Nose Breathing for Good Health, Fitness and Correct Craniofacial Development
Close Your Mouth

by Trisha E. O’Hehir, RDH, MS
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Close Your Mouth is the title of one of Patrick McKeown’s books. After reading his book and completing his educator’s coaching program, I found myself saying, “close your mouth” – under my breath of course – to people I’d see on television or just walking through the grocery store. Too many people walk around with their mouth open.

Patrick lived with asthma for more than 20 years, suffering with the tightness in his chest and fighting for breath. He knew the suffocating feeling in his lungs all too well; when he wanted to draw more air in, but couldn’t. His asthma also limited his physical activity. This was before 1997 when he discovered the work of Dr. Konstantin Buteyko, a Russian physician who showed a link between breathing volume and several conditions including asthma. Patrick traveled to Russia to study with Dr. Buteyko and is now teaching the Buteyko Breathing Method, which in my mind is actually the McKeown Breathing Method as Patrick has added and modified the method to achieve the best results with his clients.

Patrick is a scholar of breathing research. He helps hundreds of children and adults change from mouth breathing to nose breathing each year and trains breathing coaches all over the world. Breathing is essential to life, and deep, slow nose breathing is the goal. Where better to bring people’s awareness of their breathing to them than in the dental office? Dentists and hygienists are the ideal professionals to check for nasal vs. mouth breathing and address the many problems associated with mouth breathing. Read Patrick’s article and see if you too will want to start telling people to “Close your mouth.”
Nasal Breathing Delivers More Oxygen to the Blood than Mouth Breathing

Nitric oxide gas is produced in the paranasal sinuses and delivered continuously into the nasal airways. With each breath in, nitric oxide is added to the air reaching the lungs. When breathing through the mouth, no nitric oxide is inhaled. Nitric oxide is a vasodilator and enhances the uptake of oxygen by the blood.

Researchers in Sweden evaluated the effects of inhaled nitric oxide on oxygen uptake in the lungs. There were two parts to the study. The first evaluated the effects of nasal and oral breathing on oxygen uptake in the blood of healthy subjects. The second part evaluated intubated patients, who are deprived of nasal-airway-produced nitric oxide. They wanted to see if adding nitric oxide to their inhalation would influence arterial oxygenation. To do this, air from the patient’s nose was aspirated and fed into the inhalation limb of the ventilator.

In six out of eight healthy subjects, blood oxygen uptake was 10 percent higher during nasal breathing compared to mouth breathing. In six out of six long-term intubated patients, the oxygen uptake by the blood increased 18 percent when nitric-oxide-rich nasal air samples were added to the ventilator.

These findings show an increase in uptake of oxygen by the blood during nasal breathing compared to mouth breathing in healthy subjects. Intubated patients benefited from the addition of their own nitric-oxide-rich nasal air.

Clinical Implications: Self-inhaled nitric oxide plays an important role in pulmonary function confirming one of the many benefits for nasal breathing over mouth breathing.


Mouth Breathing Linked to Poor Posture and Reduced Respiratory Muscle Strength

Mouth breathing syndrome is characterized by a variety of functional, structural, postural, biomechanical, occlusal and behavioral issues. Body posture necessarily adjusts to mouth breathing with forward neck and head posture. Postural changes result in muscle imbalances, especially within the abdominal area and linked to the diaphragm. Core muscle strength is lost. Mouth breathing impacts nerves regulating the depth of each breath, keeping it in the upper thoracic area and not involving the diaphragm. This reduces thoracic expansion and the amount of air reaching alveoli within the lungs. Mouth breathing is evident from shoulder and upper chest movement, compared to nose breathing focusing on slow, deep belly breaths, using the diaphragm.

Researchers at the State University of Campinas, Brazil measured exercise tolerance, respiratory muscle strength and body posture in a group of children, ages 8-11 years. The test group included 45 mouth-breathing children and the control group was made up of 62 nasal-breathing children. The children were examined for nasal obstructions and were evaluated for posture. During a six minute walking exercise, breathing pressure was evaluated.

Abnormal head posture was evident in 80 percent of mouth breathers and 48 percent of nose breathers. Respiratory muscle strength, inhalation and exhalation measurements were generally lower in mouth breathers. Mouth-breathing children develop postural abnormalities in the cervical spine and decreased respiratory muscle strength compared with nose breathers.

Clinical Implications: Look for signs of mouth breathing in very young patients in order to correct the problem and prevent long-term deformities.

