

5. Pahn J, Friemert K. Differentialdiagnostische und terminologische Erwägungen bei sogenannten funktionellen Störungen im neuropsychiatrischen und phoniatischen Fachgebiet. *Folia Phoniatri* 1988; 40: 162-4.
6. Pahn J, Dettmann R, Sram F. Zur Verteilung und funktionellen Auswirkungen von Paresen der Stimmlippenbewegungs- und -spannmuskulatur anhand elektromyographischer Untersuchungen. *Folia Phoniatri* 1984; 36: 273-83.
7. Schulz JH. *Das autogene Training (Konzentrierte Selbstspannung)*. Stuttgart: Thieme, 1956.
8. Teirich HR. Musik im Rahmen der nervenärztlichen Praxis. In HR Teirich (Ed.). *Musik in der Medizin*. Stuttgart: Fischer, 1958.

YHTEENVETO

Laulu- ja puheäänien opetus ja kuntoutus nenäsointiharjoituksilla

Nenhointiharjoitusmenetelmällä kuntoutetaan äänihäiriöitä. Menettelyt vaihtelevat äänihäiriön syiden mukaan. Tämän vuoksi esitellään menetelmän käyttöä yleisesti käytössä olevien diagnostisten kriteerien yhteydessä. Kaiken kaikkiaan menetelmä sisältää seitsemän ydinajatusta. Terapien sisältö on yksilöllinen.

Voice loss in performers: a pilot treatment programme to show the effect on the voice of correcting structural misalignment

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A pilot study has been conducted to determine the importance of an aligned physical structure in vocal performance. A team of a dentist, a cranial chiropractor and a voice teacher assessed and corrected structural misalignments in 9 subjects over a period of 2 years. The subjects were all performers or training for professional performance. Posture, upright balance and the voice improved in all the subjects. The improvements included greater control of breathing, increased pitch range, no more fear, greater motivation, and the return of the enjoyment in music making. The results indicate that misalignment of the jaw, the cranium and the skeleton, causes interference in vocal efficiency, rhythm, and confidence.

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INTRODUCTION

Amorino and Taddey (1) conducted a survey in the USA in 1994 on the incidence of voice problems in singers who had temporomandibular joint dysfunction (TMD). TMD is a misalignment of the jaw in its relation to the cranium which results in asymmetrical stresses in the whole head-neck area (see Fig. 1) (6, 10). They found that in the presence of

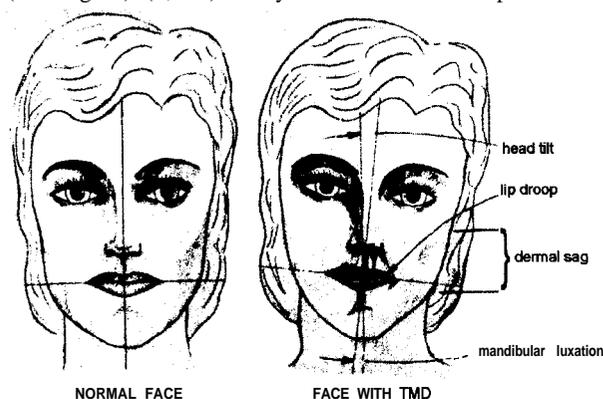


Fig. 1. Visible signs of cranial misalignment (8).

TMD singers suffered variously from unreliable pitching, running out of breath, performance nerves and a feeling of failure.

Fonder (6) alerted dentists in 1977 to the potential damage and stress which they could inflict upon the vascular, skeletal and neural structures throughout the body by aligning teeth for a beautiful smile without consideration for function or skeletal alignment. The resultant problems included not only physiological symptoms (e.g. neck and shoulder pain, lower back pain, headaches, numbness or tingling in fingers and feet) but also emotional and psychological symptoms (e.g. worrying, nervousness, forgetfulness and a feeling of failure).

According to Fonder (7) and Guzay (8), the dysfunction of the mandible in its relationship with the cranium causes specific muscle spasm in the area of C1 and C2, thus interfering with the function of the atlanto-occipital joint. The freeing of the neck, and the poise and balance of the whole body might, therefore, require dental, cranial and chiropractic assistance as well as re-education of habitual patterns of use to ensure that physical stress patterns do not interfere with efficient function. For example, Zenker and Zenker (17) in 1960 and Sonninen (14) in 1968 both suggested that the extrinsic laryngeal frame assists in regu-

lation of the vocal folds. That is, the strap muscles, which suspend the hyoid bone, affect the suspension of the larynx from the hyoid bone by adding transitory stresses to the quadrangular ligament (5).

