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THE FLUTIST'S EMBOUCHURE AND TONE: PERSPECTIVES AND INFLUENCES

by

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CONTENTS

ABSTRACT

A well formed *embouchure* and a good tone quality are vital for any flutist. This study is a detailed guide that includes general information, influences and perspectives on/about *embouchure* and tone for the flutist. Information is provided on how to form a proper *embouchure*, the relation between *embouchure* and tone, the purpose of the *embouchure* and the role of different body parts in a) forming a proper *embouchure* and b) manipulating the *embouchure* whilst playing. The anatomy of the human body and its relation to *embouchure* and tone is discussed. Pictures of the different muscles involved in flute playing, muscles of expression and the anatomy of body parts that influence *embouchure* and tone, are presented. Flute teachers', performers' and students' perspectives on aspects relating to *embouchure* and tone, are provided. Diseases, medical conditions, medicine, physical attributes and infections that can influence *embouchure* and tone are investigated. A discussion of the influences that flute options have on *embouchure* and tone is included. These options include open- or closed-hole, B or C footjoint, materials, wall thickness, split E or E ring, open- or closed-G#, pads, headjoint design and flute scales. There is also a short discussion about *embouchure* on big flutes.

OPSOMMING

‘n Goed gevormde *embouchure* en ‘n goeie klankkwaliteit is van kardinale belang vir enige fluitspeler. Die studie is ‘n gedetaileerde gids, en bevat algemene inligting, invloede en perspektiewe op/oor *embouchure* en klank, vir die fluitspeler. Informasie oor hoe om ‘n goeie *embouchure* te vorm, die verband tussen *embouchure* en klank, die doel van die *embouchure* sowel as die rol wat verskillende liggaamsdele speel in a) die vorming van die *embouchure* en b) die gebruik van die *embouchure* tydens spel, word voorsien. Die anatomie van die menslike liggaam wat verband hou met *embouchure* en klank, word bespreek. Prente van verskillende spiere betrokke tydens fluitspel, spiere van ekspressie en die anatomie van die liggaamsdele wat ‘n invloed het op *embouchure* en klank, word voorgestel. Fluit onderwysers, voordraers en studente se perspektiewe rondom aspekte wat verband hou met *embouchure* en klank, word voorsien. Siektes, mediese toestande, medisyne, fisiese eienskappe en infeksies wat *embouchure* en klank kan beïnvloed, word ondersoek. ‘n Bespreking van die invloede wat fluitopsies op *embouchure* en klank het, is ingesluit. Hierdie opsies sluit in oop- of geslote-opening, B of C voetstuk, materiale, buis dikte, gesplete E of E ring, oop- of geslote-G#, kussings, kopstuk ontwerp en fluittoonlere. ‘n Kort bespreking in verband met *embouchure* op groot fluite word ook ingesluit.

Keywords

Flute
Embouchure
Tone
Lips
Jaw
Tongue
Mouth
Teeth
Muscles
Aperture
Airstream
Headjoint

Sleutelwoorde

Fluit
Embouchure
Klank
Lippe
Kaak
Tong
Mond
Tande
Spiere
Opening
Lugstroom
Kopstuk

List of definitions

Air reed	The airstream, on making contact with the strike edge, acts as a vibrating air "reed".
Airstream	The airstream refers to the stream of air that is needed in order to produce a sound on the flute. The airstream is produced by the flutist and channeled by the *embouchure* toward the strike edge in the headjoint.
Aperture	The hole produced between the lips whilst playing the flute.
Bennett scale	Flute scale invented by flutist William Bennett.
Chimney	The length of the riser is called the chimney.
Cooper scale	Flute scale invented by flute maker Albert Cooper.
Cork	The cork refers to the piece of cork that seals the top end of the headjoint.
Crown	The crown is the screw at the end of the cork.
Embouchure hole	The hole in the mouthpiece of the flute across which the airstream is directed.
Flute scale	There are different flute scales. A specific flute scale consists of a specific combination of distances between tone holes, the size of each tone hole and the shape of each tone hole.
Headjoint	The concert flute consists of three separate parts. The headjoint is the top part and consists of a cork, crown, chimney, mouthpiece and *embouchure* hole.
Headjoint taper	Headjoint taper refers to the taper towards the crown of the headjoint.
Intonation	Intonation is the relative pitch of a note(s) as compared to the accepted norm; e.g. the produced A relative to the pitch to which the flutist has tuned. Concert A is today usually 442 Hz and the musician playing either higher or lower is said to be "out of tune", i.e. has "poor intonation".
Lip-plate	The plate against which the flutist's chin rests.
Mal-occlusion	Mal-occlusion is when there is a deviation from the acceptable relationship between the teeth in the upper and lower arches.

Mechanism	The mechanism consists of rods, posts, springs, levers and keys and is soldered to the top of the cylindrical tube of the flute (i.e. the middle and footjoint).
Mouthpiece	The portion of the headjoint consisting of the lip-plate, riser and *embouchure* hole.
Occlusion	Occlusion is the relationship between the teeth in the upper and lower arches as they come together when the mouth is closed.
Open- or closed-G#	On an open-G# flute the G# and G keys operate independently and on a closed-G# flute they do not operate independently from one another. On a closed-G# flute the in-line G# is duplicated on the side of the tube.
Overcut	Overcut refers to the rounding and shaping of the top sides of the *embouchure* hole.
Pneumo Pro	A tool that is used by flute teachers to teach correct *embouchure*, direction of the airstream, speed of the airstream and position of the headjoint in relation to the *embouchure.*
Riser	The riser is the part of the flute that raises the lip-plate from the tube.
Strike edge	The far edge of the *embouchure* hole, on the side opposite to where the flutist's chin rests.
Teardrop	A term that describes lips where the top lip is shaped with a teardrop shape in the centre. A flutist with a teardrop will need to adjust his/her *embouchure* to direct the airstream on to the strike edge.
Throat tuning	A technique used by wind players where the vocal chords are held in a certain position(s) according to the note(s) being played by the instrumentalist.
Undercut	Undercut refers to the rounding and shaping of the edges on the bottom of the riser.

CHAPTER 1

INTRODUCTION

1.1 Introduction/background and personal motivation

As a flute performer and a teacher experience has taught me that *embouchure* and tone are extremely important aspects of successful recitals, concerts, examinations, participation in competitions and teaching. This is true for any performer, teacher and student of the flute.

No-one is inspired to play or practise the flute when their tone is unattractive, unfocused and airy. This is true for students of any age or at any level. They get demotivated by their unattractive tone quality and might even lose interest in the flute completely.

1.2 Statement of the problem

Teachers, performers and students often lack knowledge on aspects regarding *embouchure* and tone. Many teachers are either not equipped to teach *embouchure* and tone properly or do not allocate enough time during lessons to teach their students these aspects. This results in performers and students not playing with the best possible tone quality.

1.3 The research question

In the light of the above problem, the following research question arises:

- What parameters influence flute *embouchure* formation and hence quality of sound?

Sub-questions that require to be answered are:

- What are the perspectives of teachers and students on the subject of *embouchure* and tone?
- What diseases, medical conditions, medicine, physical attributes and infections influence *embouchure* and tone?

1.4 Aim

The aim of this dissertation is to provide flute teachers with as much information as possible, in a single source, on *embouchure* and tone, and the various aspects that influence them. Then the teacher can use this information to teach students to play with a good tone quality. The information in this dissertation is aimed at broadening the knowledge and perspectives of the modern day flute teacher on the principles of *embouchure* and tone as well as the parameters that influence them, including diseases, medical conditions, medicine, physical attributes and infections.

Teachers can also use the exercises and pictures provided to help students grasp certain information and principles better.

A flutist may find that tone quality differs slightly from day to day. This can be attributed to many influences like muscle fatique, weather, dry lips and too infrequent or no practice, each of which affects, and is affected by *embouchure*. Flutists need to know all the different aspects that influence *embouchure* and tone quality as well as solutions to problems that arise, or even how to take preventative measures, in order to produce the highest possible standard of performance.

To summarize, this dissertation aims to assemble information for the flute teacher, performer and student on aspects, perspectives and influences relating

to *embouchure* and tone on the flute. It also aims to help students play with a good tone quality by providing the teacher with the necessary 'tools' in order to achieve this desired result in as short a time as possible. Advice on diseases, medical conditions, medicine, physical attributes and infections that may affect *embouchure* and tone is also included.

1.5 Chapter sub-division and methodology

Chapter 1 includes the introduction/background and personal motivation. The statement of the problem, the research question and the aim of this dissertation are also included.

Chapter 2 states general aspects and concepts regarding *embouchure* and tone on the flute.

In Chapter 3 the anatomy of the human body in relation to *embouchure* and tone on the flute is discussed. The information in this chapter can be helpful for teachers and students to gain a better understanding of the muscles and other body parts that play a role in flute playing.

In Chapter 4 and Chapter 5 teachers' and students' perspectives on aspects relating to *embouchure* and tone are given. The information was compiled by means of questionnaires and interviews with teachers as well as students. Chapter 4 should be helpful to teachers because they can compare and test their own perspectives with those of other teachers. Chapter 5 shows the perspectives students have on aspects relating to *embouchure* and tone. Teachers can use this information when teaching their own students to help prevent certain misconceptions that students might form.

In Chapter 6 information on diseases, medical conditions, medicine, physical attributes and infections that can influence the flutist's *embouchure* and tone is provided. Flute teachers and performers should familiarize themselves with this information, as the knowledge might be needed to help themselves, a colleague or a student in the future.

In Chapter 7 different flute options and their influence on *embouchure* and tone are discussed.

Chapter 8 includes the summary, conclusion and recommendations.

CHAPTER 2

EMBOUCHURE

2.1 Definition

Any flute teacher will be required to explain to students what *embouchure* is, and will probably state that it is the way a flute player shapes his/her lips to produce a sound on the flute. But when *embouchure* is considered in more detail it will be seen that the above description is inadequate.

In this dissertation, Chapter 3 is dedicated to the anatomy of the human body in relation to tone and *embouchure* on the flute. Here it will be seen that there are a number of muscles, the jaw, the lips, the throat, the chin and even the teeth that are involved in shaping a correct *embouchure*.

Thus, a more detailed definition might be (Westphal 1978:9) “An *embouchure* may be defined as the formation of the performer’s lips with supporting muscles, teeth and jaws in relation to the *embouchure* hole which has to do with tone production”.

The word *embouchure* is a French term, derived from the word ‘bouche’ meaning lips. It is used in English as there is no adequate English word that can replace the French word, *embouchure*. One of the greatest flutists of our time, Sir James Galway, has stated (1990:82): “Certainly the English language has no substitute to offer, so *embouchure* it is, for you and for me”. That is the reason why flutists (and other woodwind players) will probably use this term as long as woodwind instruments exist.

2.2 *Embouchure* and tone

Embouchure and tone are closely integrated terms. These two terms can not be separated, because the 'better' (more correct) the *embouchure* is, the better and more mature the sound (tone) will be.

What is the definition of a good tone being created by a good *embouchure*? When creating a good tone on the flute the tone will have focus. The tone will not be 'airy' but rather have a distinct 'edge' to it. The tone must be round and full over all the range of the flute and the tone (or specific pitch) must be in tune. When a note is in tune the harmonics/overtones are balanced and this helps to shape beautiful notes and overall tone.

2.3 What is the *embouchure* for?

The purpose of the *embouchure* is to channel the airstream through the lips to exactly where it is needed, the strike edge of the *embouchure* hole in the headjoint.

Musical instruments are divided into five different types/categories in respect of sound production. They are: Chordophones (sound produced by a vibrating string), Idiophones (percussion instruments divided into two groups, definite and indefinite pitch), Membranophones (sound produced through the vibration of a stretched membrane), Aerophones (sound generated by a vibrating air mass) and Electrophones (sound generated by means of vacuum valves or semiconductor devices).

The flute falls into the category of Aerophones. Thus air needs to vibrate in the flute (tube) for a sound to be produced. To channel the right amount of air at the best possible angle onto the strike edge of the headjoint would then scientifically give the 'perfect flute sound' (given you play a 'perfect flute'). Thus it can be said

that *embouchure* is directly linked to producing a sound on the flute. For this to be understood, and to get as near as possible to the 'perfect flute sound', it is necessary to explore *embouchure*.

2.4 Lips

2.4.1 Lip formation

There are a few basic 'rules' that help define a good *embouchure*. Here are some of the aspects that are essential for a beginner to know in order to create the correct *embouchure* as early as possible in their flute playing career:

- Function of the lips

  The lips' main purpose is to manipulate the direction and the amount of air passing from the lips.

- Keep the flute parallel with the bottom lip

  If the flute is not parallel to the bottom lip the airstream will not hit the strike edge optimally. The student should be given the opportunity, through guidance and the use of a mirror, to discover the best relative positions of the head, arms and flute.

- The lip aperture should be in the centre of the flute's *embouchure* hole

  The vapour on the far side of the lip-plate will give a visual indication as to whether the air is directed to the centre of the *embouchure* hole or not. Once again students can experiment with the different options. The centred position gives the best quality tone. Nevertheless, there are situations where this centering needs to be modified (see Chapter 4.5.2).

- Amount of *embouchure* hole covered

The amount of the *embouchure* hole that needs to be covered with the lips will vary between ¼ to almost ½ depending on the student's attributes and the register.

If a student covers too much of the *embouchure* hole the tone will get thin, the intonation will tend to be flat and the dynamic range small. Unfortunately, students easily pick up that by using this method less air is required.

If the student does not cover enough of the *embouchure* hole the tone will get breathy and thin. The intonation will be sharp and the dynamic range small. The high register (3rd octave) notes will also be difficult to produce.

- Lip opening

The opening between the lips will vary, depending which register is being produced.

For the low register an oval shape aperture is required. The high register will require a smaller and rounder aperture.

To feel and see the way the lips are manipulating the aperture through different notes and registers, playing scales while looking in a mirror is suggested. It will be found that there are minute changes for almost each note. Also see Chapter 2.11 for a more detailed discussion.

Low Register

High Register

- Placement of the lip-plate

  As a guideline, the placement of the lip-plate against the bottom lip should be just underneath the red part of the lip.

  The size, shape and thickness of the lips will play a role in the actual placement.

2.4.2 Size and shape of the lips

The size and shape of the lips does play a role in where the flute should be positioned on the bottom lip. If one has thick lips the flute will have to be placed higher up on the bottom lip, and lower for a thin bottom lip.

Will the size of an individual's lips determine whether he/she will have a good or bad *embouchure* and hence a good or bad tone? It is a common misconception that thick lips or thin lips will have a negative influence on the overall sound. But I have personally seen flute players with different sizes and shapes of lips producing beautiful and warm sounds. It is rather a question of how to accommodate the size and shape of your lips to your own *embouchure*.

2.5 Jaw

2.5.1 Direction of the airstream

There is a definite interaction between the lips and the jaw. This interaction between the lips and the jaw plays an essential role in the shaping of a good *embouchure* because it is largely responsible for directing the airstream to the desired place. That is, in turn, important for the influence and affect it has on pitch as well as on the volume of sound.

In general terms, if the airstream is directed more into the flute this will make the pitch lower and the dynamic louder. If the airstream is directed higher this will make the pitch higher and the dynamic softer.

2.5.2 Physical attributes of the jaw

There are cases where the structure of the jaw deviates from the normal, i.e. when the relationship between the two parts of the jaw is disproportionate. This can affect the *embouchure* of a student quite dramatically.

Also see Chapter 3.2, Chapter 4.5.3 and Chapter 6.4 for more information and discussions on the jaw.

2.6 Tongue

If one wants to retain the best quality of sound on the flute one needs to keep the tongue at the correct place at all times. The tongue is used to articulate (also called tonguing) notes as indicated on the sheet music.

While tonguing, the tongue stops the flow of the airstream before the start of each note. After the note has been articulated (the airstream released by the tongue), the note must still sound for the remainder of its value. The tongue has to move to a different location inside the mouth so that the air can travel from the lungs, to the lips and onto the strike edge of the flute.

This movement of the tongue can influence the tone negatively. While tonguing, the tongue should move up and down rather than back and forth. The reason for this being that when the tongue is moving forward and backwards, it can cause a slower tongue action and make the sound less focused.

Students must be sure not to move the lips and jaw while articulating as this will influence the tone negatively. It is helpful to practise in front of a mirror to ensure that the jaw and lips don't move because of the tongue moving inside the mouth. One should be careful not to use the whole tongue when articulating because this will result in jaw movements. Only the front part of the tongue should be used for effective articulation as that does not influence the *embouchure*. For double and triple tonguing the middle part of the tongue will also be used in conjunction with the front part of the tongue.

2.7 Teeth

The physical attributes of our teeth can influence tone quality. Teeth are considered normal when they are straight and the maxillary (upper) teeth naturally rest on the mandibular (lower) teeth or if the maxillary teeth slightly overlap the mandibular teeth (Wilkins 1999:255). Sometimes we get deviations from the normal teeth mentioned above. See Chapter 4.5.1 and Chapter 6.3.2 for more information.

2.8 Throat and oral cavity

What is the role played by the throat and oral cavity when playing the flute? Basically, the throat and oral cavity serves as a channel for air to pass from the lungs until it reaches our lips where it is needed to create the air reed that produces sound on the flute. But there are also other aspects that need to be considered:

2.8.1 Vibrations in the throat and oral cavity

When air is blown through the lips into the flute it hits the far edge of the lip-plate (the strike edge). The vibrations that are created then travel down the tube, but also back into the player's oral cavity and throat. This is possible because the

airstream is travelling a lot slower than the vibrations that are travelling at the speed of sound. This results in the player actually becoming part of the instrument (Boulton 2006:4).

