



EARN
3 CE
CREDITS

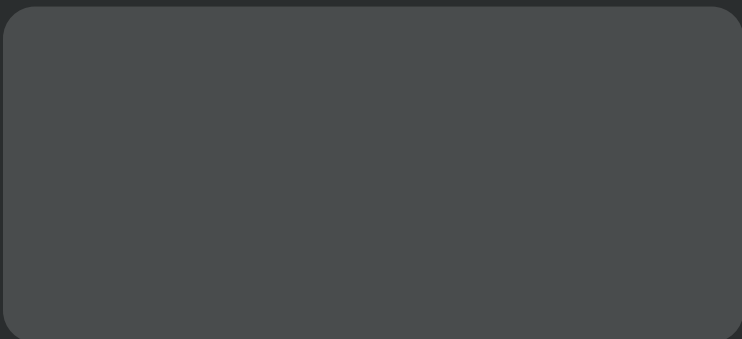
This course was written for dentists, dental hygienists, and dental assistants.



479575576 © wxin | gettyimages.com

Oral and systemic effects of breathing patterns: Nasal breathing vs. mouth breathing

A peer-reviewed article written by JanaLee R. Gustafson, RDH; Suzette Foster, BA, RDH; Kandice Swarthout, MS, RDH, LPC



PUBLICATION DATE: SEPTEMBER 2022

EXPIRATION DATE: AUGUST 2025



SUPPLEMENT TO
ENDEAVOR PUBLICATIONS

EARN
3 CE
CREDITS

Oral and systemic effects of breathing patterns: Nasal breathing vs. mouth breathing

Educational objectives

1. Examine peer-reviewed studies regarding the implications of both nasal and mouth breathing
2. Evaluate the quality of evidence provided
3. Determine why nasal breathing is favored over mouth breathing in support of overall and oral health

Abstract

A growing body of evidence demonstrates that nasal breathing provides clear health advantages over mouth breathing. Nasal breathing delivers warm, filtered air to the body and serves as the first line of defense against pathogenic invasion by bacteria and viruses in the air. It provides positive effects of bronchodilation and vasodilation and increases beneficial nitric oxide production through the paranasal sinuses. Moreover, recent studies that have examined mouth breathing have determined dysfunctional mouth breathing may lead to dental and facial deformities such as increased facial height, mandibular plane, gonial angle, and malocclusion development. Other oral conditions negatively affected by mouth breathing include increased xerostomia levels, gingivitis, halitosis, and tooth decay. Additionally, systemic problems due to mouth breathing include declining cardiovascular health, low sleep quality, fatigue, systemic inflammation, poor academic performance, and declining emotional health.

This continuing education (CE) activity was developed by Endeavor Business Media with no commercial support.

This course was written for dentists, dental hygienists, and dental assistants, from novice to skilled.

Educational methods: This course is a self-instructional journal and web activity.

Provider disclosure: Endeavor Business Media neither has a leadership position nor a commercial interest in any products or services discussed or shared in this educational activity. No manufacturer or third party had any input in the development of the course content.

Presenter disclosure: Author discloses that they do have a leadership or financial relationship to disclose related to this continuing education activity.

Requirements for successful completion: To obtain three (3) CE credits for this educational activity, you must pay the required fee, review the material, complete the course evaluation, and obtain an exam score of 70% or higher.

CE planner disclosure: Laura Winfield, Endeavor Business Media dental group CE coordinator, neither has a leadership nor commercial interest with the products or services discussed in this educational activity. Ms. Winfield can be reached at lwinfield@endeavor2b.com or 800-633-1681.

Educational disclaimer: Completing a single continuing education course does not provide enough information to result in the participant being an expert in the field related to the course topic. It is a combination of many educational courses and clinical experience that allows the participant to develop skills and expertise.

Image authenticity statement: The images in this educational activity have not been altered.

Scientific integrity statement: Information shared in this CE course is developed from clinical research and represents the most current information available from evidence-based dentistry.

Known benefits and limitations of the data: The information presented in this educational activity is derived from the data and information contained in the reference section.

Registration: Rates for print CE have increased due to the manual nature of producing and grading courses in this format. For a lower-cost option, scan the QR code or go to dentalacademyofce.com to take this course online. **MAIL/FAX:** \$69 for three (3) CE credits. **DIGITAL:** \$39 for three (3) CE credits.

Cancellation and refund policy: Any participant who is not 100% satisfied with this course can request a full refund by contacting Endeavor Business Media in writing.

Provider information:



Endeavor Business Media is a nationally approved PACE program provider for FAGD/MAGD credit. Approval does not imply acceptance by any regulatory authority or AGD endorsement.
11/1/2019 to 10/31/2022.
Provider ID# 320452
AGD code: 010



Endeavor Business Media is designated as an approved Provider by the American Academy of Dental Hygiene, Inc. #AADHPNW (January 1, 2021-December 31, 2022). Approval does not imply acceptance by a state or provincial Board of Dentistry. Licensee should maintain this document in the event of an audit.

ADA CERP® | Continuing Education Recognition Program

Endeavor Business Media is an ADA CERP-recognized provider.

ADA CERP is a service of the American Dental Association to assist dental professionals in identifying quality providers of dental continuing education. ADA CERP does not approve or endorse individual courses or instructors, nor does it imply acceptance of credit hours by boards of dentistry.