A team of a dentist with skills in TMD and orthodontics, a chiropractor with a postgraduate specialization in cranial-sacral techniques, and a voice teacher with a working knowledge in both of those disciplines has been established to investigate the connections between misalignment of the skeletal structure. The team assessed a group of performers who were experiencing voice problems to determine whether:

- (a) specific structural problems occurred concurrently with voice problems;
- (b) a deteriorating pattern of voice function could be traced through a deteriorating pattern of structural misalignment; and
- (c) a correction protocol could be set up which would halt that deteriorating pattern.

A treatment protocol was developed which addressed related misalignments in the jaw, the cranium and the pelvic system, and the position of the tongue.

Malocclusion and cranial torque

It has now been established that inadequate development of the crania-facial complex in the adult begins in infancy. The most common cause is birth trauma, as in forceps "aided" delivery (16). As a result of this many children arrive at their early teens with insufficient maxillary development to provide room for all of the upper teeth. The cranial base, the front of which is the maxilla, is then compressed by crowding of the erupting teeth. The result is twofold, as shown in Fig. 1: (a) misalignment of the teeth or malocclusion and (b) misalignment of the cranium (10). Pre-molar teeth are routinely removed in adolescents to reduce this overcrowding, but this treatment compounds the problem by discouraging further development of the crania-facial complex.

The role of the pelvic system

Two strong joints between the pelvis and the sacrum (the sacroiliac joints) stabilize the pelvic system. Once the pelvis misaligns the body will increasingly adapt to compensate for the postural imbalance. However there is a finite limit to the range of adaptation. It has been estimated that it takes approximately 15 years to reach the limit of Physiological Adaptive Range (PAR) (9), which is signalled by onset of pain. SOT chiropractic defines three stages in the progression from minimal adaptation (no one is perfect) to chronic pain: Categories I, II and III. According to our findings voice problems become obvious with the onset of Category II (see Fig. 2).

The role of the tongue

There is agreement in dental and orthodontic literature that the natural resting position of the tongue is one in which the upper surface of the visible tongue lies against and acquires the shape of the maxilla (11, 12). The front of the

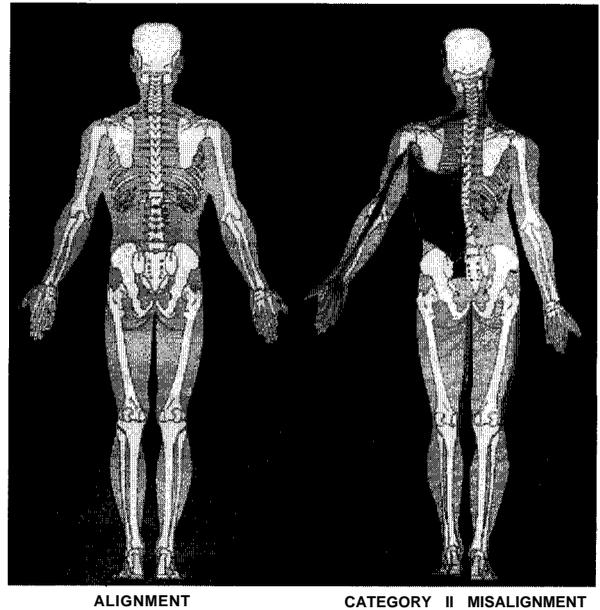


Fig. 2. Structural imbalance, Category II, after Howat (0 Cranial Communications Systems).

tongue should lie just behind the alveolar ridge, just behind but away from the front teeth. In this natural resting position the tongue can make a seal with the soft palate which allows the continuation of nose breathing when the mouth is open (3). Crelin (4) built a rubber duplicate of an adult human vocal tract and discovered that all the vowel sounds are most efficiently formed in the pharynx by the back of the tongue. The styloglossus muscle pulls the tongue up into the palate and back into the pharynx. The strengthening of this muscle gives priority for articulation of vowels in the pharynx by the walls of the pharynx, the front wall of which is the back of the tongue (2, 4). It was necessary to strengthen the styloglossus muscle in the entire pilot group and to re-position the tongue.