The size of our throat (the physical size and to what extent we open it) will have an affect on the air and the vibrations travelling through the inside of our mouth and throat. The conclusion that can be drawn from the above is that the size and shape of our throat and oral cavity will have an influence on our overall tone quality.

2.8.2 Size and shape of the throat and oral cavity versus tone quality

Is it possible to find or work out to what extent the throat structures (throat structures include the *trachea*, *esophagus*, *epiglottis* and tonsils, all of which are detailed in Chapter 3) and the oral cavity influence a flute player's sound? The size of the oral cavity, as well as the length of the *trachea,* differs between human beings. To what extent will differences like these influence tone quality?

To analyse each individual's throat and oral cavity would be possible. However, differences between individual tone qualities can not derive solely from the attributes of the throat and oral cavity. There are many factors that can influence a flute player's tone quality, for example: vibrato, articulation, intonation, attributes of the lips and the jaw, attributes of the face muscles and the individual's teeth, tension, the type of flute being played on, the angle and the volume of air hitting the strike edge. If all of the above-mentioned factors could be eliminated, then an experiment could be done on the influence that the size and shape of the throat and oral cavity have on tone quality.

In Chapter 2.8.1 it was stated that the size and shape of the throat and oral cavity will have an influence on the overall sound. Unfortunately it is not possible to eliminate all of the above-mentioned factors in such an experiment. Therefore it

is very difficult to determine to what extent the size and shape of the throat structures and oral cavity influence tone quality.

The other aspect making it difficult to answer the questions stated in the beginning of Chapter 2.8.2 is that most of these differences between the sizes and shapes of the human throat and oral cavity are not visible to the human eye. Technology like x-rays and sonars is necessary to study these differences.

2.8.3 Open throat and 'throat tuning'

If the flute is played with a tight throat the result is a very thin sound (usually with a fast vibrato). Playing with an open throat gives a much better sound and the vibrato can also be controlled better (Dick 2007:11).

Robert Dick (1997:10) is the acknowledged expert on a concept he calls 'throat tuning'. He says: "For all wind and brass players, not just flutists, that resonance comes from the throat more than the mouth. If you hold your vocal chords in a position where they are ready to sing the note you are playing, you will maximize this resonance". He further states that to understand and exercise 'throat tuning' it is necessary to play the desired note first and then sing the same note thereafter (not necessarily in the same octave). Next one practices playing and singing the desired note simultaneously. When single notes have been mastered one then continues on to short phrases. Also see Chapter 4.6.1.

2.9 Cheeks

A flute player's cheeks should not be puffed up but rather loose and relaxed. By keeping them loose and relaxed the sound will be improved. The puffing up of cheeks is a very common mistake with beginners so it is important for teachers to be on the lookout for this specific problem.

The only time a flute player needs to puff up his/her cheeks is when using circular breathing (Dick 1987:12). What basically happens is that a volume of air is stored in the cheeks, and blown out while quickly inhaling through the nose. Circular breathing and its influence on *embouchure* is discussed in Chapter 4.13.7.

2.10 Dynamics

Dynamics are governed by unique combinations of the volume of air being exhaled and the speed of the airstream, all of which require *embouchure* control.

2.10.1 The influence of dynamics on the size of the aperture

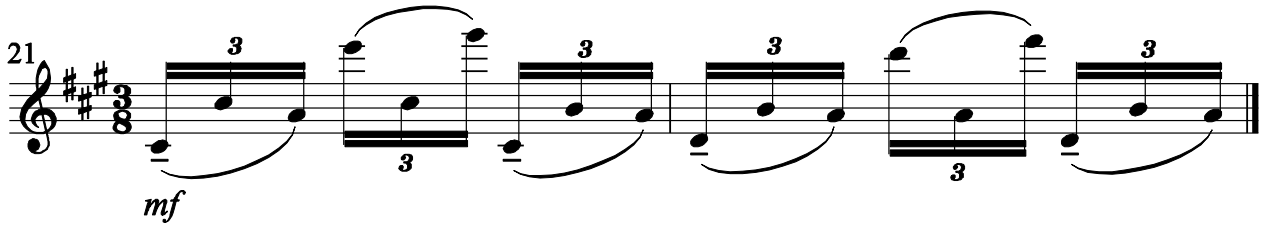
The size of the aperture needs to change according to the desired dynamic. For louder dynamics the aperture needs to be larger and for softer dynamics it needs to be smaller.

2.10.2 Dynamics and registers

The flute has a natural built-in difference of dynamics between registers. In the low register it is easy to play softer (*p* & *pp*) and in the high register louder (*f* & *ff*).

This situation will be especially audible in beginner's flute playing. The beginner has not yet learned the different techniques that compensate for this natural tendency for dynamic differences between the registers. The following music example illustrates this tendency:

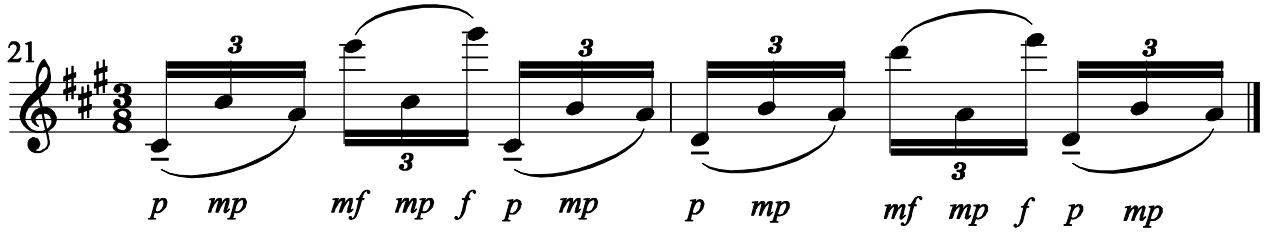
Example A:



Theobald Böhm, *Tempo di valse* mm. 21-22 from Graded Studies for flute Book 2 by P. Harris and S. Adams.

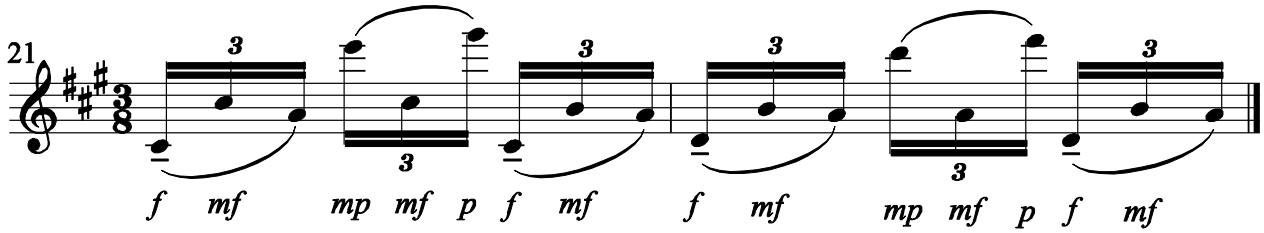
If this passage is played without any compensation for the flute's natural dynamic tendencies, it will sound as shown in Example B.

Example B:



To play this passage musically it is necessary to compensate for the flute's tendencies. Example C shows suggested dynamics that a flutist should attempt in order to compensate for the flute's natural dynamics as shown in Example B.

Example C:



In order to obtain the desired result our *embouchure* needs to change with complex interactions between the lips, jaw, direction of airstream, air speed and the amount of air used for each note.

2.10.3 *Crescendo*

When creating a *crescendo* the following aspects need to be considered. The air pressure needs to be increased during a *crescendo*. The opening between the lips should gradually get bigger for the volume of air to increase and hence produce a louder dynamic. The flute's natural tendencies result in the pitch rising as this occurs. In order to compensate for this the top lip should gradually move from a relaxed position to a more stretched position and the jaw needs to move in a downward direction during the *crescendo*.

2.10.4 *Decrescendo*

To create a *decrescendo* it is necessary to reverse the above procedure. The aperture size needs to get smaller during a *decrescendo*, the top lip should change from a stretched position to a more relaxed position and the jaw will move upwards. The air pressure must still be manipulated carefully. For a *decrescendo* the air pressure must not decrease too much but needs to be relatively constant and sustained until the end of the phrase, otherwise notes in the middle and upper registers may well descend to the fundamental.

2.11 *Embouchure* movement versus abdominal support

Michel Debost (2007:4) suggests that we do not focus on the lips and the jaw to produce different intervals on the flute. The reason for this is that when playing a fast passage, like the example in Chapter 2.10.2, there is not enough time to make big changes with the lips and the jaw. Obviously, intervals bigger than an octave require some changes in *embouchure* to be made.

He suggests that the flutist rather focuses on changing the air speed. With proper abdominal support (see Chapter 3.6) and the correct air speed for the desired note(s), fast passages will be played more successfully (with more control over the sound) than trying to change the lips and jaw constantly. Debost (2007:4) sums up his opinion by saying that "I do not think a tone concept based on *embouchure* will work in the long run".

In an article by Alexa Still (2008:19) she says that flutists that play using large *embouchure* changes could easily encounter a problem such as focal dystonia (see Chapter 6.2.4 for more information on focal dystonia) and should rather focus on correct use of air speed and direction. She goes on to say that the *embouchure* is a relatively small area to be solely responsible for creating all the different tone colours. Her solution is similar to that of Debost: "I work with students to use their torso's air control and body resonance to help craft vibrato and tone colours".

Some flute teachers say that there should be a different *embouchure* position for every note. If we compare this statement with what Debost and Still are saying these opinions are contradictory. In my opinion *embouchure* and air control are both important in finding the best end result. We must know what our lips and jaw are doing, while focusing our attention on air control.

CHAPTER 3

ANATOMY OF THE HUMAN BODY IN RELATION TO EMBOUCHURE AND TONE ON THE FLUTE

As with most of the information in this chapter, the information is in the public domain and has been sourced from, and checked against, a variety of sources. On this account, not every fact has been referenced. Nevertheless, all sources appear in the list of sources.

The human body is a very interesting and complex field of study. Today we get specialists in almost every different part of the body, for example: neurologists (who study and treat diseases of the nerves), dermatologists (who study and treat skin diseases). Musicians are able to study all the different parts of the body that have an influence on performance because of the large amount of information available.

If a student understands his/her body it can help with developing better posture, improving technique and the shaping of a good (correct) *embouchure*. This is what Pearson (2002) call 'body mapping' for flutists.

In the forthcoming discussion figures 3.1 to 3.35 are taken from a variety of sources; these are noted below each figure.

3.1 Muscles

To play the flute different muscles from the hands, arms, face, neck, torso and shoulders are obviously used. But gluteal muscles, intercostal muscles, abdominal muscles and even muscles from the back play a role in a flutist's performance. In order to understand the various muscles involved, it is necessary to briefly discuss some of the characteristics of human muscles.

There are more than 500 muscles in our body and these contribute more or less 40% to our body weight. There are three types of muscles (Anthony & Thibodeau 1980:63): skeletal muscles, nonstriated muscles and cardiac muscles.

* Skeletal muscles

The most important characteristic of skeletal muscles is that they connect to a bone (usually two bones). Anatomy books (e.g. Kendall 1983:238 and Anthony & Thibodeau 1980:63) cite the terms *origin* and *insertion*. These two terms refer to the places where the muscles are connected to the different bones in the human body. The muscle's *origin* will be the connection to a bone that is more fixed or still, and *insertion* to a bone that is more mobile.

Usually these muscles contain cells with connective tissue in between. We also get a layer of tissue, called the *fascia* that is around the muscle.

Skeletal muscles are also called voluntary or striated (striped) muscles. The reason for them being called voluntary muscles is the fact that skeletal muscles' actions can be controlled voluntarily (Anthony & Thibodeau 1980:62). From a flute player's perspective, we are most interested in these muscles because they can be controlled.

* Non-striated muscles

These muscles are also called smooth or involuntary muscles. Non-striated muscles are called smooth because of their smooth appearance, and involuntary because we can not control their actions directly by will (Anthony & Thibodeau 1980:63).

* Cardiac muscles

The only organ with cardiac muscles is the heart. The three different types of muscles are shown on page 3-3.

Skeletal muscle | Non-striated muscle | Cardiac muscle

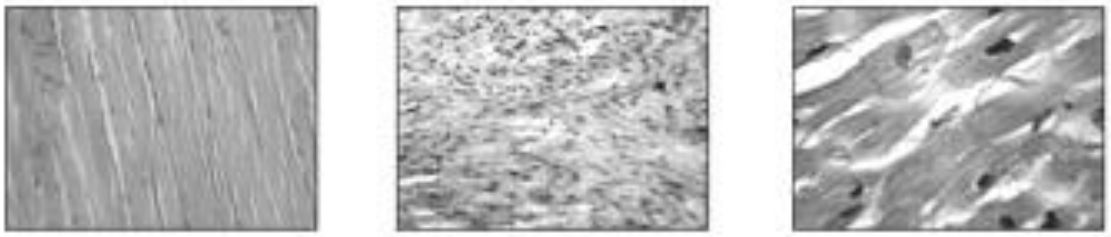


Figure 3.1
Muscle (2009)

Muscles are connected to bones with tendons. Tendons are very strong and will not tear easily.

3.1.1 Superficial muscles of the face (head)

The term 'superficial muscle' refers to the outer layer of muscles, while the muscular structure of the body includes many 'deeper' muscles.

The muscles of the face are the muscles that directly influence every individual's *embouchure*. The names of the major structures are illustrated and discussed hereafter. The head consists of 39 muscles in total.

The muscles of the face that are shown in Figures 3.2 and 3.3 are; *frontalis*, *orbicularis oculi*, *zygomaticus minor*, *zygomaticus* major, *buccinator*, *orbicularis oris*, *depressor anguli oris*, levator labii superioris, levator anguli oris, *risorius*, *masseter, depressor labii inferioris* and the *mentalis* muscle. The others are from the neck and shoulder and will be discussed later.

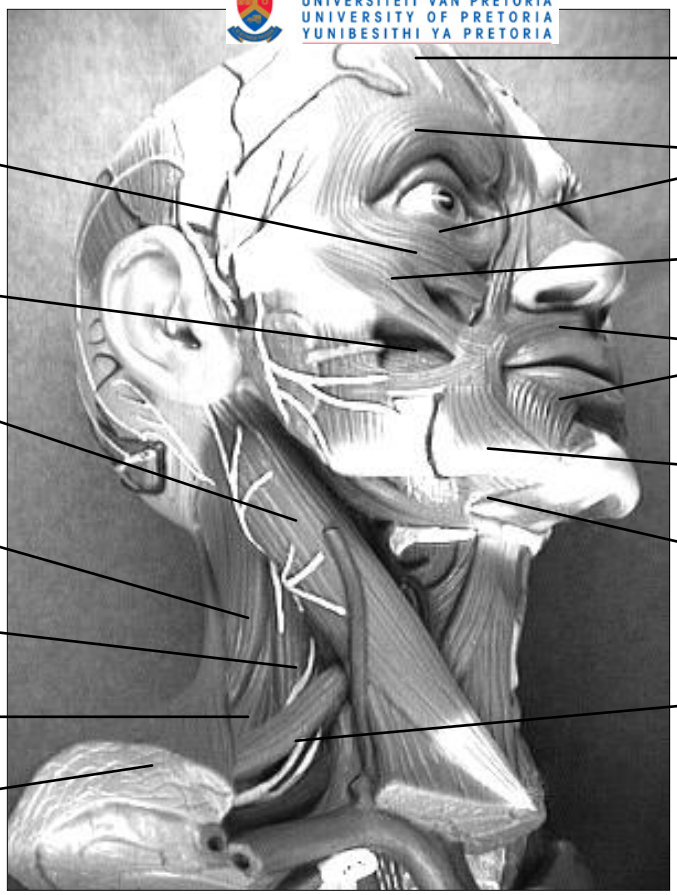


Figure 3.2
Crimando (1999)

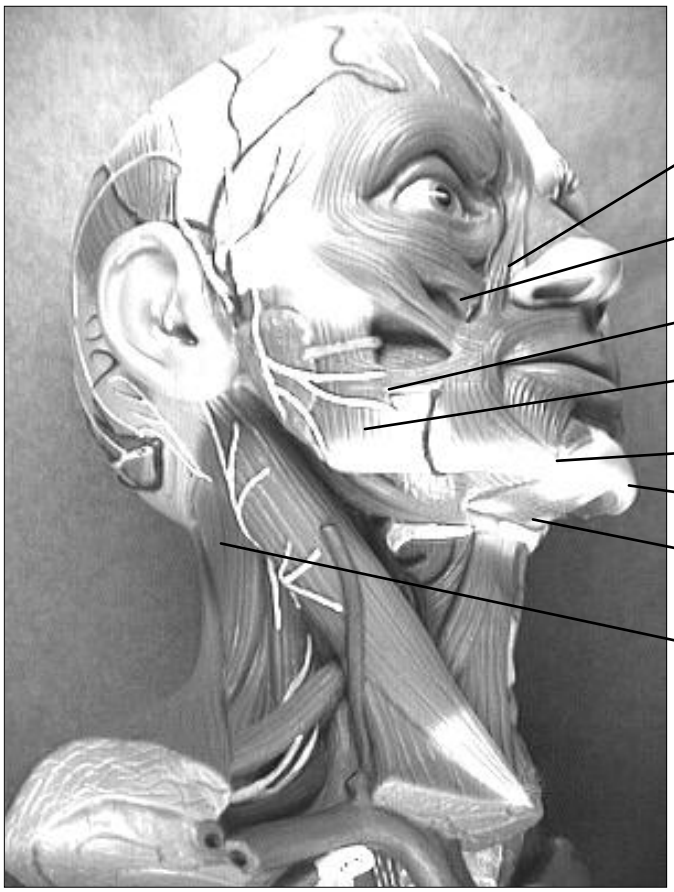


Figure 3.3
Crimando (1999)

The *Grant's Atlas of Anatomy* (Anderson 1983:7-15B) refers to these muscles as "muscles of expression". All the face muscles of expression are skeletal muscles. It is these muscles that are especially important to the flute player. Also see *Muscles, testing and function* (Kendall 1983:240-244).

