheffé post hoc tests to determine where there were significant between-group differences.

RESULTS

We enrolled 478 participants in our study, 258 of whom were women. The participants’ demographics were consistent with those of the population of West Virginia (92.4 percent white, 4.7 percent African American, 0.9 percent Asian, 0.7 percent Hispanic, 0.7 percent Native American and 0.6 percent “other”).²⁵ The median age of participants was 33.0 years (range, 18-90 years; mean [standard deviation {SD}], 36.4 [14.8] years), and the median level of education was 12 years (range, 6-25; mean [SD], 12.6 [2.5] years).

Figure 1 shows the distribution of participants among the frequency of gagging groups. Notably, and unlike for dental care-related fear, we found no sex, age or education differences for prevalence of gagging in the dental clinic.

When we performed MANCOVA, we found that the dependent variables in combination with one another were affected significantly by gagging group (Wilks λ , 0.87; $F_{6,942}$, 11.15; $P < .001$; partial eta squared, 0.066).

The results of follow-up ANOVAs revealed that there were significant differences in DFS, FPQ-9 and RDBS scores across the gagging groups. The table shows the results of these analyses. Scheffé post hoc test results revealed that significant differences in DFS and RDBS scores existed between participants in all three gagging groups ($P < .05$ for all between-group comparisons). Patients who had minimal frequency of gagging reported less dental care-related fear and fewer negative beliefs

about dental professionals and dental treatment than did patients who had moderate or high frequency of gagging. Similarly, patients who had moderate frequency of gagging reported less dental care–related fear and fewer negative beliefs about dental professionals and dental treatment than did patients who had a high frequency of gagging in the dental clinic. Scheffe post hoc test results also revealed that significant differences in FPQ-9 scores existed between participants who reported minimal frequency of gagging and those who reported high frequency of gagging ($P < .001$) and between participants who reported moderate frequency of gagging and participants who reported high frequency of gagging ($P = .006$). Patients who had minimal or moderate frequency of gagging reported lower levels of fear of pain than did those with a high frequency of gagging in the dental clinic. Patients with minimal frequency of gagging did not have FPQ-9 scores significantly different from those with moderate frequency of gagging ($P = .37$).

Figure 2 shows the triggers that participants reported as inducing gagging during dental visits, according to frequency of gagging. Among participants who indicated any problems with gagging at dental visits, those who reported gagging during dental treatment resulting from less-intrusive stimuli (that is, fingers in the mouth) reported greater levels of dental care–related fear, as measured by means of the DFS (mean [SD], 51.3 [20.2]), than did participants who reported gagging resulting from other stimuli, such as such as dental instruments or bitewing radiograph film or sensor holders (mean [SD], 46.2 [18.2]; t test [df] [t_{290}], 2.23; $P < .05$). Gagging in the dental clinic was associated positively with gagging in other contexts (r , 0.38; $P < .001$).

DISCUSSION

Gagging is a prevalent, intrusive concern in dental care. There are no observed effects of sex, age or level of education on problems with gagging, which suggests it is generalized across socioeconomic and other demographic strata. It would be helpful for dental professionals to

monitor whether a patient has problems with gagging because the experience could be a source of discomfort and could lead to avoidance of care, especially for fearful patients. Our study results show that gagging is associated with dental care–related fear, fear of pain and negative perceptions of oral health care professionals and dental treatment, which supports our hypotheses. Other researchers who focused exclusively on patients who had problems with gagging found a high degree of dental fear in such patients as a whole but not differentiated across gagging severity levels.⁶

The results from our study highlight an important problem in dental care, but they cannot be used to elucidate the mechanisms involved. It may be that dental care–related fear causes more frequent gagging in the dental office, that frequent gagging causes apprehension and leads to the development of dental care–related fear or, more likely, that a feedback cycle exists wherein fear results in more frequent gagging that reinforces and perpetuates the fear. The types of data collected for the purposes of our study do not allow such a mechanistic