METHOD

Eight singers and an actress, at various stages of both performance and training for performance, took part in the pilot study. They all had voice problems which were apparently intensifying. The received wisdom in each case was that this was due to performance stress.

Each subject was interviewed by, and sang to, the voice teacher. Each was then asked to repeat the performance while sitting and bouncing on a body ball and stretching a stretch band behind the head to free the shoulder joints. In all cases there was a short-term improvement in singing. The subjects then repeated the singing while standing on a balance board to test upright balance.

The tongue resting position and facial muscle balance were observed during these exercises. All the subjects had a forward tongue resting position (11). All the subjects were assessed as at least category II (see Fig. 2). Table 1 shows the results of the initial vocal, chiropractic and dental assessments of all the subjects.

Table 1. *Details of the assessment and treatment of the nine subjects in the pilot study, with the results to date (FTP = Forward Tongue Posture; SCM = Sterno Cleido Mastoid; TMJ = Temporo Mandibular Joint)*

Subject Details		Assessment						
Subject	Age	Musical qualifications	Voice	Chiropractic	Dental	Adaptation	Treatment	Results to date
1. Singer; Performer; Teacher.	60	AGSM; LRAM; scholarship for 4th year at music college; Alexander teacher.	Voice loss; balance problems.	Category II-III; cranial torsion.	Crossbite; wisdom teeth extracted at age 19.	Spasm in SCM and psoas; uneven leg length; spasm in diaphragm; FTP	Chiropractic treatment; maxillary widening; correction of crossbite; tongue repositioning; voice and body exercises.	Return to professional performance.
2. Singer; Teacher.	27	AGSM; County Awards; Grade 8 piano.	Out of tune singing; limited pitch range; jaw pain.	Category II; poor cranial-facial development.	Premolars extracted for overcrowding in early teens.	Body sway; spasm in psoas muscle; FTP	Chiropractic treatment maxillary widening. Tongue repositioning. Voice and body exercises.	Extension of vocal range and resonance; return to accuracy of pitch and rhythm.
3. Singer; Performer.	46	Lead singer in folk rock band, 25 years at top of her profession.	Loss of singing voice; performance stress.	Category II caused by birth of son, now 15.	Satisfactory.	Restricted diaphragm; FTP	Chiropractic treatment tongue repositioning voice and body exercises.	Removal of stress; no more voice loss; development in range and repertoire.
4. Actress.	50	One woman show, regular recording artist for radio plays.	Loss of voice quality and flexibility.	Category II.	Asymmetry in translation at TMJ; malocclusion.	Severe spasm in extrinsic frame and SCM	Chiropractic treatment; correction of malocclusion by re-grinding new crown.	Return to regular employment.
5. Singer (counter-tenor)	27	Silver medallist chorister; leading counter tenor for five choirs.	Loss of singing voice; decreased range; throat problems.	Category II; poor cranial-facial development; low back pain.	Premolars extracted for overcrowding in early teens.	Spasm in SCM and psoas; unequal leg length; spasm in diaphragm; FTP	Chiropractic treatment; maxillary widening; tongue repositioning; voice and body exercises.	Voice stabilizing; cranial torsion correcting; tongue repositioning.
6. Singer; Performance Student.	21	Leading tenor in National Youth Music Theatre at age 18-19, Grade 8 double bass;	Total loss of singing voice.	Category II; poor cranial-facial development.	Premolars extracted for overcrowding in early teens.	Spasm in SCM and psoas; unequal leg length Spasm in diaphragm; FTP	Chiropractic treatment; maxillary widening; tongue repositioning; voice and body exercises.	Development in range and repertoire; accepted on performance module of music degree course.
7. Singer; Performance Student	18	Grade 8 singing; Grade 8 piano; former member National Youth Chamber Choir.	Limited range; breathing problems; swaying.	Category II; poor cranial-facial development.	Premolars extracted for overcrowding in early teens.	Spasm in SCM and Psoas; uneven leg length; spasm in diaphragm; FTP	Chiropractic treatment, no dental input due to cost factors. Tongue repositioning; voice and body exercises.	Voice stabilizing only with regular chiropractic treatment; some extension to pitch and range; still swaying.