Muscles of expression (detailed descriptions are included directly following figures 3.4 to 3.13):

Orbicularis Oris

Close the lips and protrude them forward as in whistling.

Figure 3.4
Tolsma (2009)

Zygomaticus Major

Draw the angle of the mouth upward and outward as in smiling. .

Figure 3.5
Tolsma (2009)

Levator Anguli Oris

Draw the angle of the mouth upward creating a furrow to the side of the nose. Expression is similar to that of sneering.

Figure 3.6
Tolsma (2009)

Depressor Labii Inferioris and Platysma

Draw the angle of the mouth downward and outward, and tense the skin over the neck area. The platysma muscle is shown in Figure 3.14.

Figure 3.7
Tolsma (2009)

Buccinator

Press the cheeks firmly against the teeth. The angle of the mouth should be pulled back. This is a lot similar to blowing a trumpet.

Figure 3.8
Tolsma (2009)

Depressor Anguli Oris

The angles of the mouth should be drawn downwards.

Figure 3.9
Tolsma (2009)

Risorius

The angles of the mouth should be drawn backwards.

Figure 3.10
Tolsma (2009)

Mentalis

Protrude the lower lip similar as to when pouting. The skin over the chin should be raised.

Figure 3.11
Tolsma (2009)

Masseter

Bite firmly (teeth must be clenched).

Figure 3.12
Tolsma (2009)

Levator Labii Superioris

Protrude and raise the upper lip in order to show the upper gums.

Figure 3.13
Tolsma (2009)

Some of the muscles will now be discussed for a better understanding of their function (the following information in Chapter 3.1.1 is taken from Andersen 1983:7-15A, Kendall 1983:241-244 and Facial Muscles 2008):

The upper lip is called the *labia superfluous entafada* and the lower lip the *labium inferius*. The *orbicularis oris* muscle is the muscle around the upper and lower lip as shown in Figure 3.2. Generally, many flutists and teachers concentrate only on the lips (the *labia superfluous entafada* and the *labium inferius*) for

embouchure purposes. Teachers should help students understand the function of the *orbicularis oris* in shaping the correct *embouchure*.

The way a flutist shapes his/her lips (*labia oris*) together with the *orbicularis oris* muscle, similar to "clown" lips (Pearson 2002:68), is vital to *embouchure* refinement. The *orbicularis oris* is a sphincter muscle. A sphincter is a structure consisting of a circular muscle. There are more than 40 sphincters in the human body and some of them are microscopic in size. This muscle is used by all woodwind and brass players.

The *zygomaticus* muscle is used when a person smiles to raise the corners of the mouth. To create a correct *embouchure* on the flute it is necessary to draw the lips horizontally (sideways). Smiling and forming an *embouchure* on the flute are very similar because in both cases the corners of the mouth are moved by the *zygomaticus* muscle (see Figure 3.5).

The *depressor labii inferioris* muscle's action is to help depress the bottom lip (see Figure 3.7).

The *buccinator* muscle's action is to pull back the corners of the mouth. This will result in the cheek area flattening (see Figure 3.8).

The *depressor anguli oris* muscle is the muscle associated with frowning (see Figure 3.9). It is also called the *triangularis* muscle.

The other muscle also associated with smiling is the *risorius* muscle. This smile would not involve the skin around the eye, so it's a softer type of smile (see Figure 3.10). The bigger smile will involve the *zygomaticus* muscle as mentioned above.

The *mentalis* muscle is a face muscle situated at the tip of the chin. It is responsible for the upward movement of the lower lip and this causes a wrinkling of the chin (see Figure 3.11). The emotions associated with the movement of this muscle are doubt or displeasure.

There are four muscles that work together in the process of mastication. Mastication is the process of chewing food before it goes to the stomach for digestion. In Figure 3.3 one of these muscles is shown, the *masseter* muscle (also see Figure 3.12). The other three muscles (not superficial muscles, but deeper muscles) that are involved in mastication are; *temporalis*, *medial pterygoid* and the *lateral pterygoid* muscles.

These are the primary muscles that are used to shape all individual *embouchures*. Other facial muscles do contribute to this process, but to a lesser extent.

3.1.2 Superficial muscles of the neck and the shoulders

The reason for discussing other muscles of the human body that are not directly responsible for a sound being produced by a flute player, is the fact that many flute players (especially young students) tend to tense certain areas, especially the neck and the spine. Tension in various parts of the body will influence the flexibility and tone.

Tension can be caused by, for example, bad posture. Some young beginners try to use the left shoulder to support the flute, so that it feels more secure in their hands. This can cause tension in the shoulder and neck area.

Another cause of tension is stiffening up when trying to play *fff* or *ppp*, through trying to use other body parts (for example the neck) to get the desired results (*fff* or *ppp*). A tensed neck or shoulder will adversely influence tone quality.

The neck muscles shown in Figures 3.2 and 3.3 are; *sternocleidomastoid*, *digastric*, *omohyoid*, *mylohyoid*, posterior *scalene*, middle *scalene*, *levator scapulae*, *trapezius* and *splenius capitus*. A human has 42 muscles in the neck.

The *digastric* muscle's action is to open the jaw (called *digastric* because it has two muscular bellies). This action is important in breathing (breathing through the mouth and not the nose), and also when playing the flute. After each breath the *embouchure* must be newly formed for the next set of notes. So, the *digastric* muscle plays an important part in playing the flute because it is used so often (Digastric Muscle 2007).

The *trapezius* muscles are named *trapezius* as the two *trapezius* muscles together form the shape of a trapezium. These muscles form part of the neck, shoulder and back muscles.

Another muscle that forms part of the neck muscles is the *platysma* muscle shown in Figure 3.14. This muscle is associated with expressions of surprise, fright or a frown. Also see the muscles of expression in Figure 3.7.

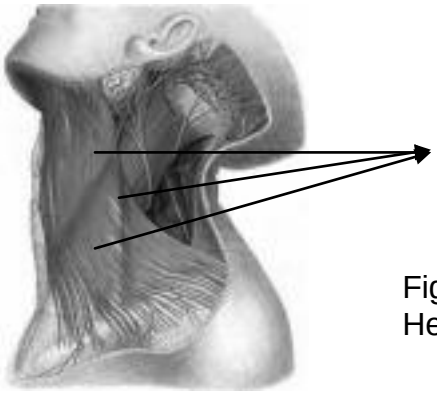


Figure 3.14
Health and Medicine on Squidoo (2008)

The muscles of the shoulder shown in Figures 3.15 and 3.16 are; *supraspinatus*, *deltoid*, *infraspinatus*, *teres* and *subscapularis*. The *trapezius* muscle that forms part of the shoulder is not included in these pictures, but can be seen in Figures 3.2, 3.19 and 3.20. Figure 3.15 shows the anterior shoulder and Figure 3.16 shows the posterior shoulder.

Anterior shoulder and upper arm

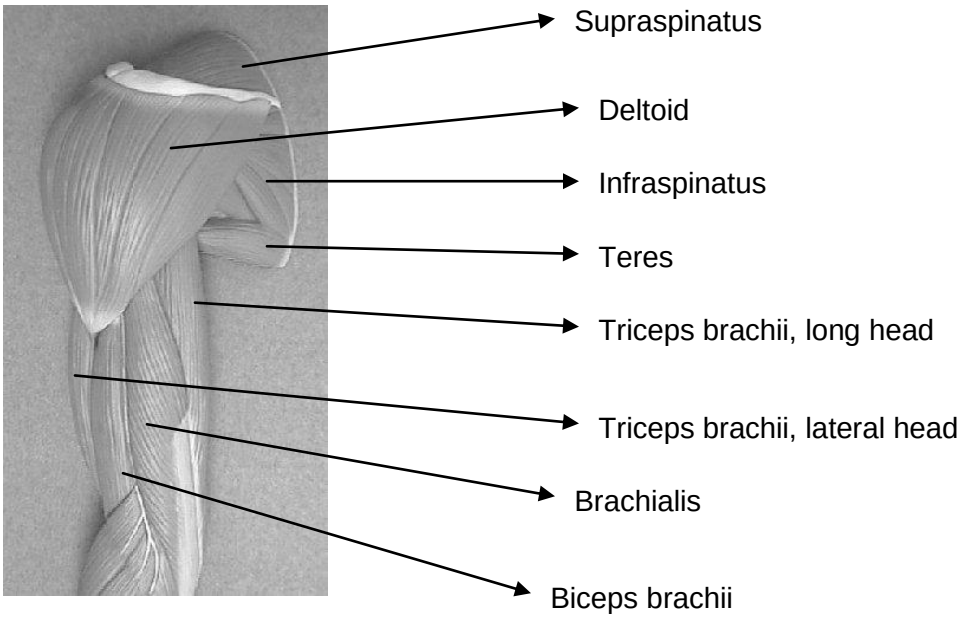


Figure 3.15
Crimando (1999)

Posterior shoulder and upper arm

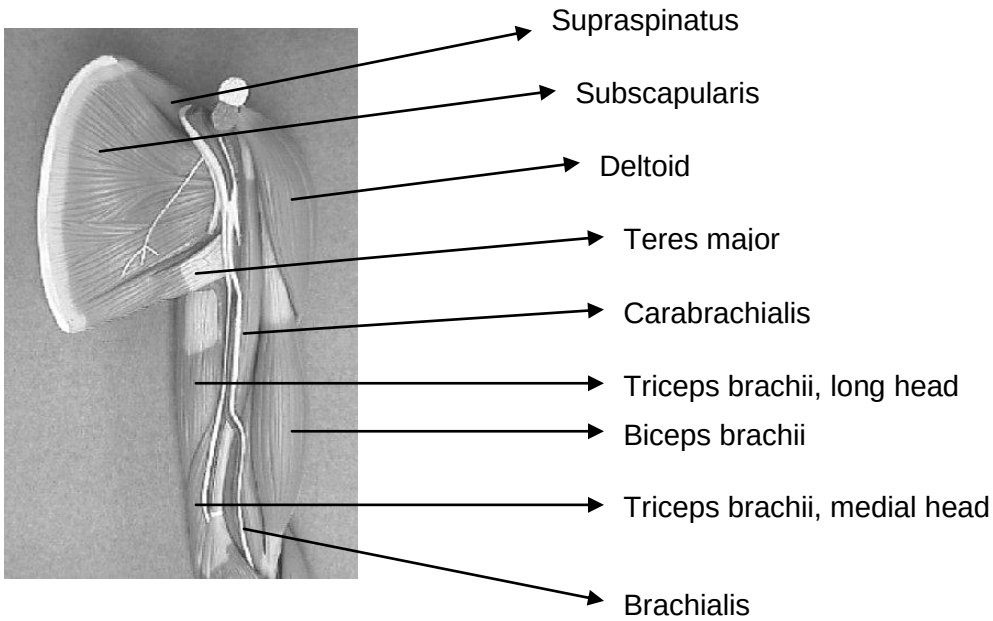


Figure 3.16
Crimando (1999)

3.1.3 Superficial muscles of the arms and the hands

The muscles of the arms and hands also play a role in the overall flexibility of the flute player. In my experience tension in one hand can spread to the shoulder or neck muscles and then have an impact on the actual sound being produced.

The muscles of the human arm are: *triceps brachii*- long head, *triceps brachii*- lateral head, *brachialis*, *biceps brachii*, *carabrachialis*, *triceps brachii*- medial head, *pronator teres*, *flexor corpi radialis*, *flexor corpi ulnaris*, *palmaris longus*, *brachioradialis*, *flexor digitorum superficialis*, *anconeus*, *extensor carpi radialis longus*, *extensor digitorum*, *extensor corpi ulnaris*, *extensor carpi radialis brevis*, *abductor pollicis longus* and *extensor pollicis brevis*. They are all shown in Figures 3.15, 3.16, 3.17 and 3.18.

Anterior arm

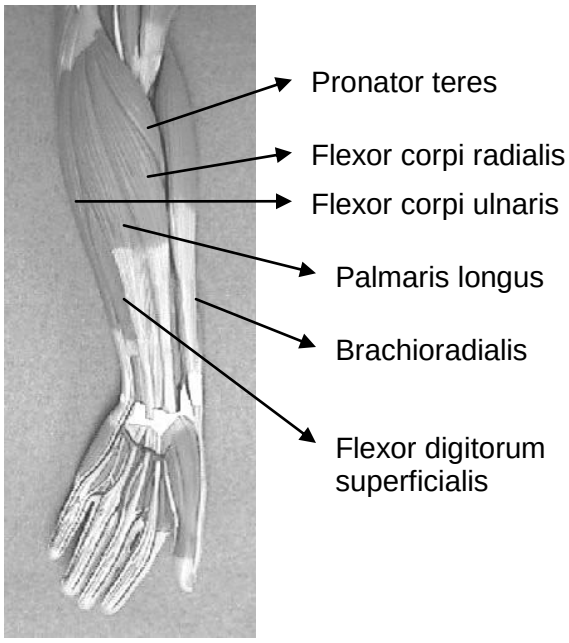


Figure 3.17
Crimando (1999)

Posterior arm

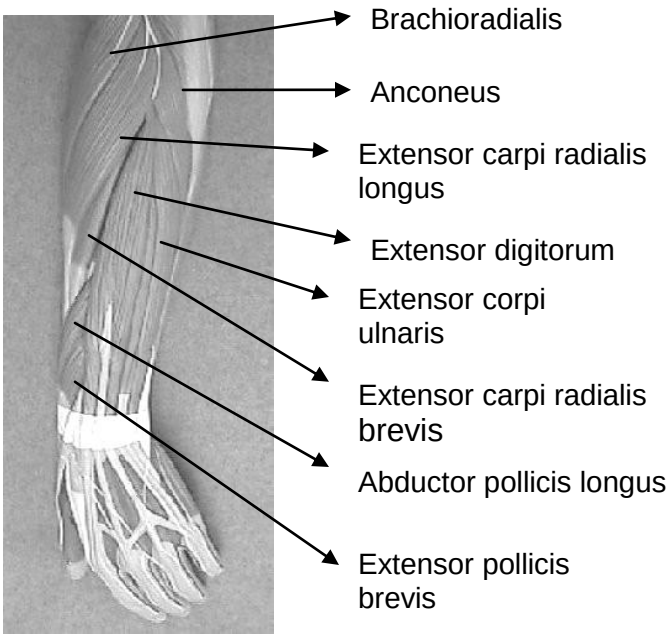


Figure 3.18
Crimando (1999)

3.1.4 Superficial muscles of the torso

Posterior

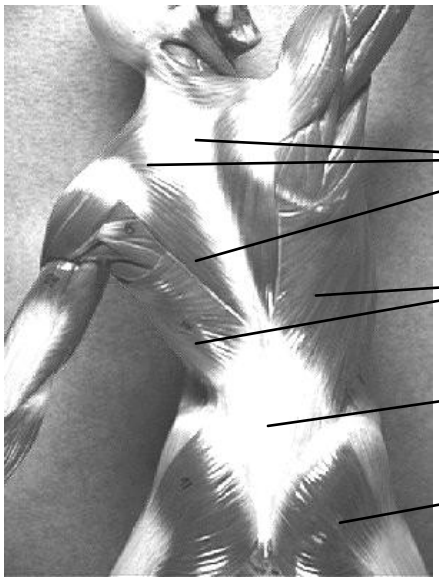


Figure 3.19
Crimando (1999)

Anterior

Figure 3.20
Crimando (1999)

The muscles shown in Figures 3.19 and 3.20 are: *trapezius*, *latissimus dorsi*, *gluteus maximus*, *pectoralis*, *deltoid*, *serratus*, *eternal* and abdominal muscles.

The *latissimus dorsi* muscles are very important in a flute player's posture. Of all the back muscles, the *latissimus dorsi* has the biggest influence regarding arm movement. The *latissimus dorsi* are attached to the upper arm bone called the *humerus* and are responsible for movements of the shoulder joint as well (Pearson 2002:59).

The large triangular shape muscle from the posterior upper torso is called the *trapezius* muscle. This muscle is responsible for a variety of actions: a) pulling the shoulder blades down, b) drawing the shoulder blades closer to the spine and c) lifting the shoulders. This muscle is usually one of the first muscles to exhibit pain when there is tension in the neck (Pearson 2002:59).

Importantly, muscles that are too tight can put pressure on nerves as well as blood vessels. According to Pearson (2002:58) this can cause reduced sensation and occasional numbness.

3.2 Jaw

The human jaw has two separate bones called the lower jaw (mandible) and the upper jaw (maxilla). For flutists the jaw can help to shape *embouchure* nuances when used in the right relation with the lips. Figures 3.21 and 3.22 show the human jaw.