Concerns or complaints about a CE provider may be directed to the provider or to ADA CERP at ada.org/cearp.



Go online to take this course.
DentalAcademyofCE.com

QUICK ACCESS code 22102



Characteristics of mouth and nose breathing

Respiration is a critical physiological function of the human body through nasal breathing or mouth breathing. Characteristics related to mouth breathing and nasal breathing differ. The two modes are distinguished by specific physical behaviors. For example, individuals may naturally alternate how they breathe; however, the way a person breathes while resting is the distinguishing factor in being labeled as a mouth- or nose-breather.¹ A breath taken in and out of the nose is medically viewed as a normal breath.¹ Healthy humans breathe through the nose while resting and combine breathing through the mouth and nasal passages while participating in exercise; both examples describe normal breathing. Mouth breathing is considered abnormal breathing both while awake or during rest, except while exercising.¹ When referring to individuals who breathe primarily through their mouth, it is known as mouth breathing syndrome even when some nasal capacity is present.²

The nose serves the body in many functions such as warming, filtration, humidification, and olfaction.³ The oral cavity also plays a role in the respiratory system and mastication, swallowing, suckling, and speech. If there is an imbalance in one of these functions, abnormal growth or development in the craniofacial complex's soft or hard tissues can occur from an early age.⁴ This article will explore how breathing can affect the body in both positive and negative ways (table 1).

Causes and detrimental effects of mouth breathing

Many physiological factors, including breathing difficulties triggered by allergies, chronic colds and stuffy nose, enlarged tonsils and adenoids, asthma, and a deviated septum, may provoke an individual to mouth breathe.⁵ Additional anatomic factors such as narrow airways, nasal polyps, nasal turbinate hypertrophy, and sleep position may further contribute to the etiology of mouth breathing.⁶ Research has found when the nasal airway is obstructed, an individual will use an alternate path to breathe. "In about 85% of cases, mouth breathing represents an

TABLE 1: Quick-reference guide to the benefits and negative effects of mouth and nasal breathing

	Mouth breathing	Nasal breathing
Benefits	<ul style="list-style-type: none"> - More oxygen intake during exercise 	<ul style="list-style-type: none"> - Engages the parasympathetic nervous system - Lowers heart rate - Lowers blood pressure - Deactivates fight or flight response - Helps asthma and COPD patients control breathing issues - Improves sleep - Decreases anxiety - Lowers cortisol levels
Negative effects	<ul style="list-style-type: none"> - Altered air pathway - Imbalanced forces exerted by cheeks, lips, and tongue - Orofacial deformities - Reduced nasal respiratory function - Altered tongue posture - Structural changes - Lower face height - Upper and lower incisor proclination - Open lip posture - Retrognathic occlusion - Posterior crossbite - Narrow maxillary arch - High vaulted palate - Sleep apnea - Pharyngeal collapse - Tongue thrusting - Cardiovascular disease - Fatigue - Halitosis - Headaches - Stress - Tooth decay 	<ul style="list-style-type: none"> - Feeling "air hungry" when first making breathing pattern adjustments - Requires practice and commitment to make new breathing patterns natural

involuntary, subconscious adaptation to reduced patency of the nasal airway, and mouth breathing is required simply to get enough air."¹ The onset of mouth breathing may occur in childhood years, a trait that can then develop into a habit and persist with health outcomes into adulthood.⁷

Mouth breathing has been recognized as a dysfunctional and problematic behavior negatively affecting oral and systemic health. Mouth breathing alters the air pathway, causing an imbalance of forces exerted by the lips, cheeks, soft palate, and tongue. These slight changes make a big difference in the craniofacial complex and can be recognized as early as 3 years of age.²

Orofacial alterations related to chronic mouth breathing result in reduced nasal respiratory function. This reduction in airflow then forces increased mouth breathing, leading to further issues such as altering tongue posture, which influences the inferior positioning of the mandible and muscular activity in the face and neck, resulting in further structural changes.⁴ Prolonged mouth breathing leads to many postural and muscular changes, which then cause dentoskeletal alterations to occur. Typical characteristics seen by these changes are an increase in lower face height, referred to as adenoid facies, which is visually represented by a long face, a lower tongue posture, and

increase in upper and lower incisor proclination, a narrow alar base, and lips that are postured in an open position. Other clinical observations of mouth breathers may include a retrognathic occlusion, posterior crossbite, narrow maxillary arch, and a high-vaulted palate. More than one's appearance is influenced by the structural changes from mouth breathing. Existing structural changes from mouth breathing, combined with continued mouth breathing patterns, can lead to obstructive sleep apnea and anterior tooth loss.²

A study by Suzuki and Tanuma on the collapsibility rate of the pharyngeal airway found that higher inspiration velocity of airflow was likely to cause a collapse of the pharyngeal airway.⁸ Comparing three different breathing patterns, mouth breathing led to higher velocity and static pressure. It was suggested that mouth breathing patterns are a primary cause of pharyngeal collapse. Those who favored nasal breathing had a lower velocity and smoother airflow with fewer pharyngeal wall collapsing incidents. When comparing nasal breathing while the mouth is open or closed, the velocity did not significantly differ, but the breath's flow pattern did. In cases where nose breath was taken with an open mouth, nasal breathing led to an intermittent stream of air with a disturbance at the lower portion of the pharynx, making it less stable than in those whose nasal breathing was taken with their mouth closed. When the nose breath was taken with the mouth closed, a steady stream of air throughout the entire breath was recorded.⁸