Table 1. (Continued)

Subject Details		Assessment				Treatment	Results to date
Subject	Age	Musical qualifications	Voice	Chiropractic	Dental		
8. Singer; Performance Student.	21	Grade 8 singing; Grade 5 piano; former member National Youth Choir.	Frequent tonsillitis; limited range; swaying.	Category II; poor cranial-facial development.	Premolars extracted for overcrowding in early teens.	Spasm in SCM and Psoas; uneven leg length; spasm in diaphragm; FTP	Chiropractic treatment; no dental input due to cost factors. Tongue repositioning; voice and body exercises. Voice stabilizing only with regular chiropractic; some extension to pitch and range; still swaying.
9. Singer; Performer.	54	Former principal soloist for major opera companies for 20 years.	Total loss of singing voice; depression.	Category II with cranial torsion.	Upper and lower molars removed on left, heavy dental plate crossing the roof of the mouth. Lower "saddle" plate which rocks.	Spasm in SCM and Psoas; uneven leg length; spasm in diaphragm; FTP	Short-term appliance (light weight) to replace saddle and increase support while major dental restructuring takes place; chiropractic treatment; tongue repositioning; voice and body exercises.

Chiropractic treatment commenced immediately with pelvic stabilization. Weekly voice and body exercise sessions (2) were begun to reprogramme compensatory muscle systems. Dental corrections (see Table 1) were coordinated with chiropractic treatment when the subject had achieved pelvic stability. The team met regularly to discuss individual progress.

RESULTS

Table 1 gives details of the subjects, their vocal, chiropractic and dental assessments and treatments, and the results obtained to date.

In all the subjects as the pelvis stabilized, weight bearing was observed to shift onto two feet and the body tension that had been necessary to maintain upright balance was permanently reduced. This brought about the first major difference in the voice and the first relief in the subject. The lateral stabilization of the subjects improved.

At this stage of the treatment, those subjects who had had premolar teeth removed for overcrowding were unable to achieve a tongue/palate seal because the tongue did not fit into the undeveloped palate. In the case of removal of wisdom or other molar teeth the tongue lacked articulatory reference at the back of the mouth for consonants. When strength of spring was required for the tongue to hit the palate, the tongue spilled sideways. This was the obvious moment to begin the dental treatment.

There were three basic dental problems which occurred in different age groups (see Table 1): (a) the under-30s all had a narrow and foreshortened palate; (b) the over-30s all had spaces where reference was required; and (c) the over-30s all had malocclusion through misaligned translation of the mandible.

Dental appliances were fitted to five subjects. The appliances were chosen for their light wire properties (no acrylic was used). Two of the subjects gave public recitals while wearing ALF (Applied Light Function) dental appliances top and bottom.

DISCUSSION

All the subjects have shown a marked reduction in their voice problems since their treatment started. The results raise important issues. None of the subjects began the study having any knowledge of the functional anatomy of the voice. None of the subjects knew anything about the development of the voice in infancy and through childhood, and in many instances the subjects were not only operating with inaccurate mechanics but were practicing very hard to maintain these inaccurate mechanics in spite of a feeling that they might be wrong.

One subject, the actress, unashamedly sought immediate help when the voice went wrong. When the singers' voices went wrong they wasted precious correction time agonizing

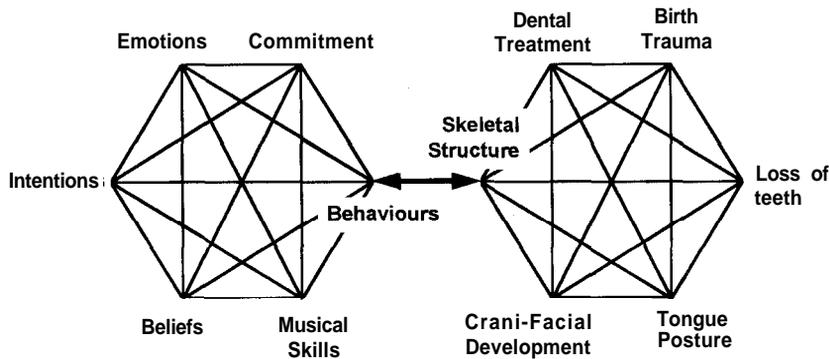


Fig. 3. A model illustrating the interactions between the various factors affecting the training and maintenance of the voice.

over their own musical failure. During that time they tried to hide the problem and in the process compounded it. One is compelled to ask at what stage of education this attitude is introduced.