The jaw can move in three different ways: back and forth, up and down, and from side to side (Bupa 2008:1).

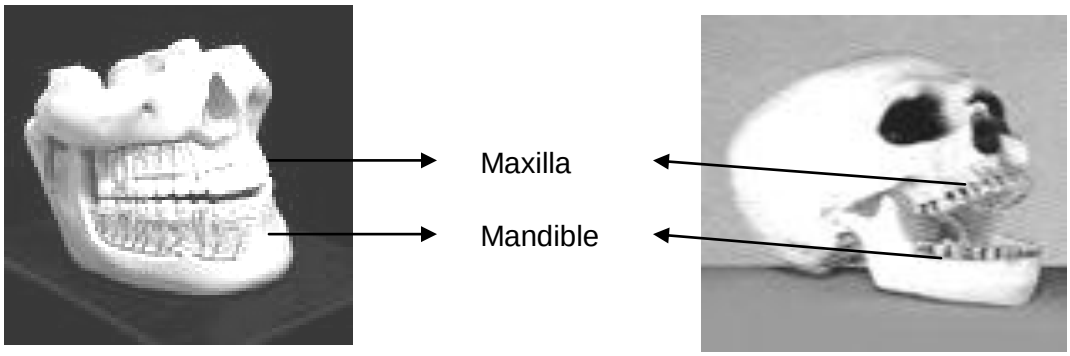


Figure 3.21
University of Saskatchewan (2008)

Figure 3.22
911COSTUMES.COM
(2008)

3.3 Tongue

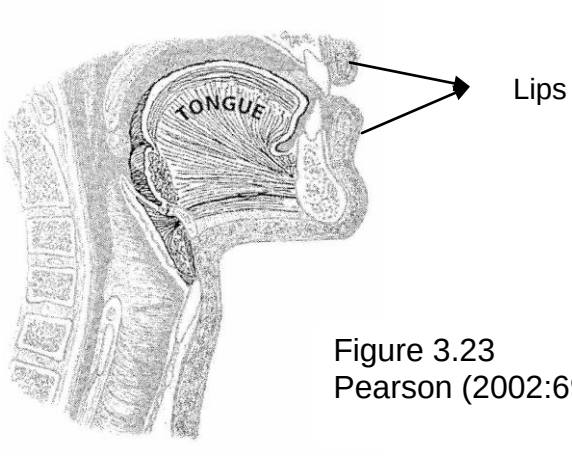


Figure 3.23
Pearson (2002:69)

Figure 3.23 depicts the shape and appearance of the human tongue. The tongue is made up of different muscles and is not only one muscle. Because the tongue consists of many muscles it has the ability to be very agile (Pearson 2002:69).

3.4 Throat and mouth

As mentioned in Chapter 2.1 the throat also plays a role in our tone production. The throat and the mouth act as resonance for the sound (see Chapter 2.8.1) and therefore it is important to understand the size and shape of the cavities in our mouth and throat.

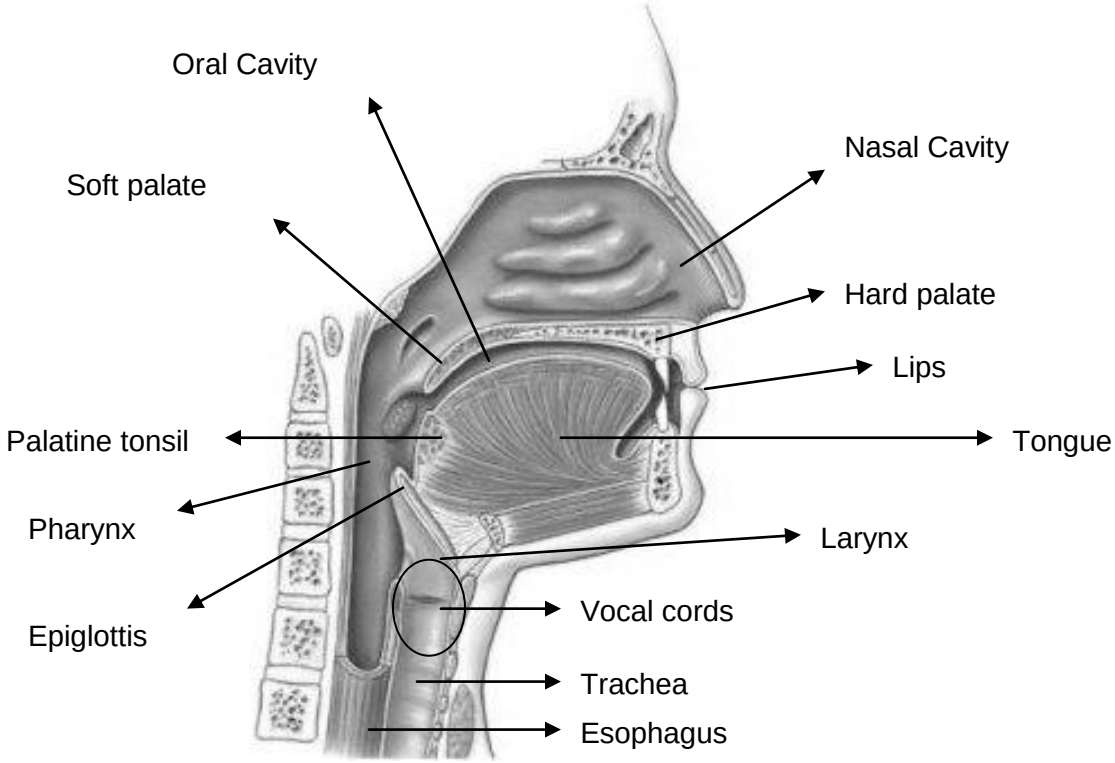


Figure 3.24
Reynolds (2005)

Some of the parts shown in Figure 3.24 are discussed below, for a better understanding of their function; all information has been obtained from *Structure and function of the body* (Anthony & Thibodeau 1980:173-195).

The hard palate is made of bone and the soft palate is composed of muscles. The soft palate's main purpose is to separate the part of the throat behind the nose from the oral cavity. Hanging from the soft palate is the uvula. Figures 3.25 and 3.26 show the oral cavity with uvula (note that there are no tonsils in Figure 3.25).

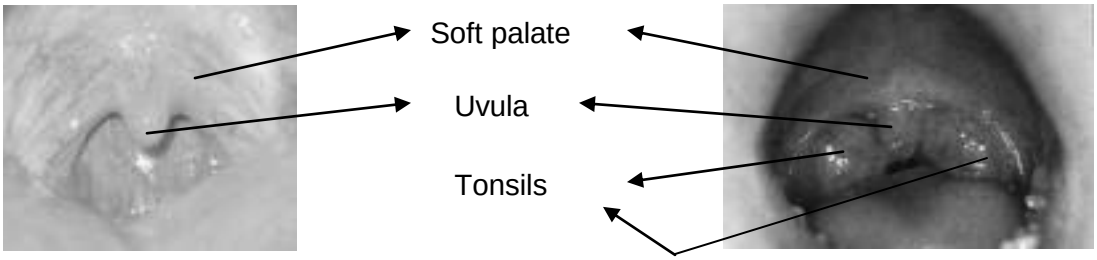


Figure 3.25
Karma (2007)

Figure 3.26
Thompson (2008)

The *pharynx* is located behind the nasal cavity as well as behind the mouth (oral cavity). Because of its location, food and air must pass through the pharynx and therefore it plays a role in the respiratory as well as digestive processes.

The *esophagus* or food pipe connects the *pharynx* with the stomach and is about 25cm long.

The *larynx* (voice box) is located underneath the *pharynx* as shown in Figure 3.24. It is composed of different parts including the thyroid cartilage (better known as the "Adam's apple"), *epiglottis* and the vocal cords.

The vocal cords play an important role in what flutists call "throat tuning". "Throat tuning" helps to maximize the resonance inside the mouth and throat cavities. This is discussed in detail in Chapter 2.8.3 and Chapter 4.6.1. Also see Figure 3.28.

Muscles within the *larynx* can manipulate the vocal cords so that they are either tense and short or relaxed and long. When they are tense our voice will make a high pitched sound and when they are relaxed our voice will make a low pitched sound.

The *trachea* is a tube of more or less 11 centimeters and serves as a passageway for air that is inhaled, then moving through the *trachea* into the lungs. This passageway must stay open in order to facilitate breathing. Figures 3.27 and 3.31 also show the *trachea*.

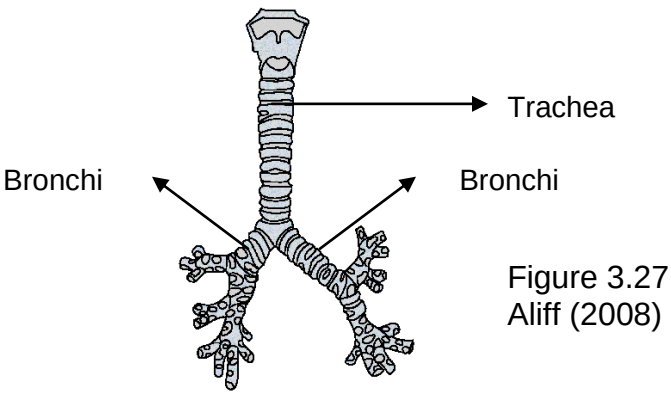


Figure 3.27
Aliff (2008)

The *epiglottis* is a flap that covers the entrance of the *glottis* (*trachea*). The *glottis* is the opening between the vocal cords, see Figure 3.28. The *epiglottis* closes the *glottis* so that food does not enter the *trachea* (Aliff 2008).

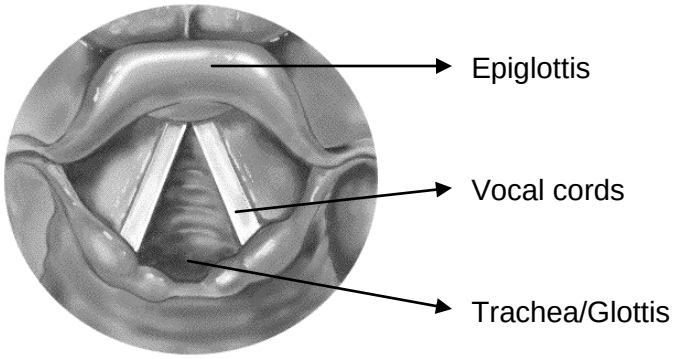


Figure 3.28
Aliff (2008)

3.5 Sternum

The sternum is a long and flat bone that connects to the ribs. It also helps to protect organs like the lungs and heart.

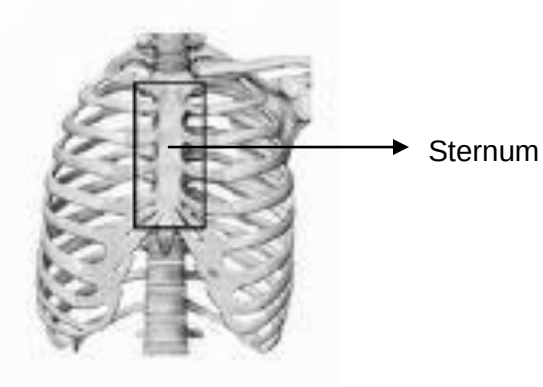


Figure 3.29
Consumer Health Information Network (2008)

Immanuel Dannenbring (2008:8), practitioner of Chi-Kung (Chinese system of energy cultivation), says it is important to rather release air from the sternum than pushing it out from the abdomen.

3.6 Abdomen

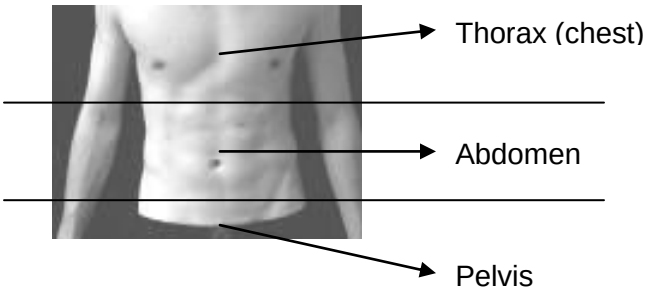


Figure 3.30
Medical Gross
Anatomy (2000)

The abdomen is the part of the human body below the *thorax* (chest) and above the pelvis (bone structure at the bottom end of the spine). The diaphragm, intercostal muscles and abdominal wall muscles all form part of the abdominal area and play a major role in proper breath support when playing the flute (Pearson 2002:73).

Considering the importance that the breath and breathing have on tone, the following quote states this interaction clearly (Stevens 1967:18): “More than any other physical factor in flute playing, the quality and projectivity of tone depends on the player’s ability to use and control his wind to the utmost”.

3.6.1 Thoracic diaphragm

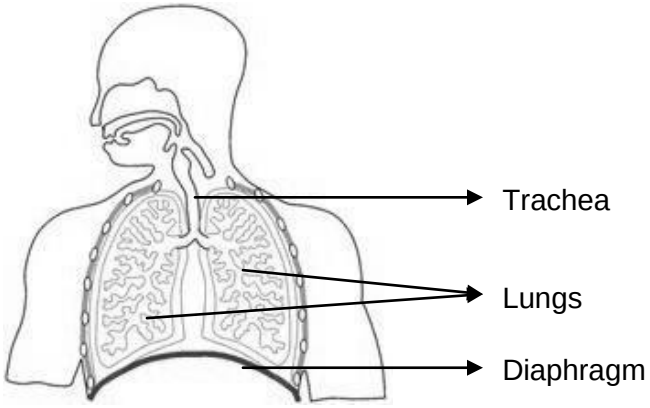


Figure 3.31
Steane (2008)

Many people know what muscle (or sheet of muscles) is being referred to and more or less where it is positioned when the diaphragm is mentioned. There are, however, a few things that many people, especially students, do not know about the diaphragm.

In the human body we find many different types of diaphragms including the urogenital diaphragm and the pelvic diaphragm. The one that is most commonly referred to as 'diaphragm' is the one called the thoracic diaphragm (Diaphragm 2008).

Although the diaphragm does about 75% of the muscular work during the respiration process it has to be remembered that the diaphragm has no sensory nerve endings. Therefore the diaphragm can not be controlled directly but rather manipulated through other muscles like the intercostal muscles and abdominal wall muscles (Pearson 2002:73-74).

When we practice proper breathing while playing the flute we have to consider the fact that the diaphragm is connected to the spine (Pearson 2002:74). This is relevant because our posture, and therefore the position of the spine, will have a direct influence on our diaphragm and thus exert an influence on our breathing.

The diaphragm is also important for the supporting of a constant air flow when playing the flute, especially when playing with soft dynamics in the high register and when tonguing fast passages (Hinch 2003). Teachers and students need to be aware of the fact that the spine and diaphragm are connected and thus good posture has a direct impact on abdominal support, and hence sound.

3.6.2 Intercostal muscles

It has been stated (see Chapter 3.6.1) that the diaphragm does about 75% of the muscular work when breathing. The intercostal muscles do the other 25% of the

muscular work. The intercostal muscles are the muscles between our ribs. The external intercostal muscles, internal intercostal muscles and the innermost intercostal muscles form the three principal layers (Pearson 2002:73).

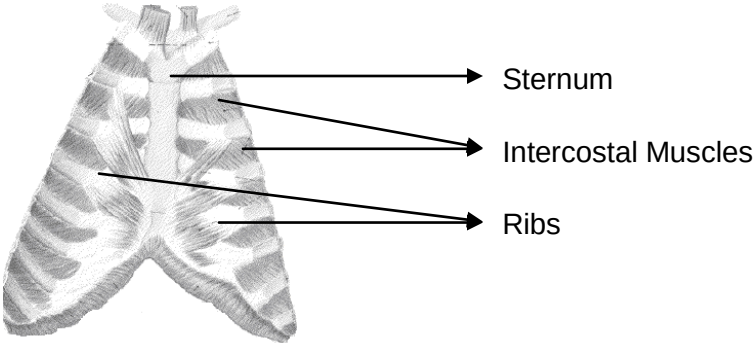


Figure 3.32
Armstrong (2008)

3.6.3 Abdominal wall

The abdominal wall forms the boundaries of the abdomen. It is made up of different layers of skin, *fascia*, muscle, *fascia transversalis* and *peritoneum*. The main muscles of the abdominal wall are the external oblique muscle, the internal oblique muscle and the transverse abdominal muscle. These abdominal muscles also play a part when flutists support the airstream needed for flute playing (Abdominal Wall 2008).

3.7 Spine and Atlanto-Occipital joint

Spine

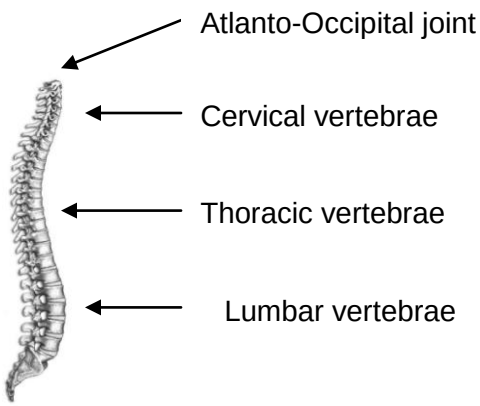


Figure 3.33
Cedars-Sinai
(2008)

The Atlanto-Occipital joint (A.O. joint) is the joint where the skull and the last cervical vertebrae of the spine meet. Cervical vertebrae are the vertebrae behind the skull. The A.O. joint is positioned between our ears and is the joint on which the head balances (Pearson 2002:28).