Further studies on mouth breathing effects suggest a strong correlation between mouth breathing and tongue thrusting, an open bite, and malocclusion.⁹ All these lead to a loss of lip tone that results in the flaring of anterior teeth. Flared teeth are more at risk for traumatic damage, mucosal drying, and periodontal disease, all of which result in an increased incidence of tooth loss, causing negative esthetics, functionality, and quality of life for an individual.⁹

Beyond abnormal facial and dental development, further health issues such as cardiovascular disease, fatigue, halitosis, headaches, hypertension, systemic inflammation, sleep apnea, snoring,

stress, and tooth decay positively correlate with mouth breathing. The attributing factor is the lack of nitric oxide (NO) levels in the respiratory tract's airways in mouth-breathing individuals.¹⁰

Effects of mouth breathing on periodontal disease and healing

Chronic mouth breathing is a risk factor for periodontal diseases. In one study, 20 mouth-breathers and 20 nose-breathers between the ages of 18 and 23 were matched and compared. Observations of plaque index, salivary flow, saliva's buffering capacity, and *Streptococcus mutans* and *Lactobacillus* incidents were measured.¹ While salivary flow and buffering capacity for saliva had no significant differences between study groups, there was a significant difference in plaque index. Data reveals that mouth breathers had more plaque buildup, which continually increased during the study compared to the control group.¹

Furthermore, *Lactobacilli* colonization tended to be higher but not significantly, although the risk of developing *S. mutans* was four times higher in mouth breathers than in the control group. Even with oral hygiene procedures and instructions, the *S. mutans* colonies increased, suggesting that mouth breathing counteracted good oral hygiene benefits.¹ Insufficient nasal ventilation causes a predominance in mouth breathing, which increases the prevalence of a coated tongue, gingivitis, and periodontitis.¹¹

A study by Kaur et al. found a link to the periodontium's healing response after periodontal therapy.¹² Sixty-six adults with a mean age of 31 with chronic periodontitis, half who breathed through their mouths and half who breathed through their noses, were subjects in the study. After scaling and root planing, mouth breathers had significantly lower improvements in full-mouth plaque index and bleeding on probing scores than nose-breathers at week four. A 12-week follow-up showed an increase in plaque at maxillary palatal sites of mouth-breathers compared to the nasal-breathing group. Oral dryness and lack of salivary constituents were observed in mouth breathing, which led to inflammation of underlying

periodontal tissues. The inflammation then became the primary reason for slow healing of the periodontium, putting the patient more at risk for systemic infections. Forty-two percent more water is lost by mouth breathers than nose breathers.¹³ The study by Kaur et al. showed this reduced the opportunity for salivary mucins to bind with water and coat the oral mucosa, resulting in decreased tissue hydration and an increased chance for xerostomia, increased plaque levels, and gingival inflammation.¹²

Breathing, the nervous system, and salivary proteins

The autonomic nervous system is composed of two parts: parasympathetic and sympathetic. The parasympathetic nervous system comes into play during times of rest and relaxation. It affects systems such as digestion, feel-good hormones, salivation, and arousal before sex. It is often referred to as the "feed and breed" system.¹³ The sympathetic nervous system has the opposite function. It sends signals to organs and body systems signifying that action is needed. This is called the "fight-or-flight" response.¹³ Long periods of dysfunctional mouth breathing resulting from stress, allergies, and nasal obstruction may cause the parasympathetic nervous system to become dysfunctional, leading to sympathetic dominance. This is when the sympathetic nervous system is in control of immediate actions and reactions. During rest, if breathing is relaxed, the parasympathetic nervous system comes into play. If breathing is rapid or strained, even while at rest, the sympathetic nervous system is engaged, and the fight-or-flight response is activated. Because human bodies are not meant to stay in sympathetic response for long periods of time, sympathetic dominance can result in symptoms such as anxiety, muscle tightness, pain, decreased circulation, and aging.¹⁴

Wallace examined the role of psychophysiological coherence and epigenetics on the etiology of caries.¹⁴ Psychophysiological coherence (PPC) is a balanced connection between the heart and brain that harmonizes with positive emotional, mental, and biological health. When the

heart and brain are coordinated with each other through positive emotional well-being, there is a change in psychological functioning between the cognitive and emotional realms of the body. Mouth breathing interrupts the body's desire to synchronize with the heart's rhythm and attain coherence, thus engaging the sympathetic nervous system. This is considered psychophysiological incoherence. Incoherence not only affects the psychological health of a person but can also have a profound consequence on saliva.¹⁴ Weakened PPC, through sympathetic responses, changes the structure of salivary proteins, which may render saliva unable to fulfill its protective role of bathing the teeth with immunoglobulins. It is believed that this can result in a higher incidence of caries.¹⁴

The need for correction and breathing retraining

Evidence supports the need to correct habitual mouth breathing to prevent or rectify physical problems.⁵ Various methods to correct mouth breathing problems include surgical intervention, myofunctional therapy involving an orthodontic palate expander, and breath retraining through corrective breathing practices and breathing exercises. Once a child begins mouth breathing, whether due to habit or obstruction, corrective measures including surgery or the use of appliances such as orthodontic palate expanders will become necessary. Training the child on correct breathing practices using breathing exercises is also essential.⁵