Young Mouth Breathers Prone to Forward Head Posture

Forward head posture is associated with mouth breathing as it helps open the pharynx to allow air to enter through the mouth. Mouth breathing is associated with a high frequency of nasal obstruction and enlarged tonsils. Mouth breathing is more often focused in the upper chest rather than deeper breaths from the belly. Mouth breathing bypasses the filtration provided by the nose, leading to allergic rhinitis.

Researchers at the State University in Campinas, Brazil evaluated children over the age of five years, comparing a group of 306 chronic mouth breathers and a control group of 124 healthy nasal breathers. The study was conducted at the university hospital where all the children were examined medically and dentally and underwent medical endoscopy to measure nasal obstruction. Posture was also evaluated for all the children.

There were more male mouth breathers than female. The children in the mouth breathing group were more likely to have significant nasal obstruction and larger tonsils than the nose breathing children. Mouth breathers also had a higher incidence of allergic rhinitis than nose breathers. Narrow palates were also more frequent in mouth-breathing children.

Postural changes with rounded shoulders and forward head position were significantly more frequent among mouth breathers compared to nose breathers. Mouth breathing seems to be a syndrome rather than a single condition.

Clinical Implications: Forward head posture is one sign of mouth breathing and is easy to evaluate in children before looking into the mouth. Early intervention and interdisciplinary treatment is essential to overall health.


Long Face Syndrome

Long face syndrome, also called adenoid face, results from mouth breathing rather than nasal breathing. Switching from nose to mouth breathing leads to a deviant cranio-facial growth pattern. Total face height increases, specifically the lower anterior region. Nasal apertures narrow, the upper lip is shorter and the lips rest apart in an open-mouth posture. The angle of the mandible increases. Low tongue posture occurs with mouth breathing. When the tongue no longer sits in the palate or pushes into the palate with each swallow, the palate grows narrow and high.

A contrary opinion is held that the long face is actually genetically inherited and has nothing to do with mouth breathing. The inherited narrow nasopharynx leads to mouth breathing, rather than the other way around. However, there is no scientific evidence to support this theory. Despite that fact, debate continues as to the importance of a patent airway and whether dental professionals should be addressing mouth breathing to prevent abnormal facial growth.

Several theories suggest a cascade of events explaining the morphologic changes associated with Long Face Syndrome. For some, the obstructed airway comes first and for others it is a result of several other factors. One theory suggests changes in posture lead to a forward head posture which leads to soft tissue stretching which puts forces on the skeletal bones leading to changes that cause airway obstruction leading to mouth breathing.

Conversely, research shows that plugging the nostrils of young monkeys for two years leads to mouth breathing and morphogenic changes characterized by the Long Face Syndrome.

Clinical Implications: Intervene early with young children showing signs of mouth breathing, to prevent Long Face Syndrome.
Nasal Obstruction in Children Linked to Dental Abnormalities

Otolaryngologists see more and more children with nasal airway obstruction leading to changes in facial skeletal growth, snoring and sleep apnea. For more than a century, orthodontists have debated whether a cause and effect relationship exists between mouth breathing and dentofacial development. Some believe that muscles of the cheeks, lips and tongue play a role in facial development while others believe it is strictly genetic.

This controversy includes both medical and dental professionals as 60 percent of craniofacial growth occurs during the first four years of life and is 90 percent complete by age 12. Growth of the mandible is generally complete by age 18. To prevent facial changes due to mouth breathing, intervention should be at a very early age. Medical and dental professionals should be checking all patients for mouth breathing. Although there are children who are either mouth or nose breathers exclusively, many combine both nasal and mouth breathing, being more likely to mouth breathe at night, dropping the tongue from the palate and opening the mouth.

The term “adenoid face” was introduced in 1872 and related all dento-facial changes associated with nasal airway obstruction to adenoid enlargement. Today, there are many reasons for a child to switch from nose to mouth breathing so the term “long face syndrome” is more accurate. This is characterized by mouth breathing, difficulty keeping lips together, open bite, cross bite, elongation of the lower face, retrognathia, narrow arch, high palate and a gummy smile.

Clinical Implications: Nasal obstruction and mouth breathing in children are issues that dentists, hygienists, myofunctional therapists, orthodontists, pediatricians and otolaryngologist need to address as a team.