TABLE

QUESTIONNAIRE	FREQUENCY OF GAGGING SCORE, MEAN* (STANDARD DEVIATION)			F RATIO	P VALUE	EFFECT SIZE, PARTIAL ETA SQUARED
	Minimal	Moderate	High			
	Dental Fear Survey	37.4 (17.1) ^a	45.9 (18.5) ^b			
Fear of Pain Questionnaire–9	21.4 (7.4) ^a	22.6 (7.3) ^a	27.6 (7.5) ^b	$F_{2,478} = 9.8$	< .001	.04
Revised Dental Beliefs Survey	45.1 (18.5) ^a	53.0 (21.6) ^b	69.4 (28.5) ^c	$F_{2,478} = 21.3$	< .001	.08

* Means in each row that do not share a common superscript differ significantly on Scheffé post hoc tests at the .05 level.

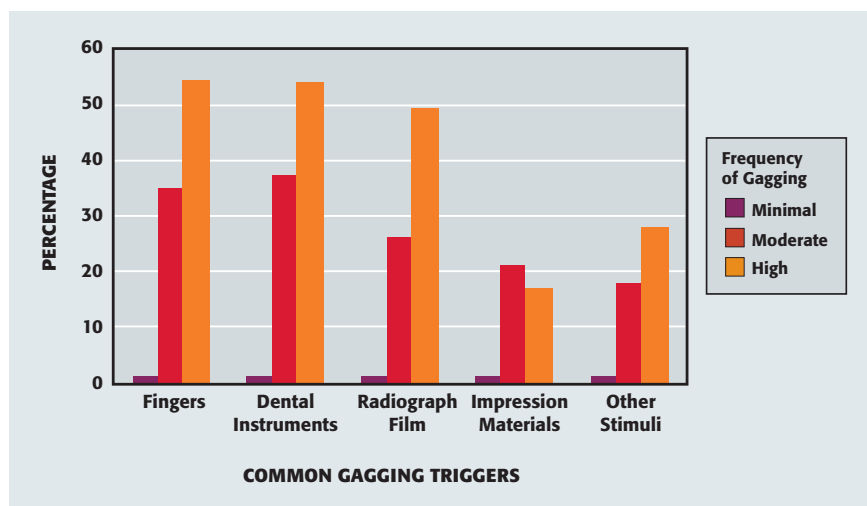


Figure 2. Percentage of participants reporting gagging stimulated by common triggers, according to frequency of gagging.

model to be tested. Regardless of the true cause-and-effect relation between fear and gagging, we believe an association between fear and gagging likely exists as a result of operant, classical and other conditioning.

Although reflexive in part, gagging is modifiable by means of chairside and other behavioral interventions that dentists and oral health care team members can use.¹ A number of these treatments may be relevant to dental professionals who routinely obtain bitewing radiographs and impressions and place dental instruments in their patients' mouths, because as we found in our study, these procedures are associated with a greater prevalence of problems with gagging. One commonly used strategy for dealing with gagging in the dental office is to encourage patients to learn slow, rhythmic breathing.¹² Another strategy dentists have reported anecdotally is to have patients breathe through the nose before the behavioral response is triggered. Before starting procedures in patients who have problems with gagging, a clinician can teach and help patients practice slow, rhythmic breathing; nose breathing; or both, demonstrating that the technique works by encouraging patients to put their

atically confronting a hierarchy of fears and gagging triggers, systematic desensitization can shape the patient's response and help him or her cope with stress and remain relaxed while experiencing increasingly aversive stimuli.²⁶ There are straightforward ways (for example, practicing by gradually moving the bitewing radiograph apparatus from the anterior part of the oral cavity to the posterior part) to help patients who frequently experience gagging become desensitized by using a similar behavioral approach.⁹

Techniques such as placing salt on the tongue, acupuncture and hypnosis have been used in the treatment of frequent gagging.^{27,28} Whether these strategies truly are efficacious and effective is unknown. However, one of the mechanisms involved likely is distraction (which is a behavioral approach) of the patient for long enough to complete treatment. Such techniques do not eliminate the problem entirely.⁹ Anecdotally, other distraction methods include having the patient raise his or her legs and counting up or down from 100. The use of distraction techniques, including those that involve audiovisual equipment, has demonstrated success in reducing fear,

If gagging is an immediate problem that is delaying or preventing treatment, special care must be provided because a high level of dental care-related fear may be present.

fingers or a dental instrument into their mouths during the practice. Reminding and encouraging patients to use such breathing before and during the procedure may be critical. Encouraging pediatric patients who have problems with gagging to wiggle their toes during procedures also can be effective. This method provides distraction and may provide an outlet for physiological arousal that can serve to decrease gagging behavior. Patients who manage their own gagging and can complete treatment subsequently may experience lower levels of fear during procedures and may develop more positive beliefs about dentistry.