For patients with asthma, mouth breathing may present extra challenges. For example, in one study, challenging-to-treat people living with asthma, who concurrently displayed dysfunctional breathing patterns including mouth breathing, were determined to be 3.3 times more likely to suffer from anxiety and 2.8 times more likely to have depression than those without dysfunctional breathing.¹⁵ Mouth breathing patients in this study frequently had elevated incidences of sleep apnea, gastrointestinal reflux, compromised asthma status, and greater rates of unemployment. The study was conducted to include data in

symptom control, exacerbation rates, and quality of life. The authors emphasized that these patients remained “unresponsive to an escalation of asthma therapies yet responsive to breathing retraining.” This highlighted the substantial need for early identification and treating dysfunctional breathing for challenging-to-treat asthma.¹

Benefits of nasal breathing patterns

Nasal breathing patterns not only counteract the negative structural effects of mouth breathing but have several systemic benefits. Several types of nasal breathing methods show a positive correlation to health, including pranayama (yogic breathing), Buteyko breathing method, and capnometry-assisted respiratory training (CART).

Pranayama

The word *pranayama* can be dissected into “prana,” meaning breath of life/vital energy, and “ayama,” meaning expansion/regulation/control.¹⁶ Pranayama is known as the yogic art of breathing, and yoga and pranayama are commonly practiced and studied together. Pranayama implements several nasal breathing patterns such as alternate nostril breathing, rapid diaphragmatic breathing, slow/deep breathing, breath-holding/retention, internal breath retention, external breath retention, exhalation, and inhalation.¹⁶ When pranayama is practiced without yoga, asthma patients benefit in as little as 12 weeks.¹⁶ Benefits include decreases in pulse rate, blood pressure (both systolic and diastolic), respiration rate, flow rates of forced inspiration, expiration, and improvements of vital capacity. Fewer asthma attacks, a decrease in the attack's severity, and a decline in the use of asthma medication have been reported.¹⁶

Patients with chronic obstructive pulmonary disease (COPD) displayed improved symptoms and increased activity after practicing pranayama breathing.¹⁶ Cancer patients who practiced pranayama reported better sleep, less fatigue, decreased anxiety, and improved emotional status.¹⁶ Hypertension patients showed a reduction in both systolic and

diastolic blood pressure.¹⁶ Interestingly, in a group of battered women, those who practiced pranayama had a more significant reduction in a posttest Beck Depression Inventory assessment (BDI-II) than the control group after providing testimony about their abuse.¹⁶ The success of pranayama on the cardiopulmonary system is believed to reflect the reduction of oxidative stress levels and a decreased number of free radicals.¹⁷

Long-term pranayama breathing methods improve the body's autonomic system functions by reducing stress, improving mood, and lowering the catecholamine and cortisol levels. It was suggested that the sympathetic system, which affects inflammation, neuroendocrine, and hemodynamic properties stimulated by the vagal nerve, also had positive effects. Pranayama showed many therapeutic benefits for several diseases and populations.¹⁶

Buteyko

Buteyko is a breathing method that originated in Russia and focuses on control and breath-holding.¹⁸ Dating back to the 1960s, doctors claim that Buteyko is helpful in the treatment of several conditions such as diabetes and many immune, metabolic, reproductive, and psychological disorders. Five separate clinical trials conducted between 1998 and 2006 tested the effectiveness of therapeutic mechanisms of the Buteyko method for patients with asthma, with results reporting substantially reduced asthma medication in patients “with no deterioration of lung function or asthma control.”¹⁸

Buteyko method practitioners use techniques to reduce the air volume during breathing while increasing abdominal muscle tone, paired with relaxing other muscles usually used while breathing. The reduced volume breathing leads to mitigation in the effort to breathe, which causes the muscles in the respiratory system to relax. This is said to improve the function of the diaphragm and reduce the amount of air getting trapped in the lungs.¹⁸ The combination of long holds of breath “interspersed with reduced-volume breathing used by Buteyko method produce a mild fluctuating hypoxia, another mechanism

which is known to influence nitric oxide (NO) and its functions.¹⁹

The science behind the effectiveness of the Buteyko method is unclear. One proposed theory involves the biochemical influence of NO through nasal breathing.¹⁸ NO is part of many physical responses in the body such as bronchodilation, vasodilation, tissue permeability, immune response, oxygen transport, neurotransmission, insulin response, memory, mood, and learning. Since patients practicing the Buteyko method must continually maintain strict nasal breathing, NO levels produced in the paranasal sinuses remain elevated.¹⁸

Capnometry-assisted respiratory training

Another nasal-breathing technique used as therapy for asthmatic patients is capnometry-assisted respiratory training (CART). Like the Buteyko method, CART is structured to reduce tidal volume (the air capacity moved in and out of the lungs) when breathing.²⁰ Capnometry-assisted respiratory training focuses on normalizing end-tidal carbon dioxide (PCO₂), which measures the maximum amount of carbon dioxide remaining following an exhalation. This teaches patients to use abdominal breathing, favoring controlled, slow, shallow breaths. Chest breathing tends to provoke feelings of tightness or pain in the chest, and any increases in tidal volume can trigger a hyperventilation response. Nasal breathing is used in CART to reduce the amount of air inspired.²⁰ Its system of utilizing biofeedback mechanisms targeting hyperventilation has shown success in reducing asthma symptoms and peak flow variability. CART could be a viable option to prevent symptoms such as paresthesia, dizziness, lightheadedness, feelings of faintness, and improve overall wellness.²⁰