In all the singers the tongue was found at assessment to rest in the floor of the mouth. All the singing subjects admitted that they had trained the tongue to rest in the floor of the mouth on the advice of singing teachers. In each case the resonance and range of the voice improved when the tongue was restored to its natural resting position.

In six of the subjects, teeth had been removed for overcrowding. Removing teeth, especially the premolars, halts development of the maxilla (roof of the mouth) and prevents the tongue from achieving its natural resting position (11).

Before our structural assessment of the subjects, they had all had their problems attributed to performance stress. Selye (13) described stress as the "non-specific response of the body to any demand". Stress is necessary. Good stress, which Selye referred to as "eustress" produces a healing, stimulating response because demand remains within the adaptive capacity of the body. If, however, demand exceeds adaptive capacity by being too great or too sustained or both, it produces "distress". Both eustress and distress are accumulative. Selye called this distress cycle "General Adaptive Syndrome" (GAS) (13). Fonder (7) suggested that malocclusion and TMD intensify GAS, but where GAS is relieved by sleep, the Dental Distress Syndrome (DDS) (7) is present for 24 h because of the involvement of the teeth. Almost half of both sensory and motor aspects of the brain are devoted to the "dental area" (10).

Singing and acting currently belongs to development of potential and not to pathology thereby distancing singers and actors from structural clinicians except as a last straw. It appears that it is at this "last straw" or end of PAR that performance "eustress" becomes performance "distress". The model shown in Fig. 3 illustrates the interactions between the various factors that may affect the training and maintenance of the voice. This pilot study concentrated on the factors in the right hexagon.

No one is completely symmetrical or perfectly balanced. This is not important if it does not interfere with life. It is more important to match demand and adaptive range. Those who demand more precision (e.g. a sportsman, an

instrumentalist or a professional voice) must develop and maintain more precise balance and coordination (15). This is not possible in the presence of misalignment, whether it be in the cranium, the jaw or anywhere else in the skeletal system.

REFERENCES

1. Amorino S, Taddey J. Temporomandibular disorders and the singing voice. *Natl Assoc Sing Teach J* 1994; 50: 3-14.
2. Caine A. *The voice workbook*. London: Hodder & Stoughton, 1991.
3. Caine A. *The voice as a therapy*. In: Varley P (ed.). *Complementary therapies in dentistry*. London: Butterworth-Heinemann, 1997.
4. Crelin E. *The human vocal tract: anatomy, function, development, evolution*. New York: Vantage, 1987.
5. Fink BR, Demarest RJ. *Laryngeal biomechanics*. Cambridge MA: Harvard University Press, 1977.
6. Fonder A. *The dental physician*. Rock Falls IL: Medical-Dental Arts, 1977.
7. Fonder A. *The dental distress syndrome*. Rock Falls IL: Medical-Dental Arts, 1990.
8. Guzay CM. *The quadrant theorem*. Chicago IL: Doctors' Dental Service, 1980.
9. Howat J. *Chiropractic*. In: Varley P (ed.). *Complementary therapies in dentistry*. London: Butterworth-Heinemann, 1997.
10. Jecman JM. Understanding malocclusion. *Cranio-View* 1995; 4: 9-32.
11. Mew J. Tongue posture. *Br J Orthod* 1981; 8: 203-21.
12. Rocabado M, Johnstone BE, Blakney M. Physical therapy and dentistry: an overview. *J Craniomandib Prac* 1983; 1: 47-9.
13. Selye H. *The stress of life, 2*. New York: McGraw-Hill, 1976.
14. Sonninen J. The external frame function in the control of pitch in the human voice. *Ann NY Acad Sci* 1964; 155: 68-90.
15. Taddey JJ. Musicians and temporomandibular disorders; prevalence and occupational etiologic considerations. *J Craniomandib Prac* 1992; 10: 242-4.
16. Upledger JE, Vredevoogd JD. *Craniosacral therapy*. Chicago IL: Eastland Press, 1983.
17. Zenker W, Zenker A. Über die regelung der stimm lippenanspannung durch von aussem eingreifende mechanismen. *Folia Phoniatr* 1960; 12: 1-36.

SAMMANFATTNING

När artisten tappar rösten: strukturell obalans och röstproblem hos sångare och skådespelare

Författaren beskriver en undersökning med syfte att fastställa i vilken utsträckning artisters sang- och talröst