In the field of ergonomics it is common knowledge that bad posture can create a lot of tension in the muscles around this joint. This can result in headaches and tension in areas like the neck and spine.

← Atlanto-Occipital joint

Figure 3.34
Fotosearch (2008)

Flutists need to be aware of this joint and do exercises to keep it relaxed and free of tension. When one practices to keep the body in balance with itself the A.O. joint is one of the major focus areas.

3.8 Knee

When the knees are locked the *gluteus maximus* (buttock muscles), thigh and back muscles are tightened (Pearson 2002:59). Therefore it is important to keep the knees balanced at all times and not to lock the knees as many students do. It may seem unnecessary to mention the knees when talking about *embouchure*, but tension in one's posture eventually has an influence on the sound.

3.9 Teeth

In flute playing the teeth do play a role in the shaping of a good *embouchure*. If the teeth are skew or the gaps between the teeth are too big this can slow down a student's progress.

The upper teeth are called the maxillary teeth and the lower teeth are called the mandibular teeth. The naming is similar to the upper jaw (maxilla) and lower jaw (mandible).

Figure 3.35
Tooth (2008)

3.10 Summary

The aspects discussed in this chapter all influence a flute players' tone to a greater or lesser extent. Teachers should make relevant aspects of this information available to students in order to help the students shape their own perspectives concerning *embouchure*.

CHAPTER 4

TEACHERS' KNOWLEDGE AND PERSPECTIVES

The knowledge and perspectives of teachers play an essential role in the education process. Therefore it is absolutely vital that teachers are well equipped and that they take part in an on-going learning experience. In this chapter there are exercises and ideas from various sources to help equip teachers to teach the flute.

A questionnaire (Appendix B) was distributed to full-time and part-time flute teachers. The information compiled from the questionnaires and from interviews with present-day flute teachers forms part of the discussion in this chapter. Teachers can benefit by reading about other teachers' experiences and their thoughts about aspects regarding *embouchure*. All the teachers filled in the questionnaire anonymously.

4.1 First lessons of the beginner flutist

4.1.1 The importance of *embouchure*

All teachers agreed that teaching correct *embouchure* to the beginner flutist is absolutely vital. There are, however, differences of opinion as to how much information students should receive on this subject. Many teachers feel that too much information will be overwhelming and only demotivate the student.

Other teachers feel that more information can be given to students especially if the student is 13 years and older. Teachers need to be flexible and aware of students' differences, and each teacher needs to decide how much information is necessary and/or suitable for a specific student at any specific time. There should not be one fixed rule for all students. Other feedback from teachers includes:

- It is important that each student finds an *embouchure* that is comfortable
- The less the student thinks about *embouchure* the better
- Teachers should be on the lookout for bad habits.

The experiment discussed in Chapter 5.1 also links with the aspects mentioned above.

4.1.2 Teaching *embouchure*

Below are important teaching tips – derived from the above-mentioned questionnaires and interviews - when teaching *embouchure* to a beginner flutist:

- The aperture needs to be very small (almost as if trying to play with closed lips)
- The flute needs to be parallel with the lips
- The aperture should preferably be in the middle of the lips. If a student produces a better sound when the aperture is not in the middle of the lips it might be best to allow them to continue in that way
- The flute must rest firmly against the bottom lip without pushing the flute too hard. If the flute is not firmly held it might affect the balancing of the flute, and the finger movements might affect the *embouchure* by causing the lip-plate to bounce (or wobble) on the lower lip
- The direction of the airstream should not be too low or too high. The Pneumo Pro can be helpful in this regard
- Students should know that they need to direct the airstream onto the strike edge of the flute
- The correct placement of the lips on the lip-plate is important
- The distance the airstream must travel from the lips to the strike edge should not be too far
- Push more of the sides (corners) of the lower lip forward onto the lip-plate

- The airstream must have focus. When air is blown onto the hand it must be cold (focused) and not warm (unfocused)
- The corners of the mouth need to be pushed forwards and pulled downwards
- The lower lip needs to be pushed (rolled) outwards
- Students need to produce a sound with no undue tension in the jaw or throat
- The lips should be relaxed and not tightened like when smiling. Students should rather try and make a "sad face"
- A relaxed bottom lip is essential
- Students must cover between one fourth and half of the *embouchure* hole with their lower lip
- Jaw flexibility is important
- Use a mirror to help students see what they are doing correctly and what they are doing incorrectly
- Students should practice tuning with a well-tuned piano or a tuning device from beginners level
- Quality of tone should be the guideline as to what *embouchure* formation works for a specific student.

Most teachers do not suggest any *embouchure* exercises for the beginner flutist, although a few suggest an exercise or two to strengthen the lip muscles. See Chapter 4.2 for more information.

4.1.3 The use of the headjoint

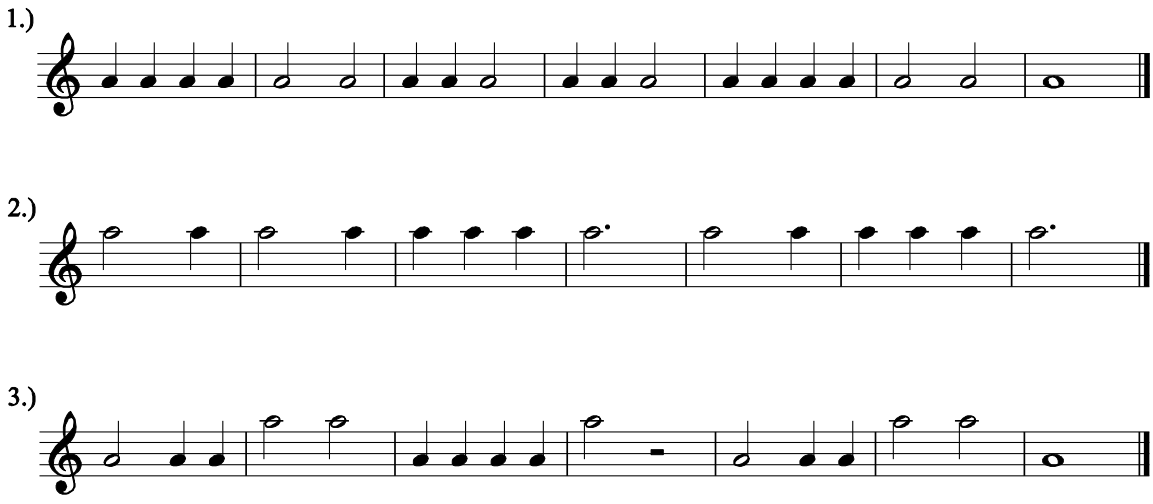
In my experience the reason for using mainly the headjoint in the first four to eight weeks of a new student's lessons is to focus the student's attention on forming a correct *embouchure* and to produce a focused tone from the instrument.

If students need to concentrate on many different aspects at once it is more difficult for them, therefore they get demotivated more easily. Teachers need to use their own discretion as to what time period should be spent on the headjoint.

All teachers agree that the elements of 'fun' and variation are vital, especially with younger students (five to thirteen years of age). I suggest the following exercises and ideas in order to help teachers in this regard:

a) Playing rhythms using the headjoint:

The following rhythms can be clapped and then played by using the headjoint. The lower A[1] (A4) is produced by covering the bottom end of the headjoint with the right hand. The higher A (A5) is produced by leaving the bottom end of the headjoint uncovered. Exercise 3.) is played by covering and uncovering the bottom end of the headjoint.

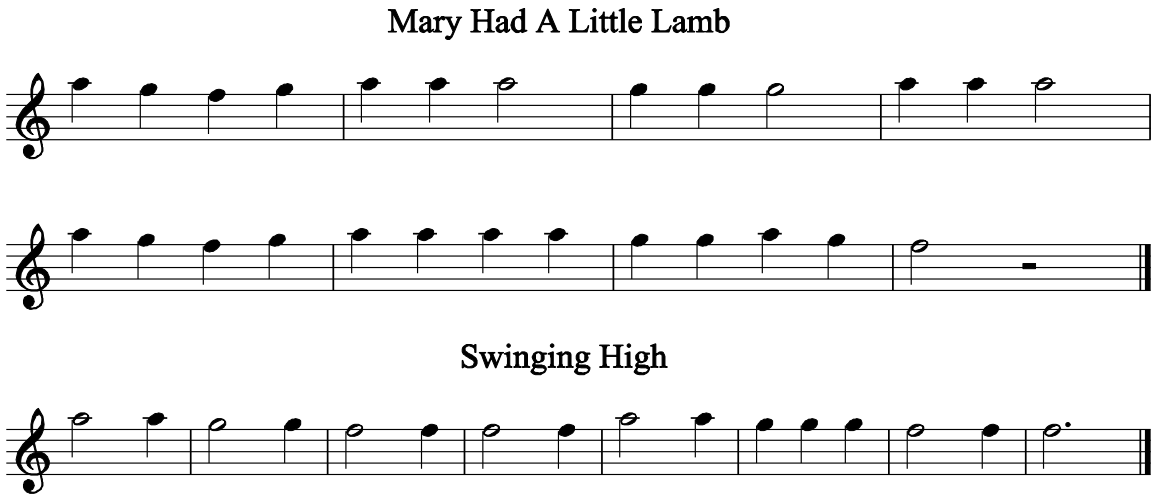


b) Playing tunes using the headjoint:

To play the top note (A5) leave the end of the headjoint uncovered. To play the middle note (G5), put your right hand index finger into the open end of the headjoint, so that the visible part of your nail is inside the headjoint. To play the

1.) Approximately 440 Hz

lowest note (F5) the right hand index finger must be put into the headjoint until the second joint of the finger is even with the end of the headjoint. The notes sounding should sound approximately as written. Teachers can compose similar rhythms and tunes for the beginner flutist.



Songs from: Blocki Flute Method
Blocki (2008)

4.2 Exercises for developing a student's *embouchure*

Below are some ideas and exercises – derived from the above-mentioned questionnaires and interviews - to facilitate the development of a student's *embouchure*:

- Listening to tone quality
- Practicing scales and arpeggios. The largest possible range of the flute should be utilized in these exercises (obviously depending on the level and ability of the student)
- Playing harmonics
- Practicing various intervals (tongued and slurred)
- Playing long notes (also with varying dynamics)

- Practicing *embouchure* exercises in front of a mirror. The student should carefully look at the lips' position and the minute changes between different notes
- Producing an airstream on his/her hand (Galway 1990:89). The air needs to be focused and therefore cold. This exercise can also be used to practice channelling the airstream upwards and downwards on the hand by using the lips and jaw and not the head
- Practicing *crescendos* and *decrescendos* to help with flexibility of lip positions
- Note bending exercises
- Practicing with a tuner. This helps the student to understand the direct influence of *embouchure* on intonation
- Trevor Wye's *Practice Book for the Flute*, Volume 1 (Tone)
- Marcel Moyse's book *"De la sonorité"*
- Suzuki's "rice-spitting" method.

4.3 Different types of flutes

There are various options regarding types and sizes of flutes for a beginner to start with. The age of the student, the *embouchure* formation on the instrument as well as the availability of instruments may be deciding factors.

4.3.1 Concert C flute

Most teachers prefer this as the starting instrument for students that want to play the flute. A very young player can not start on this instrument, because the instrument is too heavy and students have to utilize wrong hand positions. Most teachers suggest starting flute lessons somewhere between the ages of nine and eleven. The deciding factors as to whether a student is ready to start with lessons are the student's physical size, and especially the length of his/her arms. The student must be able to hold the flute comfortably.

The concert flute is readily available. There are many good student flutes available on the market. Teachers need to be on the lookout for 'bad' instruments – usually cheap or old second-hand instruments - as this will affect the progress and motivation of the student. If the instrument has leaking pads or a defective mechanism a beginner does not know this and usually thinks it is something he/she is doing wrong.

4.3.2 Piccolo

Very few teachers recommend this as an optional instrument for a beginner to start with. The advice is to rather wait until the *embouchure* on the flute is established. The piccolo *embouchure* is much more refined and tone production difficult because of the small *embouchure* hole. Intonation on the piccolo is also difficult. The muscles of the face need to be developed properly in order to produce a controlled and fast airstream. A youngster that starts on piccolo and changes over to flute will experience some difficulty in adapting his/her *embouchure* to the flute. The piccolo is a good instrument to learn once a student starts to play in ensembles or orchestras, after having learnt to play the flute for a few years. Both Geoffrey Gilbert and James Galway started on a piccolo (Hinch 2003).

Piccolos are readily available. A reasonably priced, acceptable piccolo is usually more expensive than an equivalent standard flute. Good second-hand piccolos are not easy to find and usually need major overhauls to make them playable.

The high pitch and shrill tone can also be a problem for students, parents and neighbours. This might cause the student to practice less in order to avoid negative comments. If a student is too small to hold a flute it might be best to rather wait or start with a recorder or fife.

4.3.3 E^b soprano flute

Not many teachers know about this flute. One reason why teachers do not use this instrument is because it is a transposing instrument (sounds a minor third higher), therefore repertoire and accompaniments are difficult to find. This instrument is expensive for parents to buy as a stepping stone for the concert flute. The E^b flute requires a smaller *embouchure* than that of the concert C flute, though not as small and refined as the piccolo. The E^b soprano flute is not readily available.

One of the advantages of the E^b soprano flute is the fact that it is smaller and therefore needs less air than the concert C flute. It is not as heavy as the concert C flute making it beneficial for promoting good posture. There are sometimes parts written in flute choir music for the E^b flute, establishing it as a unique member of the flute family.

4.3.4 Concert flute with curved headjoint

The teachers who are familiar with this headjoint are positive about using this for young students and students that are physically small. It brings the keys closer to the student, making it easier to reach all the keys. It might be better for students to wait until they are physically ready for the 'normal' concert flute, but for those who are very eager this is an excellent alternative. This is not an option for older or adult students though, as they can start on the concert flute immediately.

The *embouchure* is unfortunately influenced by the balance of the flute with a curved headjoint. Because the balance of this flute is different the jaw can not be used as an anchor in the same way as on a concert flute. Teachers that have experience in teaching with this instrument state that the 'balance problem'

causes a lot of frustration. The balance of the flute is improved slightly by tilting the headjoint upwards.

Curved headjoints are not as readily available and are often slightly more expensive than the normal concert flutes. Some student flutes are available with both curved and 'straight' headjoints in order for a smooth transition to the 'normal' flute at the appropriate time. This obviously has cost implications.

4.3.5 Fife

Most teachers noted that the chromatic fingerings on the fife are quite difficult compared to the concert flute. Most of the chromatic fingerings differ from those of the concert flute. When teaching the fife without the chromatic fingerings the repertoire for the fife becomes very limited. As the fife does not have keys it is difficult for young students to close the holes properly, thus affecting tone production. The fife requires a smaller *embouchure* than the concert flute and although there is a change in *embouchure* when moving to the concert flute the students usually adapt quickly. These students need to focus on relaxing their *embouchure* when switching to the concert flute.

For students who are very young or physically small this is a good alternative to the recorder as a stepping stone to play the concert flute. Teachers suggest this for students between the ages of seven and nine. The fife is easy to hold (because of its size), inexpensive and readily available. There are also tutors available that include only the fingerings that are the same as on the concert flute, making the transition to the concert flute much easier.

4.3.6 Recorder

Seventy percent of the flute teachers said the recorder is a good instrument to use as a stepping stone for young or physically small students that want to play

the concert flute. Teachers recommend this for students between the ages of six and nine. The recorder can be used to teach breath control, rhythm, note values, theory, general musicality and fingerings. Most of the initial fingerings on the recorder are the same as on the concert flute, thus making the transition relatively easy. Because tone production on the recorder is much easier than on the concert flute it helps students to focus and work on other aspects, as mentioned above. When those students proceed to the concert flute many skills are already developed and attention can be focused on forming a proper *embouchure*.

There are, nevertheless, some teachers that feel it is best to rather wait until the student is old enough to start on the concert flute. Then the student's *embouchure* and other aspects of their playing can develop simultaneously. Teachers' experience has shown them that students that start on a recorder have a different concept of tone production than those who start on the concert flute. In some cases this affects the student's *embouchure* negatively once he/she proceeds to the concert flute. However, most teachers do not agree with this and state that their pupils make the transition to the concert flute without any difficulty.

Parents and teachers can use the recorder as an indication to the child's inclination towards music in general. The recorder is inexpensive and readily available.

4.3.7 Pnuemo Pro

More than ninety percent of teachers did not know what the Pneumo Pro is. The teachers that knew this tool did not have any experience in teaching with it, although they were very positive about the possibilities that this tool offers in teaching *embouchure* to the novice student. This tool is inexpensive and relatively easily available. If a teacher buys the Pneumo Pro and uses it in

lessons it is not necessary for every beginner student to buy this tool. The Pneumo Pro can also aid in helping students with braces, see Chapter 4.8.

The Pneumo Pro helps students to manipulate the direction and speed of the airstream by seeing certain fans turning or not turning on the Pneumo Pro. A coin is also placed on the Pneumo Pro to prevent students from tilting it incorrectly. Below is a picture of a Pneumo Pro.

Figure 4.1
Blocki (2008)

4.4 The jaw

4.4.1 Beginners' level

Teachers differed radically when asked about this matter. Many teachers do not mention the jaw to their beginner students. From the teachers' experience students tend to use the jaw in a very unnatural way when confronted with principles concerning the movement of the jaw when playing the flute.