Humming to encourage nasal breathing

The technique of humming may be used with children to encourage nasal breathing.²¹ Mouth breathing children can be encouraged to hum with the tongue

positioned on the palate, facilitating nasal breathing. This action will stimulate increased nitric oxide production, leading to smooth muscle relaxation and vasodilation and reengage the parasympathetic nervous system.²¹

Conclusion

In comparing the effects of breathing patterns on the body, research supports evidence of negative influences of mouth-breathing patterns and the positive impact of nasal-breathing patterns, both structurally and systemically. For dental hygienists, dentists, and physicians, recognizing signs of mouth breathing has many benefits. Early detection could allow for reversing the nasal airway obstruction, reducing or eliminating mouth breathing, and the structural and systemic changes it influences. Early detection could also aid in the reversal and management of structural changes through orthodontic and craniofacial surgery. In a dental office, recognizing a mouth breather would help explain oral findings, diagnose and treat periodontal diseases, and would account for poor healing after therapy, bad breath, increased plaque index, oral bacterial counts, oral dryness, and related symptoms.

The majority of people who implement a pattern of nasal breathing have a low risk of any adverse effects and a high prevalence of positive outcomes. A knowledge of nasal-breathing pattern techniques and their positive impact could help clinicians manage in-office panic attacks and educate their patients who have asthma, sleep apnea, COPD, hypertension, and other functions influenced by the vagus nerve. Research suggests the way a breath is taken can affect the body in both positive and negative ways. Nasal-breathing patterns lead to many positive effects on the body as compared to mouth breathing.

References

- Mummolo S, Nota A, Caruso S, Quinzi V, Marchetti E, Marzo G. Salivary Markers and Microbial Flora in Mouth Breathing Late Adolescents. *Biomed Res Int*. 2018;2018:8687608. doi:10.1155/2018/8687608
- Basheer B, Hedge KS, Bhat SS, et al. Influence of mouth breathing on the dentofacial growth of children: a cephalometric study. *J Int Oral Health*. 2014;6(6):50-55.
- Li C, Jiang J, Dong H, Zhao K. Computational modeling and validation of human nasal airflow under various breathing conditions. *J Biomech*. 2017;64:59-68.
- Malhotra S, Pandey RK, Nagar A, Agarwal SP, Gupta VK. The effect of mouth breathing on dentofacial morphology of growing child. *J Indian Soc Pedod Prev Dent*. 2012;30(1):27-31. doi:10.4103/0970-4388.95572
- Sreshtaa VS, Geetha RV. Knowledge and awareness in association of malocclusion and mouth breathing in children. *Drug Interv Today*. 2020;14(7):1090-1092.
- Zheng W, Zhang X, Dong J, He J. Facial morphological characteristics of mouth breathers vs. nasal breathers: a systematic review and meta-analysis of lateral cephalometric data. *Exp Ther Med*. 2020;19(6):3738-3750. doi:10.3892/etm.2020.8611
- Indhu Rekka NC, Sathiyawathie RS, Felcita S. Correlation between oral habits causing malocclusion in children. *Drug Interv Today*. 2019;11(4):822-824.
- Suzuki M, Tanuma T. The effect of nasal and oral breathing on airway collapsibility in patients with obstructive sleep apnea: computational fluid dynamics analyses. *PLoS One*. 2020;15(4):e0231262. doi:10.1371/journal.pone.0231262
- Haralur SB, Al-Qahtani AS. Replacement of missing anterior teeth in a patient with chronic mouth breathing and tongue thrusting. *Case Rep Dent*. 2013;2013:759162. doi:10.1155/2013/759162
- Martel J, Ko Y-F, Young JD, Ojcius DM. Could nasal nitric oxide help to mitigate the severity of COVID-19? *Microbes Infect*. 2020;22(4/5):168-171.
- Munteanu D, Vasincu D, Manea P, Gavrilescu C. Oro-dental pathology-chronic respiratory diseases correlations. *Int J Med Dent*. 2014;4(1):17-21.
- Kaur M, Sharma RK, Tewari S, Narula SC. Influence of mouth breathing on outcome of scaling and root planing in chronic periodontitis. *BDJ Open*. 2018;4:17039.
- Nestor J. *Breath: The New Science of a Lost Art*. Penguin Random House; 2020.
- Wallace L. What is the role of physiological coherence and epigenetics in the etiology of dental caries? *J Int Clin Dent Res Org*. 2015;7(2):162-164.
- Denton E, Bondarenko J, Tay T, et al. Factors associated with dysfunctional breathing in patients with difficult to treat asthma. *J Allergy Clin Immunol Pract*. 2019;7(5):1471-1476.
- Jayawardena R, Ranasinghe P, Ranawaka H, et al. Exploring the therapeutic benefits of pranayama (yogic breathing): a systematic review. *Int J Yoga*. 2020;13(2):99-110.
- Madnawat AVS, Bhardwas VK, Bhardwas S. A factor analytical study of general mental health, life skills and eco-sensory consciousness among regular and irregular male and female pranayama practitioners. *Indian J Health Wellbeing*. 2013;4(5):1083-1087.
- Courtney R. Strengths, weaknesses, and possibilities of the Buteyko breathing method. *Biofeedback*. 2008;36(2):59-63.
- Malyshev IY, Bakhtinia LY, Zenina TA, et al. Nitric oxide (NO) dependent mechanisms of adaptation to hypoxia. *Hypoxia Medical J*. 2001;3:23.
- Jeter AM, Kim HC, Simon E, et al. Hypoventilation training for asthma: a case illustration. *Appl Psychophysiol Biofeedback*. 2012;37(1):63-72.