Tongue Thrusting

During normal swallowing, the tongue pushes against the roof of the mouth without touching the teeth, the teeth contact momentarily and peri-oral muscles are not activated. With tongue thrusting, the tongue contacts the maxillary anterior teeth and the peri-oral muscles contract. Tongue thrusting is the predominant swallowing pattern in infants, with a mature swallow developed by age two to four years.

Researchers at Dental College and Hospital Nerul in Mumbai, India screened 864 children ages eight to 14 and found tongue thrust in 46 children. Based on parental consent, they selected 21 with tongue thrust and 21 without tongue thrust. The children underwent a thorough clinical exam, impressions of both arches and a lateral cephalogram.

More children with tongue thrust showed lip incompetence, 86 percent versus 14 percent. These figures were the same for lisping. Mouth breathing was found in 38 percent of tongue thrusters versus none in the control group.

Hyperactive mentalis muscle activity was observed in 24 percent of tongue thrusters versus none in the controls. The upper lip was found to be thicker in those with a tongue thrust as well as a more acute naso-labial angle.

Open bite was found in half the tongue thrusters and none of the controls. Most of the children without tongue thrust had a 1-2mm overjet. The angle of the maxillary anterior teeth in children with a tongue thrust was increased. No significant skeletal differences were observed between groups.

Three controls showed lip incompetence with no mouth breathing, having a palatal tongue position rather than down and forward.

Clinical Implications: Check young children for signs of tongue thrusting.
In 1704, a racing stallion by the name of The Darley Arabian arrived in Britain from Syria and is responsible for 95 percent of today's male thoroughbreds. Geneticist Patrick Cunningham and colleagues from my alma mater, Trinity College, Dublin traced the lineage of nearly one million horses from the past two centuries and determined that 30 percent of variation in performance in thoroughbreds is due to genetics alone. In the nature versus nurture debate, these results suggest that nature plays a significant part of our athletic abilities.

Could humans be similar to race horses in this way? Could our genetic makeup strongly dictate our athletic prowess?

There is one area in particular where a combination of genetics and behavior has considerable influence on athletic performance, and that is the way the face and jaws develop during childhood. For example, take a look at the structure of the face and jaws of former Olympic successes including Usain Bolt, Sanya Ross Richards, Steve Hooker and Roger Federer. What is strikingly apparent for this group, and for the vast majority of top-class athletes, is the forward growth of the face and width of the jaws. Athletic success depends on having good airways, which in turn is dependent on normal facial structure. Spend a lot of time with your mouth hanging open or sucking your thumb during childhood and the face grows differently than how nature intended.

In fact, Michael Phelps, the most decorated Olympian of all time, is one of very few top-class athletes who does not exhibit forward growth of the jaws and a wide facial structure. Based on his facial profile, there is a high likelihood that he was a mouth breather during childhood, possibly requiring orthodontic treatment in his early teens. It is also possible that Phelps chose swimming, either consciously or unconsciously, as it was the one sport at which he could excel. The very act of swimming restricts breathing to help offset any negative effects that have developed from mouth breathing or an inefficient breathing pattern.

Although the natural order of things is to breathe through the nose, many children – especially those with asthma or nasal congestion – habitually breathe through the mouth. Children who regularly breathe through their mouth tend to develop negative alterations to their face, jaws and the alignment of their teeth. Mouth breathing affects the shape of the face in two ways. Firstly, there is a tendency for the face to grow long and narrow. Secondly, the jaws do not fully develop and are set back from their ideal position, thus reducing airway size. If the jaws are not positioned

forward enough on the face, they will encroach on the airways. See for yourself: close your mouth, jut out your chin and take a breath in and out through your nose, noting the way air travels down behind the jaws. Now do the same but pull your chin inward as far as you can. You will probably feel as if your throat is closed up as you try to breathe. This is exactly the effect poorly developed facial structure has on your airway size. It is no wonder that those with restricted airways tend to favor mouth breathing.

The forces exerted by the lips and the tongue primarily influence the growth of a child’s face. The lips and cheeks exert an inward pressure on the face, with the tongue providing a counter-acting force. When the mouth is closed, the tongue rests against the roof of the mouth exerting light forces which shape the top jaw. Because the tongue is wide and U-shaped, it follows that the shape of the top jaw should be wide and U-shaped also. In other words, the shape of the top jaw reflects the shape of the tongue. A wide U-shaped top jaw is optimal for housing all our teeth.