Some teachers teach (put the focus on) a forward and backward movement of the lower jaw for producing a change in octaves. They teach that for the low register the jaw needs to be back and for the high register the jaw needs to be

forward to assist in raising the airstream. Although this is true, some teachers disagree with teaching this to their beginner students because it causes many students to move their whole head and this results in pain in the neck and shoulder blades. They suggest that students should rather be taught to manipulate the direction of the airstream with their lips; jaw movement can be taught later (see Chapter 4.4.2).

Teachers' responses to the position of the jaw were extremely diverse. Some said the jaw needs to be dropped down and others said exactly the opposite. Another group said the jaw needs to stay in its normal (natural) position. The fact that the answers are so diverse might partially be attributed to differences in each student's (and teacher's) facial attributes; the difference in relation between their upper and lower jaw (see Chapter 6.4).

4.4.2 Intermediate to advanced students

The pictures in Chapter 3.2 can be shown to students to enhance their understanding of what the human jaw looks like and how it works. Teachers should also advise students on the interaction between the lips and the jaw, especially the role this plays in creating dynamic nuances and for producing the different octaves on the flute.

4.5 Testing and selecting students

Physical attributes, for example lip size, shape of the lips, attributes of the teeth and attributes of the jaw can hinder a student's progress and could even handicap them from pursuing a flute-playing career. The teacher's role in cases where a student has physical problems affecting the *embouchure* is of vital importance. Therefore teachers need to be aware and informed as to what to do when situations like these occur and if it is necessary to advise students to

perhaps take up another instrument because of certain physical attributes. Many of these 'attributes' are discussed in Chapter 6.

Some teachers say musicality, temperament, enthusiasm and hard work are far more important than any deviation in the physical attributes of a student. Other aspects, for example language capabilities (see Chapter 4.5.4), braces (see Chapter 4.5.9) and the student's age (see Chapter 4.5.5) play a much bigger role in the teacher's decision-making whether or not to make a student part of his/her studio.

4.5.1 Attributes of the teeth

A deviation from 'normal' teeth can create problems for someone that wants to play the flute. Typical deviations will be, for example, teeth that are skew or teeth that have gaps between them that are too big (see Chapter 6.3.2). It can also permanently influence the child's *embouchure* if a solution is not found. Students can contact their orthodontist and ask what possibilities exist for solving the problem.

Some teachers insist that a young student should have their grown-up teeth before starting the flute. One of the teachers that filled in the questionnaire (Appendix B) said if a potential student is still without his/her grown-up teeth it is usually a good indication that the student is still too young to play the concert flute (see Chapter 4.5.5).

4.5.2 Attributes of the lips

The shape and size of our lips are important because they are directly linked to *embouchure* and hence sound. Every student's lips have certain characteristics but some lips, however, tend to favour flute playing. Teachers stated that lips

that are very thick or very thin do not tend to favour flute playing and lips with a teardrop can also be a handicap for anyone wanting to play the flute.

Although certain lip sizes tend to favour flute playing, most teachers' opinions indicate that all lip sizes can be accommodated (also see Chapter 2.4.2). The teacher and student must work together to find a solution. It may be that, despite a student being diligent and motivated, the teacher may have to eventually advise the student to take up a different instrument (teachers' questionnaire, Appendix B).

When playing the flute the airstream needs to travel through the centre of the lips in order to produce the best quality tone. Lips with a teardrop make it impossible to channel the air through the centre of the lips, therefore the student has to compromise the angle of the airstream in order to get it to the desired place, the strike edge of the flute. This compromise might affect the student's tone negatively. If a solution can not be found the teacher should advise a change to a different instrument (teachers' questionnaire, Appendix B).

Some students' apertures are also off-centred for a variety of reasons. If a student really gets a better sound with an off-centre aperture there is no reason why the teacher should change it, even if it does not 'look right'. The teacher only needs to suggest changing something if it is affecting the tone quality in a negative way.

4.5.3 Attributes of the jaw

Deviations from a normal occlusion (see Chapter 6.4.1) can not necessarily be seen with the naked eye, depending on the nature of the deviation. If the student has braces or used to have braces he/she can get a detailed report on the attributes of their jaw and teeth from their orthodontist. The teacher can study the information in order to see if there is any significance regarding the occlusion

and its influence on playing the flute. In most of the cases where students are part of an orthodontist program the problems with the occlusion are already being solved by the orthodontist. Then it is the teacher's responsibility to encourage the student to have patience with this process.

If a teacher suspects a student of having a mal-occlusion, and the student is not part of an orthodontist program, the teacher can advise the student to have an inspection at an orthodontist. The downside of these inspections, however, is that they are very expensive.

In the teachers' feedback they were very positive that any of the mal-occlusions can be accommodated by a student that has a strong desire to learn the flute. The teachers stated that it might be necessary for students to place the flute higher or lower on the bottom lip, or adjust the shape of their *embouchure* to accommodate the mal-occlusion.

4.5.4 Language capabilities

The teacher and student have to communicate with each other. Therefore they need to speak a common language. The situation, however, is not always simple. A student may speak or understand the specific language of tuition but to a far lesser extent than necessary. The teacher has to make a decision on whether or not communication with the student will be successful. The communication must preferably not hinder the goal of learning to play the flute. In some cases there is not a teacher available to teach in the language the student understands best. The only option for this student is to take lessons in a language he/she does not understand that well. The teacher can also consider the option of a translator.

4.5.5 Age

Teachers' preferences regarding the age at which students should start with flute lessons differ a lot. Some teachers prefer not to take in students younger than fourteen while others take in students from the age of five. From the teachers' perspectives the following aspects play a role in decision making: concentration span (a younger student's concentration span is much shorter than that of an older student), the length of the student's arms (see Chapter 4.5.6), other physical attributes (see Chapter 4.5.1, Chapter 4.5.2 and Chapter 4.5.3) and the need to incorporate other elements when teaching young students (see Chapter 4.1.4).

4.5.6 Length of the arms

If a student's arms are not long enough they will struggle to hold the flute. Teachers can use other instruments besides the concert flute (such as the recorder, fife, piccolo, etc.) if a student is not ready to hold the concert flute yet (see Chapter 4.3). A curved headjoint is another possibility.

4.5.7 Musicality

The progress of a student can be hindered by their lack of musicality. Teachers can decide not to teach a student because he/she lacks the ability to assimilate the basic skills necessary for desirable progress. Teachers should, however, be very careful in turning a student away. In the past, teachers have made wrong decisions regarding this aspect.

If a student is very shy it can influence his/her ability to perform at his/her best. This is one of the reasons why teachers should be careful not to make hasty decisions. Although there are different opinions on whether or not a specific student should be allowed to start/continue with music lessons, the general

advice is to make use of a musicality test; for instance see Ben-Tovim (1990:11-12). Teachers must use their own discretion in deciding whether or not a student should be allowed to start/continue.

4.5.8 Interest in the flute and the time available to practice

A potential student's interest in the flute should form part of the decision-making on whether or not to accept the student. Students that show real interest in the flute (however 'musical' they may appear) are usually the students that produce results superior to those that do not show enough interest.

For some teachers good results and success are of the utmost importance. If a student fails to practice regularly and consistently the teacher may feel the need to discontinue the lessons. Not all teachers have the same goals for their students and not all students have the same goals for themselves. Teachers are strongly advised to discuss aspects regarding practice time, commitment and the number of extra-mural activities a student should have on his/her weekly schedule if they want to play the flute.

The teacher must also decide whether or not a specific student will suit his/her style of teaching. Teachers must rather recommend a different teacher if incompatability is perceived.

4.5.9 Braces

Just over forty percent of teachers said they would take in any student with braces and/or continue lessons with their own students who will be getting braces. Twenty percent of the teachers said that their decision depends on the situation and the motivation of the student whether or not to start with lessons. Another twenty percent said they will turn down students with braces if they are

very young, but if older they can start. The other fifteen percent of teachers strongly recommend starting with flute only after the braces have been taken off.

One of the teachers said that she finds it easier for pupils to start with braces and then have the braces removed than to start playing and then get braces. Most teachers feel that students that have already been playing for a while need to continue even though they are getting braces. A very small percentage of teachers recommend that students rather discontinue their lessons until afterwards.

The period of time that the student will have braces, or the time he/she has left before the braces are taken off also plays a role in the decision whether or not a student can start with lessons or should rather wait. If a student's braces are coming off soon the advice is to rather wait. If there is still a long period before the braces will be removed most teachers feel that students should rather start with lessons, otherwise a lot of time to work on aspects of flute playing other than sound quality could be lost. If a student is told to wait for too long a period he/she might lose his/her interest and motivation to play the flute.

One of the teachers that felt there is no reason to wait or delay lessons because of braces said the following; "Why waste time and possible talent when you can teach fingers, breathing and basic tone, and improve on these once the braces come off".

4.5.10 Personality traits

Every teacher and every student has a certain personality. Sometimes the teacher's and the student's personalities do not function well together. Teachers should be honest with themselves and with potential students in this regard. If this clash in personalities will affect the student's progress negatively, another teacher should be recommended.

4.6 The throat

4.6.1 Throat tuning

In Chapter 2.8.3 throat tuning was briefly discussed. Throat tuning helps to maximize the resonance in the throat and as a result enhances the overall tone quality (Dick 2007:10). Unfortunately, according to answers received from the questionnaires, many teachers are of the opinion that throat tuning will tighten the throat and therefore affect the tone quality negatively. Singers can sing notes in different registers with an open and relaxed throat and the same principle applies for flute players.

A small percentage of teachers recommend that throat tuning should be taught from intermediate level. An even smaller percentage of teachers said that throat tuning can be taught as soon as basic tone production is established. In my opinion, and according to some teachers, throat tuning can be introduced to aid resonance (improving tone quality), practicing the inner ear and can help in relieving tension in the throat or neck.

4.6.2 Exercises to get an open throat

Beginner students can accept images to help produce an open throat. Examples are: a) imagine a ping pong ball in your mouth while playing, b) imagine having an egg in the back of the throat and c) yawning inside the mouth.

Other exercises, suggested by teachers, that aid in playing with an open and relaxed throat include:

- Take a quick breath through the mouth. Exhale, keeping the throat position the same as for inhalation

- An exercise I have found useful is, with the *embouchure* hole between the lips, the student must blow hot air through the instrument, similar to when warming up the instrument. The airstream must be slow and as little noise as possible produced. Any fingering that the student is comfortable with can be used
- The student must imagine the sound resonating inside the head whilst playing long notes.

4.7 Breathing, the diaphragm and the abdominal muscles

4.7.1 Exercises teachers can use to help students feel the sensation of the diaphragm and abdominal muscles (Jooste 1982:23-24) are:

- Blow up a balloon
- Cough with the hand placed just underneath the lowest rib
- Laugh so that the body shakes
- Pant like a dog that is tired, with the hand on the tummy
- Lift up a heavy object while the breath is being held.

Good use of abdominal and intercostal muscles helps to support and manipulate the airstream, thus improving the overall quality of tone.

4.7.2 Exercises to aid the process of breathing correctly include:

- Practice yawning. Do not lift the shoulders
- Imagine filling the stomach with air whilst inhaling
- Slowly breathe in through the nose, similar to when smelling a flower (Duran-Sloan 2003:4)
- Whilst exhaling, create a sizzle or snake sound (Duran-Sloan 2003:4)
- Create a brisk pass of air through the nostrils or mouth by quickly inhaling and exhaling. The amount of air inhaled and exhaled should be small.

The average quantity of air in the lungs should remain the same for this exercise. The exercise should be done many times, with the lungs at different levels of 'fullness', but still keeping the average quantity of air in the lungs the same (Drew 1937:608)

- Stand up straight and keep the right hand two centimetres away from the stomach. Whilst inhaling, let the stomach touch the hand. Exhale, and do the exercise again. Then, whilst inhaling keep the stomach for at least four seconds against the hand and sustain the exhale process for another four seconds. Now place the right hand thumb and index finger firmly underneath the rib cage (thumb at the back). Inhale for four seconds and exhale for four seconds, whilst keeping the tension in the muscles constant. The thumb and index finger are not allowed to move backwards whilst exhaling. This exercise is first-class for improving air support and strengthening the abdominal and intercostal muscles (Fouse 1980:37).

4.7.3 Indications that a student is breathing incorrectly

Teachers tend to agree that the following indicate incorrect methods of breathing:

- When a student's shoulders are moving upwards whilst inhaling
- When relatively short passages can not be played in one breath
- If the student finds it difficult to play in the third register
- When unnecessary noises are heard whilst inhaling or exhaling.

4.8 Braces and false teeth

For many people that play the flute whilst having braces, it is a painful and irritable time in their flute career. Braces make it extremely difficult to have a refined tone and an *embouchure* to rely on. The teachers substantiated my own experience that the tone is weaker, at least initially, and suffers after each time the braces are tightened. The tone is affected because there is a change in the

distance between the teeth and the lips, thus making it difficult to focus the airstream. Secondly, the *embouchure* needs to be 'relearned' and adapted many times, because of the constant changes inside the oral cavities.

It is possible to get braces on the back of the teeth. This will solve many problems relating to *embouchure* and pain for the flutist, but unfortunately articulation will be affected negatively. Removable elastics inside the mouth should be taken off whilst playing the flute. When the elastics are kept on whilst playing, the *embouchure* needs to adapt once again. The more changes a student needs to make the more frustrating the whole process becomes.

Teachers need to be on the lookout for any unnecessary tension. Less pressure of the lip-plate against the bottom lip can help to restrict pain, but a loss of tone quality should be expected. It is an arduous task to focus the airstream effectively and teachers must help the students in this regard. The Pneumo Pro, see Chapter 4.3.7, can help students to gain control of effectively directing the airstream onto the strike edge. I have found that the flute can be placed higher on the bottom lip to aid in correcting the angle of the airstream onto the strike edge.

Practicing for shorter periods of time, but more often, can help reduce discomfort. Other aspects of flute playing, for example technique, articulation and breathing can enjoy more attention than tone production during these times. Although students should aim to play with an optimal temporary sound it can be very demotivating if too much time is spent on tone production and *embouchure*. It might be necessary to delay exams if the braces will affect the student's marks negatively. To reduce pain, wax can be put over the braces to minimize the contact with any sharp edges.

After the braces have been taken off, the *embouchure* and tone are affected once again. Some teachers say that the tone is worse when the braces are

removed than when getting the braces initially; but they also say that this is only temporary as the tone improves quickly thereafter.

The teacher's main responsibility when teaching a student with braces is to constantly encourage and motivate the student, reminding him/her that it is only temporary. Maybe the best solution is not to get braces at all; but this is never for the teacher to decide.

Playing the flute with false teeth may affect a flutist's tone negatively - or in some situations even improve the player's quality of tone. Lynn Lakin (2009) said the following; "I play with false teeth. I play better than ever now because I don't have any more dental problems hurting or hindering my playing".

4.9 Common *embouchure* 'mistakes'

Here is a list (compiled from experience, various sources and teachers' comments) of common *embouchure* mistakes flute students usually make:

- Pulling the lips back
- Lips going inwards
- Lips either too "tight" or too "loose"
- Tucking the bottom lip in, and as a result the top lip is too far over the lip-plate
- The top lip held too tight against the upper teeth
- Aperture too big, causing an airy and unfocused sound
- The bottom lip not covering enough of the *embouchure* hole
- Turning the flute in too much
- The flute being placed too high on the lip
- Incorrect placement of lips on the lip-plate
- Playing with the so-called "smile *embouchure*" that creates tight lips and corners of the mouth pulling backwards

- Tensing up the muscles around the mouth too much
- The upper and lower teeth being held too close to each other inside the mouth
- Playing with an airstream that is too slow
- No or very little support from the diaphragm and intercostal muscles
- Stance being very skew, resulting in the flute and lips not being parallel to each other
- Lips not flexible enough to make dynamic differences or play in tune
- Not confident enough to experiment with the *embouchure*.

4.10 Nationality and language

Although most teachers agree that nationality and language have an influence on a flutist's tone, there are some that believe that there is no correlation between these two. A high percentage of teachers were of the opinion that different vowel formations expand tonal variety and tonal colours. Flutists whose native language is for example French, will most definitely form vowel formations peculiar to the French language, different to those of a native English speaker. The same is true when many other languages are compared. It has to be said that teachers who are of the opinion that language and tone have no correlation, but who still state that vowel formations expand tonal variety and tonal colours, contradict themselves. With practice, students and professional flute players can, over time, change certain vowel formations accurately to imitate a specific language even though that language is not their native tongue.

People of a certain nationality or race group have certain physical characteristics. Africans tend to have big lips thus affecting *embouchure*. They need to place the flute higher up on the bottom lip in order to accommodate the attributes of their lips. One teacher also suggested that it might be possible that different languages cause different muscles in the face to develop differently, also affecting *embouchure*.

Certain languages have more guttural consonants and vowels than other languages. The term guttural is used to describe any consonant or vowel that is produced at the back of the oral cavity near the throat. Languages with a large number of guttural sounds are, amongst others, German, Arabic languages, historical Hebrew and Khoisan languages. German flutists will have a stronger propensity for utilizing guttural consonants and vowels for tonal variety than, for example, French flutists.