Notes

21. Madhushankari GS, Yamunadevi A, Selvamani M, Mohan Kumar KP, Basandi PS. Halitosis—an overview: part-I—classification, etiology, and pathophysiology of halitosis. *J Pharm Bioallied Sci.* 2015;7(Suppl 2):S339-S343. doi:10.4103/0975-7406.163441

**JANALEE R. GUSTAFSON, RDH,**

graduated from the dental hygiene program at Collin College. As a student, she served as treasurer of the student chapter of the South Carolina American Dental Hygienists' Association (SCADHA). She plans to pursue a bachelor of science in dental hygiene at Texas Women's University. Her most prized possession is her family. She also enjoys running and spending time at the lake on her SUP board or kayak.

**SUZETTE FOSTER, BA, RDH,**

earned her education degree from Queens College and taught kindergarten through fifth grade in public elementary schools within New York, New Jersey, and Florida. Passionate about learning and oral health and wellness, she embarked on a new journey and is now a practicing registered dental hygienist. In her free time, Suzette enjoys gardening and boating with her partner, Luke, while together raising their three boys in Prosper, Texas.

**KANDICE SWARTHOUT, MS, RDH, LPC,**

is a licensed professional counselor, registered dental hygienist, and full-time dental hygiene educator in Texas. Kandice is the owner of Inspired Education & Wellness, where she is a speaker, writer, and private practice therapist. She combines her clinical dental and mental health experience to help other health-care professionals have a fulfilling work-life experience. Read her articles in *Dentistry IQ*, *Today's RDH*, and her blog on Facebook, *Fearless Compassion: Stories of Personal Triumph*.

Use this page to review questions and answers. Visit dentalacademyofce.com and sign in. If you have not previously purchased the course, select it from the Course Library and complete your online purchase. Once purchased, click the "Start Course" button on the course page. You will have an opportunity to review an online version of the article. When finished, click the "Next" button to advance to the quiz. Click "Start Quiz," complete all the program questions, and submit your answers. An immediate grade report will be provided. Upon receiving a grade of 70% or higher, your verification form will be provided immediately for viewing and printing. Verification forms can be viewed and printed at any time in the future by visiting the site and returning to your Dashboard page.

QUESTIONS

1. Nasal breathing:
 - A. Provides no advantages
 - B. Is not recommended
 - C. Provides clear health advantages
 - D. Offers clear vision
2. Mouth breathing is considered abnormal breathing:
 - A. While awake or during rest
 - B. During exercise
 - C. Never
 - D. All of the above
3. Warmth, filtration, humidification, and olfaction are functions of the:
 - A. Oral cavity
 - B. Eyes
 - C. Throat
 - D. Nose
4. Prolonged mouth breathing leads to all of these except:
 - A. Postural changes
 - B. Muscular changes
 - C. Dentoskeletal alterations
 - D. Normal filtration
5. Factors that contribute to mouth breathing are:
 - A. Allergies and chronic colds
 - B. Narrow airways and deviated septum
 - C. Nasal polyps and enlarged tonsils
 - D. All of the above
6. Mouth breathing ____ the air pathway, causing an imbalance of forces exerted by the lips, cheeks, and tongue.
 - A. Alters
 - B. Bothers
 - C. Has no effect on
 - D. Stops
7. Mouth breathers may present with:
 - A. Retrognathic occlusion
 - B. Posterior crossbite
 - C. Narrow maxillary arch and a high-vaulted palate
 - D. All of the above
8. It is suggested that mouth-breathing patterns are a ____ cause of pharyngeal collapse.
 - A. Tertiary
 - B. Primary
 - C. Secondary
 - D. None of the above
9. Studies show a ____ correlation between mouth breathing and tongue thrusting.
 - A. Weak
 - B. Slight
 - C. Strong
 - D. Bold
10. Further health issues positively correlated with mouth breathing include:
 - A. Cardiovascular disease
 - B. Fatigue, halitosis, and headaches
 - C. Systemic inflammation, stress, and tooth decay
 - D. All of the above
11. Chronic mouth breathing is a risk factor for:
 - A. Nasal obstruction
 - B. Periodontal disease
 - C. Allergies
 - D. Smoking
12. Data showed there is more ____ with mouth breathing.
 - A. Plaque buildup
 - B. Salivary flow
 - C. Both
 - D. Neither
13. Risk of developing ____ was four times higher in mouth breathers than in the control group in one study.
 - A. *P. gingivalis*
 - B. *Actinomycescomitans*
 - C. *Forsythia*
 - D. *S. mutans*
14. A 12-week follow-up in one study showed an increase of plaque at ____ of mouth breathers compared to nose breathers.
 - A. Mandibular lingual sites
 - B. Maxillary palatal sites
 - C. Maxillary buccal sites
 - D. Mandibular buccal sites
15. Inflammation of underlying periodontal tissues caused slow healing of the periodontium in one study. This inflammation put the patient at risk for:
 - A. Systemic infections
 - B. Bruxism
 - C. Xerostomia
 - D. Salivation
16. What is the increased percentage of water loss by mouth breathers compared to nose breathers?
 - A. 12%
 - B. 42%
 - C. 65%
 - D. 84%
17. The parasympathetic system is also known as the:
 - A. Fight-or-flight response
 - B. Feed-and-breed system
 - C. Stress-and-run response
 - D. Control-and-dominate system