Not all patients, particularly highly fearful ones, can benefit from using a nose-breathing strategy to eliminate problematic gagging behavior. Extremely high levels of fear may hinder a patient's ability to attend to the task. Behavior therapies such as relaxation training, distraction and systematic desensitization are used to replace the association of dental contexts and fear (learned by means of conditioning) with the gagging response¹ via extinction learning. In the process of extinction learning, patients no longer experience negative reactions or consequences (for example, gagging and fear) in response to dental stimuli. Instead, they learn action-outcome and stimulus-response relations (for example, being still and holding the teeth together during bitewing radiography, which yields a viable radiographic image and praise from the technician). In addition, by identifying and system-

anxiety and pain in the dental office and may be useful for some patients in addressing problems with gagging that are associated with dental care-related fear.²⁹

More comprehensive behavioral techniques, which seek to eliminate the association between two stimuli (for example, dental care and gagging), may be more appropriate for patients who desire longer-lasting reduction of dental care-related fear and associated problems with frequent gagging. A psychologist, other behavioral specialist or dentist with the proper education could treat a patient's problem with frequent gagging by using these techniques. Behavioral therapies that target a gagging response theoretically are promising, although they are not yet well studied and their efficacy and effectiveness in reducing the gag response and improving dental treatment-seeking behavior should be assessed in randomized clinical trials. If gagging is an immediate problem that is delaying or preventing treatment, special care must be provided because a high level of dental care-related fear may be present. Investigators have published reviews and empirical studies regarding the many techniques available that can be used to manage gagging problems in dentistry.^{1,6,30} Future studies should address which of these techniques is most effective for reducing problems with gagging and whether certain methods are most appropriate for different severities of gagging.

In assessing the severity of gagging, the retrospective design of our study presented a unique limitation.

We asked participants to recall their experiences with gagging episodes. However, long-term memory becomes increasingly fallible as the time from the event increases.³¹ As a result, the participants may have recalled more or less gagging than they actually experienced. Fearful people also may be more likely to report a greater predisposition to gagging without actually being more likely to gag in the dental setting. Thus, the self-report of gagging reflects the patient's unique vantage point, but the accuracy of the data may be limited. Measures of the severity of the pharyngeal reflex, such as the Classification of Gagging Problem index⁶ or the Gagging Problem Assessment,³² may be good tools to use for clinician-rated assessment. Such approaches also are valuable in that they rely on observation of overt behavior. Nevertheless, our reliance on patient self-report of the frequency of gagging also is a strength—patients' perceptions of their problems with gagging are important because this understanding likely informs and perpetuates their fears and beliefs about dental care.

Another limitation is that we collected study data in a single dental school clinic primarily from patients who were seeking emergency care. These people are not fully representative of all dental patients, particularly those who receive preventive dental care. To improve the generalizability of the research results, future samples should include patients from multiple dental offices that serve different populations. Further research also should examine the relationship between overactive gagging and cognitive vulnerabilities, which have been shown to be associated with dental care–related fear.²⁴

CONCLUSIONS

We found that greater levels of dental care–related fear and fear of pain are related to higher frequency of gagging problems during dental treatment across socio-demographic groups. This finding has broad implications for dental professionals working across specialty areas. The results of this study are another step in determining the critical correlates of and potential treatment targets for overactive gagging, a behavioral response that is more than a pharyngeal reflex. Given the prevalence of problematic frequent gagging, investigators in future studies should examine the mechanisms of how this barrier to treatment develops and is maintained, while considering variables such as dental care–related fear, fear of pain and negative beliefs about dental professionals and dental treatment, as well as cognitive vulnerabilities and previous experiences with dental treatment. ■

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