The influences of nationality and language have an even larger influence on articulation than on tone. There is a general conception that the French are better at tonguing because of their language (teachers' questionnaire, Appendix B). The French articulation is forward in the mouth making the articulation very light and fluid. Non-French-speaking players can ensure that the tongue is forward in the mouth and through patient practice there should not be any problem in imitating the French articulation. The Americans and English-speaking people find it difficult to flutter tongue with the 'rrrrrr' sound because it is not strong in their language. They rather use the throat gurgle which basically has the same effect (teachers' questionnaire, Appendix B).

4.11 Vowel formations

Different vowel formations cause the mouth cavity to change shape. A change in the form of the mouth cavity will produce a change in tone colour. Some teachers that responded to the questionnaire suggested that the following vowel formations be introduced at intermediate level (Grade 5 and upwards) to expand the student's tonal variety and colours: 'aah' (as in 'father'), 'ooh' (as in 'shoe'), 'aw' (as in 'saw') and 'uu' (as in 'err'). The vowel formation 'ee' (as in 'free') should not be used as this is too tight. Some students may be more successful in changing tone colour by imagining different moods, scenery and characteristics. The French way of pronouncing 'tu' is the best for much articulation (teachers' questionnaire, Appendix B).

At beginner's level it is in my opinion important not to teach the different vowel formations. Students will most likely not be able to hear the difference and the extra information will only confuse them. Beginner students should rather focus on keeping the throat as open and relaxed as possible in order to avoid tension and create an 'open' tone quality. Exercises to aid in playing with an open and relaxed throat are discussed in Chapter 4.6.2.

4.12 Harmonics/overtones

Playing and practicing overtones are beneficial for a variety of reasons. It helps to gain control over lip shapes by finding out what shape has what effect. For beginners it helps to establish the *embouchure* position needed to play in different octaves. Practicing overtones are excellent for training the facial muscles in order to manipulate the *embouchure* to help control air speed, direction of the airstream, dynamics, register changes and for manipulating intonation. It even helps the student to develop and expand his/her tonal colours. Harmonics are also necessary as they appear in standard flute repertoire. Harmonic fingerings can also be used to help with technically difficult passages.

Over eighty percent of teachers felt that it is important for students to practice overtones on a regular basis. The vast majority of teachers felt that overtone exercises should be incorporated from either intermediate or advanced level and not be used for beginners. Some teachers said it depends on the level of the student, especially the level of the student's tone production. Those teachers that were in favour of incorporating overtone exercises at beginner's level, explained by saying the second octave of the flute is the first overtone series and is already used by students in their first year of playing the flute. Teachers suggested using only the part of the overtone series that is suitable for the specific student's level.

4.13 Contemporary techniques and their influence on *embouchure*

Some teachers are incorporating contemporary techniques (also called extended techniques) as early as beginners' level. Over seventy percent of teachers disagree, however, and say that teachers should rather wait until the student's tone and *embouchure* are more developed. Grade five, six or seven are the suggested possible levels to start incorporating contemporary techniques into lessons.

Nevertheless, contemporary techniques can be fun and interesting for the beginner flutist, and a few teachers suggest that certain contemporary techniques can be used at beginner's level; for example flutter tonguing, singing and playing simultaneously, jet whistle and pitch bending, although not all teachers agree on which techniques are suitable for the beginner. Other extended techniques, for example whisper/whistle tones, tongue rams, residual tones, multiphonics, quarter tones and circular breathing should be introduced only at an intermediate or advanced level.

Below, some of the contemporary techniques and their influence on *embouchure* are discussed.

4.13.1 Singing and playing simultaneously

Teachers agree that the *embouchure* needs to remain unchanged for this extended technique. The throat, however, is more open thus affecting *embouchure*. This technique will aid in a more relaxed and natural *embouchure* and is recommended for those students who have problems with a tight *embouchure*.

4.13.2 Pitch bending

Pitch bending affects the movement of the jaw, the shape and size of the mouth cavity and the position and shape of the lips, thus affecting *embouchure*. This technique may also require movement of the head as well as turning the flute inwards or outwards. The relation between the lips and their placement against the lip-plate, as well as the amount of the *embouchure* hole that is covered by the lips is often compromised, thus affecting *embouchure*.

I found that pitch bending is an excellent exercise to practice *embouchure* flexibility and manipulation of the direction of the airstream. This can help students to understand the relation between *embouchure* flexibility and intonation and should be introduced as soon as possible.

4.13.3 Whisper tones

Whisper tones, also called whistle tones or flageolets, is a good technique to aid the release of unnecessary tension in the *embouchure*. To play whistle tones an open, flexible and relaxed *embouchure* is needed. Whistle tones are similar to overtones except that they require less air pressure. Teachers agree that this is one of the most difficult contemporary techniques and should only be introduced to students of an advanced level. The following abbreviations are used to indicate whisper tones.

ws. - whisper tone
WT - whistle tone

4.13.4 Flutter tonguing

Whilst flutter tonguing, the fluctuating tongue disturbs the normal flow of the airstream, and may easily influence the *embouchure*, thus affecting tone quality.

This is a relatively easy technique to acquire and can have a definite positive influence as it requires that students keep their *embouchure* steady. If the *embouchure* is too loose there will be no sound and if the *embouchure* is too tight the higher overtones will sound. Students need to keep their tongue relaxed, direct the airstream downwards, keep the lips as steady as possible and use proper support.

Nevertheless, flutter tonguing is especially difficult in the low register. Teachers should start by teaching flutter tonguing in the second register and then work downwards. It is possible to use a throat gurgle on the lower notes as this is easier and gives the same effect (teachers' questionnaire, Appendix B).

It is important to teach the 'rrrrr' sound, despite the fact that many Americans and English-speaking people find it difficult to flutter tongue with the 'rrrrr' sound; they rather use the throat gurgle as suggested for the lower notes.

4.13.5 Multiple sonorities/multiphonics

Multiphonics do affect the *embouchure*. The specific multiphonic played, will determine in which manner the *embouchure* needs to change in order to achieve the desired result. As a general rule (Dick 1989:83), a larger aperture than for single pitches is needed to play multiphonics. The dynamic attempted when playing a multiphonic also has an influence on the *embouchure* formation. As there are multiple sonorities of up to five notes sounding simultaneously, they are definitely not recommended for the beginner flutist.

4.13.6 Residual tones

Teachers were very non-commital on the influence of residual tones on *embouchure*. Residual tones are noise-like sounds which are produced when a single pitch, whisper tone or multiphonic sonority is played, although residual

tones can also be played alone. These noise-like sounds are at specific pitches and with single pitches and whisper tones create the effect of a multiple sonority. To play a residual tone, or to make it more prominent, the aperture must be widened and a more unfocused airstream is needed. In my experience residual tones should only be experimented with once good *embouchure* control has been achieved. It is possible for a flutist to change the dynamic of a residual tone by changing the *embouchure* and air support. The dynamic range of residual tones is from *ppp-ff* (Dick 1989:141). The abbreviation "R" is used to indicate residual tones.

4.13.7 Circular breathing

When a flutist uses circular breathing he stores a volume of air inside the cheeks. Therefore the cheeks are inflated and this affects the shape of the *embouchure* considerably. According to Dick (1987:12) it is difficult to have the 'work area' (lips and supporting muscles) in such a position (whilst the cheeks are inflated) that it does not affect the tone quality negatively. Although the *embouchure* is affected by the inflated cheeks it is still possible to produce a high quality tone.

During circular breathing the tongue is placed on the palate (roof of the mouth) for short periods of time. The mouth and cheeks act as a reservoir, filled with air, which can be used whilst the flutist is inhaling through the nose. The purpose of the tongue against the palate is to create a path from the nose to the lungs in which no air, whilst inhaling through the nose, is escaping into the mouth cavity. The placement of the tongue against the palate differs from the placement when tonguing, thus affecting the *embouchure*.

Whilst inhaling through the nose the air inside the cheeks and mouth is squeezed out through the lips in two ways. Firstly, by using the cheek muscles and secondly, by moving the tongue upwards and forwards. The tongue method is

usually necessary in the low register, but can be used in the higher registers as well.

Circular breathing is a delicate process in which the *embouchure* formation(s) need to be very refined in order to gain success with this technique.

4.13.8 Percussive sounds

There are four types of percussive sounds on the flute; key-slaps, tongue-clicks, tongue-stops and tongue-pizzicatos. All of these techniques influence *embouchure* and tone, as described below. As with residual tones, these are not recommended for the young beginner.

Key-slaps and tongue-clicks can be produced on a spectrum from the normal playing angle to closing up the *embouchure* hole completely. Key-slaps and tongue-clicks can also be used simultaneously. There are certain symbols used to indicate what effect the composer wants (see symbols on page 4-32). The mouth cavity and the flute itself act as resonance chambers. Therefore the different playing angles and the shape of the mouth cavity have an affect on the pitch and tone colour of the resonances produced.

Tongue-stops (also called “ht”, “tongue-rams” or “tongue-thrusts”) are produced by closing the *embouchure* hole completely with the lips. Together with a strong exhalation, the tongue is used to stop the *embouchure* hole, producing a short resonance sound in the flute. The symbol for tongue-stops is indicated on page 4-32.

Tongue-pizzicatos are produced with the flute and *embouchure* in the normal playing position. The tongue is put between the lips, and whilst keeping the lips firmed, the tongue is quickly pulled back into the mouth producing a popping sound. The symbol for tongue-pizzicatos is indicated on page 4-32.

Symbols that are used to indicate percussive sounds on the flute (Dick 1989:137-139):

+	-	Key-slap
(+)	-	Key-slap with the *embouchure* hole covered by the lips
K	-	Tongue-click
(K)	-	Tongue-click with the *embouchure* hole covered by the lips
K+	-	Simultaneous tongue-click and key-slap
(K+)	-	Simultaneous tongue-click and key-slap with the *embouchure* hole covered by the lips
(T)	-	Tongue-stop
pizz.	-	Tongue-pizzicato
U	-	Normal playing angle
⊃	-	*Embouchure* hole covered by the lips

4.14 The anatomy of the human body in relation to *embouchure*

Each person's unique physical attributes have a direct influence on their *embouchure*. The size of the lips, the position of the upper and lower jaw, size of the tongue and the teeth all play a role in the *embouchure* and hence tone.

Most teachers are concerned about the fact that unnecessary tension in the face, neck or other parts of the body has a negative influence on *embouchure*. Students should be carefully monitored to ensure they are as relaxed as possible.

See Chapter 2.4.2, Chapter 3, Chapter 4.4.1, Chapter 4.4.2 and Chapter 4.4.3, as well as Chapter 6.3.2 and Chapter 6.4.1 for further discussions.

4.15 Additional aspects that influences *embouchure*

4.15.1 Register

The speed and direction of the airstream determines the register produced. The *embouchure* is used to manipulate the speed and direction of the airstream.

The aperture of a flute player gets proportionately smaller the higher he/she plays. The low register will, therefore, need a bigger aperture than the high register. The low register needs a firm, but relaxed *embouchure*, while the high register requires a lot more firmness. Most teachers agree that in order to achieve more firmness in the higher registers the student should think of "pushing the lips together" rather than thinking of "tightened lips" or pulling the edges of the lips backwards.

For the low register the top lip needs to be slightly forward in relation to the bottom lip in order to direct the airstream downwards (lower jaw more backwards). For the high register the lips are more equal in relation to each other in order to direct the airstream more upwards (lower jaw more forward).

The changes in *embouchure* between registers are minute. Aspects that may have an influence on the principles mentioned above are the position of the head and lips in relation to the *embouchure* hole.

4.15.2 Vibrato

There are four different types of vibrato applicable to flutists, i.e. a) diaphragm and *larynx*, b) throat, c) lips (Wye 1983:19) and d) finger vibrato (Smith 2005:18). There is considerable debate as to exactly how vibrato should be produced. It is not within the scope of this dissertation to enter this debate.

Finger vibrato is also called key vibrato, vibration, sweetening or *das Klopfen* (Smith 2005:18). Finger vibrato can be used on Baroque flutes and open-hole flutes and has a flat and dull tone quality. Another method of producing vibrato is by shaking the flute (Smith 2005:18). This technique can add to tonal variety and colour, but should not be used extensively as this may result in a dull perfomance.

Vibrato should generally not be taught until the student has an acceptable *embouchure* formation and tone quality.

4.15.3 Articulation/tongue

Wind instrumentalists articulate notes with the use of their tongue (also called tonguing). If the tongue is tensed, the jaw and the lips will also be tensed, therefore, having a negative influence on the *embouchure*. The tongue can very easily be tensed whilst double and triple tonguing a passage and care should be taken to prevent this from happening.

The placement and movement of the tongue whilst tonguing are both important. If the tongue is placed too far back on the palate it will constrict the throat and the airflow. Except for extremely soft note beginnings, students should take care not to tongue between the lips, called “slip tongue technique” or “tongue out technique” as this will disturb the *embouchure* (Hinch 1993:18-20).

Advanced students can use the tongue to make the mouth cavity bigger or smaller thus creating different tone colours for more expressive playing.

4.15.4 Support

If a flutist plays with insufficient support the *embouchure* will tend to compensate by being too tight.

4.16 Dizziness

The beginner flutist tends to use much more air than is necessary and this causes hyperventilation and hence dizziness. Beginner flutists need to learn the proper combination of *embouchure* and speed and direction of the airstream. If the aperture is too large or the airstream is mis-directed dizziness occurs. The Pneumo Pro can help students control the direction and speed of the airstream. When a student gets dizzy the teacher should advise them to sit down with their head between their knees until the dizziness goes away. Breathing exercises (Chapter 4.7.2), will help stop the occurrence of dizziness. The dizziness will go away as the student learns to control the breathing and the *embouchure.*

4.17 Alignment of the *embouchure* hole in relation to the rest of the flute

Flutists differ in their alignment of the *embouchure* hole in relation to the flute's body. This is visible with students, amateurs as well as professional flutists. The differences in alignment of the *embouchure* hole in relation to the body of the flute can have a considerable influence on the overall sound and on different aspects relating to posture and technique.

Is there a 'correct' way and does it matter how a player aligns his/her flute? When teaching *embouchure* alignment, there are two methods that teachers use.

4.17.1 Lining up the centre of the *embouchure* hole with the centre of the keys

Jennifer Cluff (2009:1) calls this method, "The Marching Band flute set-up" because military bands in America insisted that their flute players use this method. The Marching Band method is when a flutist aligns the centre of his *embouchure* hole with the centre of the keys. Today this method is being taught all over the world by famous teachers (Cluff 2009:2)

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4.17.2 'Rockstro' method

The 'Rockstro' method is named after the 19th century writer Richard Sheperd Rockstro. This method is when a flutist lines up the far side of the *embouchure* hole with the centre of the keys. Some people think that this method was invented by Rockstro, but Rockstro himself gave evidence that this is not true. He quoted famous 18th century flute players like Quantz and Devienne to confirm that the method he recommended was not invented by himself: "The head-joint must be adjusted in such away that the mouth-hole shall be turned inwards, towards the mouth and out of the line of the finger-holes, to an extent equal to the diameter of the hole" (Quantz in McGee 2009:2).

When using the Rockstro method the head-joint is turned inward and out of line with the key work. Therefore the body of the flute, in relation with the headjoint, is also in a different position than in The Marching Band method. The heavy rods of the flute (long tubes that form part of the mechanism) are more at the top of the cylindrical tube, instead of being at the side. This makes it much easier to balance the flute. Compare The Marching Band (Figure 4.2) and Rockstro (Figure 4.3) methods' points of balance.

Marching Band Method

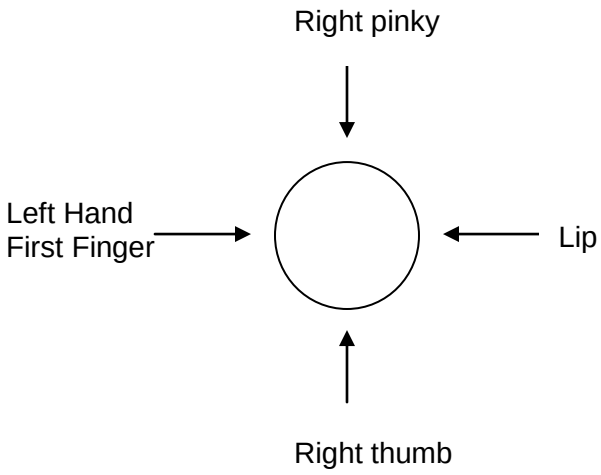

Figure 4.2
Cluff (2009:5)

Rockstro Method

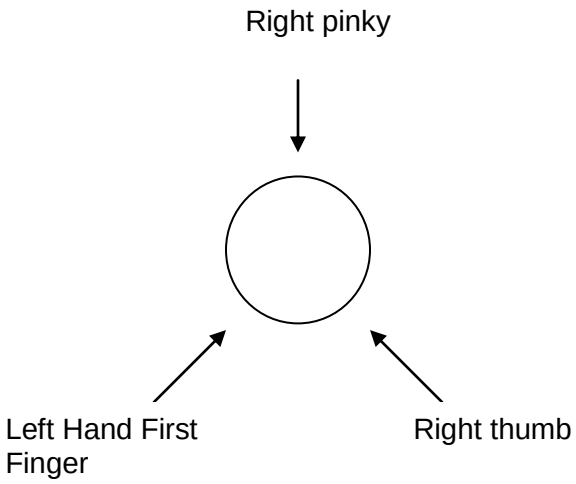

Figure 4.3
Cluff (2009:5)

In Figure 4.3 you'll notice there is a point of balance less, namely the lip. Nyfenger (Nyfenger in Cluff 2009:5) refers to the lip, but it's actually the chin that gives the fourth point of balance. Although the flute is still placed on the chin (lip) the player doesn't need to press with his chin (lip). The flute lies comfortably underneath the lower lip.