Use this page to review questions and answers. Visit dentalacademyofce.com and sign in. If you have not previously purchased the course, select it from the Course Library and complete your online purchase. Once purchased, click the "Start Course" button on the course page. You will have an opportunity to review an online version of the article. When finished, click the "Next" button to advance to the quiz. Click "Start Quiz," complete all the program questions, and submit your answers. An immediate grade report will be provided. Upon receiving a grade of 70% or higher, your verification form will be provided immediately for viewing and printing. Verification forms can be viewed and printed at any time in the future by visiting the site and returning to your Dashboard page.

QUESTIONS

18. Long periods of mouth breathing may cause the parasympathetic nervous system to become dysfunctional. This can lead to ___ dominance.
- Parasympathetic
 - Sympathetic
 - Autonomic
 - None of the above
19. Long periods of sympathetic dominance can result in symptoms such as:
- Relaxation and drowsiness
 - Anxiety, muscle tightness, pain, decreased circulation, and aging
 - Forgetfulness and loss of concentration
 - All of the above
20. Weakened psychophysiological coherence can change the structure of salivary proteins. This may result in a higher incidence of:
- Caries
 - Recession
 - Both
 - Neither
21. Types of breathing patterns that promote systemic benefits are:
- Pranayama
 - CART
 - Buteyko
 - All of the above
22. The word pranayama comes from root words meaning:
- Breath of vital life and expansion and control
 - Maximum air volume as a goal
 - Tidal wave-driven
 - Endurance running practices
23. When practiced without yoga, pranayama:
- Made no difference for asthma patients
 - Resulted in fewer attacks for asthma patients
 - Encouraged mouth breathing
 - Worsened breathing conditions for asthma patients
24. Buteyko method is a Russian-originated practice that focuses on:
- Gentle nasal breathing
 - Extended inhalation
 - Increased volume breathing
 - Breath control and holding
25. In the Buteyko method, reduced volume breathing leads to:
- Tightness in the diaphragm
 - Tension in the respiratory system
 - Relaxation in the muscles of the respiratory system
 - None of the above
26. Capnometry-assisted respiratory training (CART) teaches patients to:
- Take the deepest inhalation possible
 - Use abdominal breathing, favoring slow, controlled, and shallow breaths
 - Chest breathe
 - Both A and C
27. When mouth-breathing children are encouraged to hum:
- It facilitates nasal breathing
 - Mouth breathing worsens
 - They report difficulty in breathing
 - It stimulates the sympathetic nervous system
28. CART measures:
- How long an asthma patient can hold their breath
 - The number of breaths taken in one minute
 - The minimum amount of carbon dioxide after exhalation
 - The maximum amount of carbon dioxide remaining after exhalation
29. The action of humming will:
- Decrease nitric oxide
 - Stimulate increased nitric oxide
 - Stimulate carbon dioxide
 - Decrease carbon dioxide
30. Early detection of mouth-breathing related issues by dental professionals is important to:
- Reverse nasal airway obstruction
 - Reduce or eliminate mouth breathing
 - Aid in the reversal and management of structural changes
 - All of the above

Oral and systemic effects of breathing patterns: Nasal breathing vs. mouth breathing

NAME:	TITLE:	SPECIALTY:
ADDRESS:	EMAIL:	AGD MEMBER ID (IF APPLIES):
CITY:	STATE:	COUNTRY:
TELEPHONE (PRIMARY):	TELEPHONE (OFFICE):	

REQUIREMENTS FOR OBTAINING CE CREDITS BY MAIL/FAX: 1) Read entire course. 2) Complete info above. 3) Complete test by marking one answer per question. 4) Complete course evaluation. 5) Complete credit card info or write check payable to Endeavor Business Media. 6) Mail/fax this page to DACE. If you have any questions, please contact dace@endeavorb2b.com or call (800) 633-1681. A score of 70% or higher is required for CE credit.

COURSE CAN ALSO BE COMPLETED ONLINE AT A LOWER COST. Scan the QR code or go to dentalacademyofce.com to take advantage of the lower rate.



Educational Objectives

- Examine peer-reviewed studies regarding the implications of both nasal and mouth breathing
- Evaluate the quality of evidence provided
- Determine why nasal breathing is favored over mouth breathing in support of overall and oral health

Course Evaluation

- Were the individual course objectives met?