However, during mouth breathing, it is very unlikely that the tongue will rest in the roof of the mouth. Try it for yourself: open your mouth and place your tongue on your upper palate. Now try to breathe through your mouth. While it is possible to draw a wisp of air into the lungs, it will not feel right. It follows therefore that the tongue of a mouth-breathing child does not rest in the roof of the mouth, the end result is the development of a narrow V-shaped top jaw. Aesthetically, this contributes to a narrowing of the facial structure, crooked teeth and orthodontic problems. It has been well-documented that mouth-breathing children grow longer faces.3,4,5

The second way facial structure is affected by the way we breathe during childhood is the position of the jaws. The way the jaws develop has a direct influence on the width of the upper airways. Our upper airways comprise the nose, nasal cavity, sinuses and the throat. High athletic performance requires large upper airways which will enable air to flow freely to and from the lungs. While effective breathing is crucial for high performance, having airways that function with little resistance is also very advantageous. For example, a marathon runner who has efficient breathing but airways the width of a narrow straw is not going to get too far.

The normal growth of the face is forward, and this is achieved by the forces exerted by the tongue as it rests in the roof of the mouth. Since a mouth-breathing child does not rest his or her tongue in the roof of the mouth, the jaws are unable to be properly shaped by the tongue, and the natural forward growth of the jaws is impeded. This results in jaws that are set back from their ideal position, compromising airflow. For correct development of the jaws, face and airways, it is imperative that a child habitually breathes through the nose. Breathing through the nose with the tongue resting in the roof of the mouth helps to establish the ideal conditions for normal development of the face.

Note the forward position of the jaws, high cheekbones, airway size and width of the face in figure 1. The jaw is strong and positioned forward so that the chin is nearly as far forward as the tip of the nose. When cartoonists draw illustrations of a dominant male, his strength is often conveyed by a rugged and exag-

3. Tourne. The long face syndrome and impaiement of the nasopharyngeal airway. Angle Orthod 1990 Fall 60(3) 167-76

Fig. 1: The facial characteristics of a nasal breather. Based on Irish International and LA Galaxy soccer captain Robbie Keane.

Fig. 2: The facial characteristics of a mouth breather.

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Nose Unblocking Exercise

- Take a small, silent breath in and a small, silent breath out through your nose.
- Pinch your nose with your fingers to hold your breath.
- Wait for a minute or two before repeating the breath hold.
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- Repeat this exercise five or six times until the nose is unblocked.
- When you resume breathing, do so only through your nose. Try to calm your breathing immediately.
- After resuming your breathing, your first breath will probably be bigger than normal. Make sure that you calm your breathing as soon as possible by suppressing your second and third breaths.
- You should be able to recover normal breathing within two to three breaths. If your breathing is erratic or heavier than usual, you have held your breath for too long.
- Wait for a minute or two before repeating the breath hold.
- Repeat this exercise five or six times until the nose is unblocked.

Generally, this exercise will unblock the nose, even if you have a head cold. However, as soon as the effects of the breath hold wear off, the nose will likely feel blocked again. By gradually increasing the number of steps you can take with your breath held, you will find the results continue to improve. When you are able to walk a total of 80 paces with the breath held, your nose will be free permanently. Eighty paces is actually a very achievable goal, and you can expect to progress by an additional 10 paces per week.

Each week I teach this exercise to groups of five-to-10-year-old children, many of whom have pretty serious breathing difficulties. Within two to three weeks, most children are able to walk 60 paces with their breath held, with some children quickly achieving up to 80 paces. Try it yourself, and see how you do.

Finally, according to American research, 95 percent of head circumference growth for the average North American child takes place by the age of nine. Development of the lower jaw, however, continues until approximately age 18.

Based on these observations, for correct craniofacial growth to take place, early intervention with nasal breathing and tongue posture is essential. The negative effects of mouth breathing on the structure of the jaws and face will have the most impact when they occur before puberty, so there is only a brief window of opportunity to avoid significant changes in a child’s facial structure.

**Author’s Bio**

Patrick McKeown was educated at Trinity College, Dublin, and later studied under the auspices of the founder of the Buteyko Method; the late Dr. Konstantin Buteyko. Patrick has been teaching the Buteyko Method to health-care practitioners in Australia, USA and throughout Europe since 2002. He has penned eight books, including the self-help DVD set for children and teenagers titled ButeykoKids Meet Dr. Mew. Visit ButeykoClinic.com or ButeykoKids.com for more information.
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