Objective #1: Yes No	Objective #2: Yes No	Objective #3: Yes No
----------------------	----------------------	----------------------

Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

- | | | | | | | |
|---|---|-----|----|---|---|---|
| 2. To what extent were the course objectives accomplished overall? | 5 | 4 | 3 | 2 | 1 | 0 |
| 3. Please rate your personal mastery of the course objectives. | 5 | 4 | 3 | 2 | 1 | 0 |
| 4. How would you rate the objectives and educational methods? | 5 | 4 | 3 | 2 | 1 | 0 |
| 5. How do you rate the author's grasp of the topic? | 5 | 4 | 3 | 2 | 1 | 0 |
| 6. Please rate the author's effectiveness. | 5 | 4 | 3 | 2 | 1 | 0 |
| 7. Was the overall administration of the course effective? | 5 | 4 | 3 | 2 | 1 | 0 |
| 8. Please rate the usefulness and clinical applicability of this course. | 5 | 4 | 3 | 2 | 1 | 0 |
| 9. Please rate the usefulness of the references. | 5 | 4 | 3 | 2 | 1 | 0 |
| 10. Do you feel that the references were adequate? | | Yes | No | | | |
| 11. Would you take a similar course on a different topic? | | Yes | No | | | |
| 12. If any of the continuing education questions were unclear or ambiguous, please list them. | | | | | | |

- Was there any subject matter you found confusing? Please describe.

- How long did it take you to complete this course?

- What additional dental continuing education topics would you like to see?

Mail/fax completed answer sheet to:

Endeavor Business Media

Attn: Dental Division
7666 E. 61st St. Suite 230, Tulsa, OK 74133
Fax: (918) 831-9804

- Payment of \$69 is enclosed (this course can be completed online for \$39. Scan the QR code or go to dentalacademyofce.com to take advantage of the lower rate).

Make check payable to Endeavor Business Media

If paying by credit card, please complete the following:

- MC Visa AmEx Discover

Acct. number: _____

Exp. date: _____ CVC #: _____

Billing address: _____

Charges on your statement will show up as Endeavor.

- | | |
|---------------------|---------------------|
| 1. (A) (B) (C) (D) | 16. (A) (B) (C) (D) |
| 2. (A) (B) (C) (D) | 17. (A) (B) (C) (D) |
| 3. (A) (B) (C) (D) | 18. (A) (B) (C) (D) |
| 4. (A) (B) (C) (D) | 19. (A) (B) (C) (D) |
| 5. (A) (B) (C) (D) | 20. (A) (B) (C) (D) |
| 6. (A) (B) (C) (D) | 21. (A) (B) (C) (D) |
| 7. (A) (B) (C) (D) | 22. (A) (B) (C) (D) |
| 8. (A) (B) (C) (D) | 23. (A) (B) (C) (D) |
| 9. (A) (B) (C) (D) | 24. (A) (B) (C) (D) |
| 10. (A) (B) (C) (D) | 25. (A) (B) (C) (D) |
| 11. (A) (B) (C) (D) | 26. (A) (B) (C) (D) |
| 12. (A) (B) (C) (D) | 27. (A) (B) (C) (D) |
| 13. (A) (B) (C) (D) | 28. (A) (B) (C) (D) |
| 14. (A) (B) (C) (D) | 29. (A) (B) (C) (D) |
| 15. (A) (B) (C) (D) | 30. (A) (B) (C) (D) |

EXAM INSTRUCTIONS

All questions have only one answer. If mailed or faxed, grading of this examination is done manually. Participants will receive confirmation of passing by receipt of a Verification of Participation form. The form will be mailed within two weeks after receipt of an examination.

COURSE EVALUATION AND FEEDBACK

We encourage participant feedback. Complete the evaluation above and e-mail additional feedback to [Laura Winfield \(winfield@endeavorb2b.com\)](mailto:Laura.Winfield@endeavorb2b.com).

COURSE CREDITS AND COST

All participants scoring 70% or higher on the examination will receive a verification form for three (3) continuing education (CE) credits. Participants are urged to contact their state dental boards for CE requirements. The cost for courses ranges from \$20 to \$110.

PROVIDER INFORMATION

Endeavor Business Media is an ADA CERP-recognized provider. ADA CERP is a service of the American Dental Association to assist dental professionals in identifying quality providers of continuing dental education. ADA CERP neither approves nor endorses individual courses or instructors, nor does it imply acceptance of credit hours by boards of dentistry. Concerns about a CE provider may be directed to the provider or to ADA CERP at ada.org/cerp.

Endeavor Business Media is designated as an approved PACE program provider by the Academy of General Dentistry. The formal continuing dental education programs of this program provider are accepted by the AGD for fellowship, mastership, and membership maintenance credit. Approval does not imply acceptance by a state or provincial board of dentistry or AGD endorsement. The current term of approval extends from 11/1/2019 to 10/31/2022. Provider ID# 320452. AGD code: 010.

Endeavor Business Media is designated as an approved provider by the American Academy of Dental Hygiene Inc. #AADHPNW (January 1 2021 - December 31, 2022). Approval does not imply acceptance by a state or provincial board of dentistry. Licensee should maintain this document in the event of an audit.

RECORD KEEPING

Endeavor Business Media maintains records of your successful completion of any exam for a minimum of six years. Please contact our offices for a copy of your CE credits report. This report, which will list all credits earned to date, will be generated and mailed to you within five business days of receipt.

CANCELLATION AND REFUND POLICY

Participants who are not 100% satisfied can request a refund by contacting Endeavor Business Media in writing.

IMAGE AUTHENTICITY

The images in this educational activity have not been altered.

© 2021 Academy of Dental Therapeutics and Stomatology, a division of Endeavor Business Media