An important aspect of the Rockstro method is that the flutist's left hand is actually in a better position than in The Marching Band method. Due to the keys being turned more outward in the Rockstro method it is easier for the left hand to reach the keys without any strain. The right hand is also in a good position, provided the flute is not turned outward too far.

Nevertheless, there is not one correct way, therefore every flutist should experiment until he/she finds a position that feels most comfortable and produces the best possible tone quality. Teachers must help their students not to choose a position solely for comfort purposes, but to rather choose a position that incorporates comfort, good tone quality and technical freedom and agility.

CHAPTER 5

STUDENTS' KNOWLEDGE AND PERSPECTIVES

In this chapter information is gathered on what present day flute students of different ages and levels know about flute *embouchure* and tone and various aspects relating to it. The information has been obtained through the following means.

- By means of an experiment I conducted. I used two groups of six students each, providing one group with a lot of information on *embouchure* and tone while the other group only received the minimum necessary information on these aspects

- Before the experiment began, I asked some of my own students and students from other flute teachers to voluntarily complete a questionnaire (Appendix A). By means of these questionnaires information was obtained on what students know about different aspects related to *embouchure*

- By means of a questionnaire (Appendix B) and interviews with teachers, information on students' perspectives and perceptions was obtained from the teachers. My own experience will also form part of the discussion.

5.1 The experiment

5.1.1 Two different groups

All the students in the experiment were my own students. There were two groups with six students in each group. The first six received intensive information on *embouchure* and the other six (control group) received only the

minimum information. In order not to hinder the progress of the control group, other essential elements of technique and musicality were emphasized.

Permission from the students was obtained beforehand by means of letters of informed consent.

The goal of the experiment was to see what the differences in progress were between the two groups concerning their quality of tone.

Group 1 (experimental group):

- Received an extensive amount of information on *embouchure* over a period of 7 weeks
- Ages differed from 13 – 18 years
- Levels of flute playing ranged from beginner's level to grade 3 standard
- One student had braces
- Four male students and two female students were included in this group
- Two students in this group had started lessons with a previous flute teacher.

Here are some of the aspects that were attended to during the 7 week period:

- Students learned how to spell "*embouchure"* and that the word is French
- They studied the definition of *embouchure* and learned to explain the relation between *embouchure* and tone. It was important to help them understand the purpose of a well-formed *embouchure*
- They learned what the basic principles of a correct *embouchure* are
- Pictures of correct and incorrect *embouchures* were shown to the students

- The Pneumo Pro was used to help students manipulate their airstream and control its direction
- They were given information on the anatomy of the human body and its influence on a flute player's *embouchure*
- Aspects like vibrato, overtones, intonation, contemporary techniques and their influence on and relation to *embouchure* formed part of the information provided and the discussions.

Group 2 (control group):

- The students received the minimum necessary information on *embouchure* over a period of 7 weeks
- Ages differed from 13 – 18 years
- Levels of flute playing ranged from beginner's level to grade 3 standard
- No students had braces
- Three male students and three female students were included in this group
- Three students in this group had started flute lessons with a previous flute teacher.

Each week I wrote down what each student did in his/her flute lesson and carefully noted the progress in their tone development. They filled in a questionnaire (Appendix A) after the seventh week.

5.1.2 Comparison between the two groups

Group 1 showed a much better understanding of the concept *embouchure*. When the students were asked to explain the principles of *embouchure* formation Group 1's answers showed considerably more insight than that of the control group. Both groups showed some understanding of the direction and speed of the airstream, but Group 1 had developed more insight.

Most significant were the differences between the two groups when questions were asked about the pitch, for example, turning the flute in or out, moving the head up or down and in what registers the flute tends to play sharp or flat, and why. Also, the different *embouchure* formations for the different registers were much better understood by Group 1.

Group 1 understood that posture, intonation, vibrato and contemporary techniques have an influence on *embouchure*, and although seven weeks was a short time to grasp all the different aspects, the students showed a lot of insight.

5.1.3 Conclusion

Although it can not be said that Group 2 showed no improvement in tone production, the tone quality of the students receiving a vast amount of information on *embouchure* showed greater improvement. The Pneumo Pro was also a determining factor in this experiment as it helped the students understand certain principles of forming an *embouchure* and manipulating the direction and speed of the airstream.

Any student from the age of thirteen should be able to understand all the aspects covered in this experiment. Thus, in my opinion, students' views and perspectives should be expanded as soon as possible.

5.2 Results of the questionnaires

The questionnaire (Appendix A) was filled in by my own students as well as students from other flute teachers. None received any specific information regarding *embouchure* in order to complete the questionnaire. Students included a variety of ages and levels (beginner, intermediate and advanced).

The questionnaire (Appendix B) was filled in by a number of flute teachers, nationally and internationally.

The following information and conclusions were drawn from the questionnaires.

5.2.1 Misconceptions regarding *embouchure*

Quite a few students have misconceptions regarding the meaning of the word *embouchure*. The most common misconceptions are a) *embouchure* is something on the headjoint, b) *embouchure* is the airstream or the way a flutist blows and c) *embouchure* is the hole between the lips (aperture). One student had not heard the term *embouchure* in five years of flute lessons with their previous teacher. The conclusion is that teachers need to do much more to inform students.

5.2.2 Misconceptions of basic principles

5.2.2.1 *Embouchure* formation

A misconception that students have concerning *embouchure* formation is that the aperture must be circular at all times. There were also students that could not answer this question (see Appendix A, question 3.3.7).

5.2.2.2 Direction of the airstream

Common misconceptions regarding the direction of the airstream are a) the direction of the airstream is directly linked to the size of the aperture, b) the tongue should be used to manipulate the direction of the airstream, c) the direction of the airstream must be straight and d) warm air should be felt when holding the hand in front of the headjoint. Very few students mentioned the function of the jaw in changing the direction of the airstream.

5.2.2.3 Speed of the airstream

Typical answers regarding the speed of the airstream were a) the airstream must be soft and b) the airstream must be fast. These answers are very vague and teachers should help their students to understand these principles better.

There are many students who do not understand the principles of *embouchure* formation, the direction of the airstream and the speed of the airstream. All three of these aspects are vital in producing a clear and rounded tone through all the registers of the flute.

5.2.2.4 The influences of tongue placement on *embouchure*

The tongue can have an influence on *embouchure* and tone (see Chapter 4.15.3). Flutter tonguing, especially, can easily influence the *embouchure* as stated in Chapter 4.13.4.

Students made a connection between the placement of the tongue and tone quality, but failed to make a connection between the placement of the tongue and *embouchure*. One student mentioned that the tongue should be relaxed while articulating but failed to mention that tension in the tongue will influence the *embouchure* negatively.

A misconception is that different tongue placements inside the mouth cavity (not including the “slip tongue technique”) necessarily influence the *embouhcure*. One student said that the movement of the tongue directly influences the other facial muscles, therefore the movement of the tongue influences the *embouchure*. In my opinion, through my teaching experience and personal application, this is not true.

5.2.3 Relation between *embouchure* and intonation

Most of the beginner students do not understand the relation between *embouchure* and intonation. This is understandable because the concept of intonation can only be successfully introduced when a student's *embouchure* and tone are well developed.

There were, however, advanced students (some that are pursuing a career in music) that could not answer basic questions regarding intonation. Intermediate and advanced students need to know basic principles such as a) if you turn in the flute the pitch becomes flatter and b) if you lift your head, keeping the flute and arms constant, the pitch becomes sharper. Some intermediate and advanced students could not answer similar questions (see Appendix A, questions 3.3.4 and 3.3.5). Teachers have a responsibility to ensure that their intermediate and advanced students understand the relation between *embouchure* and intonation.

5.2.4 The size and shape of the aperture

Most students understand that neither the size nor the shape of the aperture is the same for the different registers. There were, however, advanced students who answered this question (see Appendix A, question 3.3.7) incorrectly. Although these students can obviously produce the different registers on the flute, their tone quality can benefit from understanding the principles concerning the size and shape of the aperture.

5.2.5 The human body and its influence on *embouchure*

Almost all the students understood that the physical characteristics of the human body can have an influence on *embouchure*. Many stated that tension in the face or neck muscles would influence *embouchure* negatively. A few also stated

that the face muscles are used to manipulate the shape of the lips (i.e. the *embouchure*).

5.2.6 Braces

A few students were of opinion that braces change the distance between the lips and the teeth. Students say that this distance between the lips and teeth, together with regular pain and irritation, are probably the major difficulties for the flutist to endure and overcome. In the author's opinion this is true (see Chapter 4.5.9 and Chapter 4.8).

There were many students that have never had braces themselves. Many of them did not answer these questions (see Appendix A, questions 3.4.1 and 3.4.2) because they do not have experience or knowledge in this regard.

Many students provided good advice for flutists that have to play with braces. See Chapter 4.5.9 and Chapter 4.8 for advice and information on playing the flute with braces.

5.2.7 Harmonics/overtones

A misconception students have is that overtones are produced by simply blowing harder. Overtones are produced by changing the direction, speed and volume of air in the correct relation to each other. The *embouchure*, abdominal muscles and diaphragm are all used to achieve the desired result. Also see Chapter 4.12.

5.2.8 Influence of breathing on *embouchure*

The students could not draw any relation between breathing and *embouchure*.

Teachers should help their students to understand that poor breathing will result in the *embouchure* trying to compensate for the lack of air, therefore affecting the *embouchure* negatively. The *embouchure* is also interrupted each time a flutist takes a breath. After each breath the *embouchure* needs to be reformed.

5.2.9 Influence of posture on *embouchure*

Most students could not give an accurate answer when asked to describe the influence of posture on *embouchure*. Teachers should explain that tension in the neck, face, shoulders and/or back muscles and/or jaw that is caused by bad posture will influence the *embouchure* negatively.

Futher information that should be made available to students is that a) when a flutist is hunched over while playing it will affect his/her lung capacity and b) a shortage of air while playing will result in the *embouchure* trying to compensate for the deficiency, therefore affecting the *embouchure* negatively.

5.2.10 Support from the diaphragm

Most students understand that to play the flute they need support from their diaphragm and abdominal muscles. Often students get confused with regard to the amount of support needed and the dynamic level they are playing at. Students tend to have sufficient support when they need to play at a loud dynamic. Many students, however, tend to play with insufficient support when they are playing at a soft dynamic.

I have found the following exercise helpful to students in this regard. First let the student play a *forte* note with firm support from the diaphragm and abdominal muscles. Then let him/her play a *piano* note, keeping the same amount of tension in the diaphragm and abdominal muscles. This will help students understand that when playing *piano* support from the diaphgram and abdominal

muscles are often necessary in order to sustain the desired pitch and tone quality.

This exercise will help students understand that these two aspects of flute playing, although interweaved, still need independent attention.

5.2.11 Vibrato

There are even older, more advanced students who do not understand the correct method of producing vibrato. Some students who have passed grade 5 standard do not know what vibrato is. Vibrato should ideally form part of every student's tone as soon as their tone is developed sufficiently.

5.2.12 Contemporary techniques

Very few students know what contemporary techniques are, although some students know about flutter tonguing. Contemporary techniques can help students to develop their *embouchure*. See Chapter 4.13 for a discussion of teachers' perspectives on the topic of teaching contemporary techniques.

5.3 Conclusion

Many students do not have enough knowledge on aspects regarding *embouchure* and tone. In my opinion, students who have sufficient knowledge on aspects and principles regarding *embouchure* and tone will produce a tone of higher quality.

CHAPTER 6

DISEASES, MEDICAL CONDITIONS, MEDICINE, PHYSICAL ATTRIBUTES AND INFECTIONS THAT CAN INFLUENCE EMBOUCHURE AND TONE

As with most of the medical information in this chapter, the information is in the public domain and has been sourced from, and checked against, a variety of sources. In each of the following sub-sections the chief source(s) of information has been given. On this account, not every fact has been referenced. Nevertheless, all sources appear in the list of sources.

6.1 Mouth

6.1.1 Xerostomia

Xerostomia means that the mouth is in a condition of dryness. It is a condition and not a disease. Xerostomia results from not enough saliva inside the mouth or a lack thereof (Wilkins 1999:345).

For a flutist, xerostomia can create a problem, because the lips need to be kept wet. In one of his lectures John Hinch (2003) said the following; “The centre of the lips, where the lip opening is formed must always be kept wet. The wetness acts like a lubricant for the airstream to flow smoothly out. Try drying your lips on a tissue and then playing – I’ll bet you sound ‘orrible!”.

Xerostomia may be permanent or temporary. Below is a list of things that cause xerostomia. In some cases salivary flow returns to normal (Wilkins 1999:345).

- Radiation to head and neck
- Surgical removal of glands
- Sjögren’s syndrome (see Chapter 6.6.10)
- Pharmacologically induced xerostomia

- Diabetes (see Chapter 6.6.2).

In order to manage this condition of xerostomia the following routes can be explored (Wilkins 1999:346).

- Using a saliva substitute
- Avoiding tobacco and alcohol
- Rinsing the mouth with 10ml olive oil
- Monitoring the humidity of the environment with a humidifier
- Chewing sugarless gum to stimulate saliva production
- Minimizing the effects of xerostomia through good oral hygiene
- Using fluoride toothpaste and fluoride rinses
- Taking lozenges (small sweets that contain medicine) that aid in saliva production.

6.1.2 Hyper salivation

Too much saliva inside the mouth of a flute player can cause problems with the normal flow of air. When the normal flow of air is compromised it will affect the sound proportionately.

Hyper salivation may also influence the breathing process because the flutist needs to swallow more frequently. The process of swallowing takes time and may interrupt the fluidity of the music.

Causes of hyper salivation include gastroesophageal reflux disease, pregnancy, oral ulcers, oral infections, Bell's palsy (see Chapter 6.5.1), certain medicines and when problems with the jaw (fracture or dislocation) are experienced.

It may help to use a mouthwash or brush the teeth regularly. Taking more calcium in the diet is also suggested. Chewing gum can bring relief and physical exercise may also help to dry up the mouth (Brownfield 2004).

6.1.3 Angular cheilitis

Angular cheilitis is a disease that affects the lips and the corners of the mouth. It is often caused by candida (fungal infection) or bacterial infection. Symptoms may include cracks at the corners of the mouth as well as redness and swelling.

This disease will affect a flute player's tone negatively, because the surface of the lips is affected. To produce a good tone quality on the flute the lips and the corners of the mouth must be smooth. Pain may be experienced while smiling, eating or when playing the flute. Figure 6.1 shows an example of angular cheilitis at the corner of the mouth.

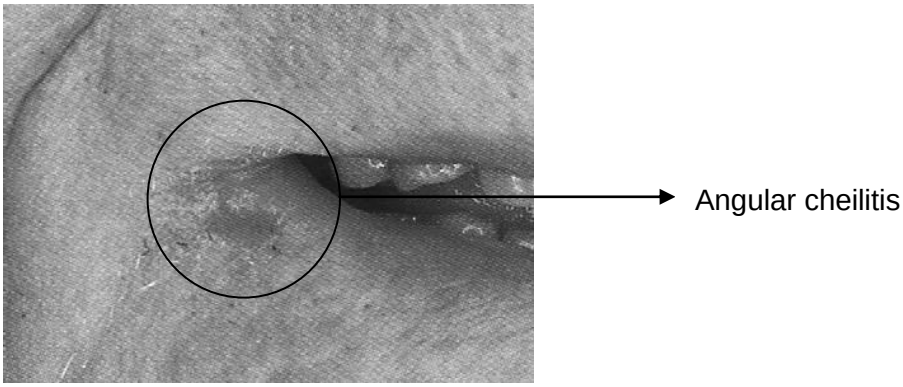

Figure 6.1
Ibsen and Phelan (1992:144)

Treatment methods include the use of lip balm (to avoid licking lips), increased water and vitamin intake, and avoiding both too much lipstick and flavored toothpaste. Applying honey to the lips may also reduce pain. Doctors should also be consulted to ascertain whether or not certain deficiencies are present in the body (Kluever 2009 and Wilkins 1999:702-703).

6.1.4 Mucositis

Mucositis is the inflammation of the mucosa (soft tissue inside the mouth). Mucositis can be caused by chemotherapy and radiation therapy (Ibsen and Phelan 1992:424 and Wilkins 1999:727-731). Also see Chapter 6.6.1.

6.1.5 Oral candidiasis

Candida albicans is a fungus and is part of many people's oral environment; it might be present without causing an infection. Candidiasis, also called thrush or yeast infection, is a fungal infection. Candidiasis can appear in different parts of the body, for example the oral cavity, pharynx, vagina and esophagus. Figures 6.2 and 6.3 show oral candidiasis. A thick white substance is visible on the tongue and palate.

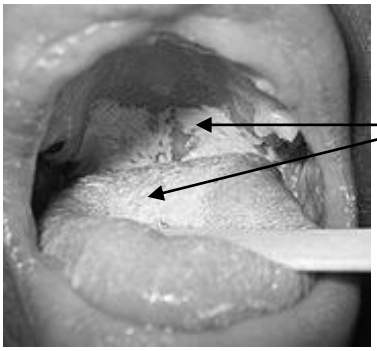

Figure 6.2
Summer (2009)

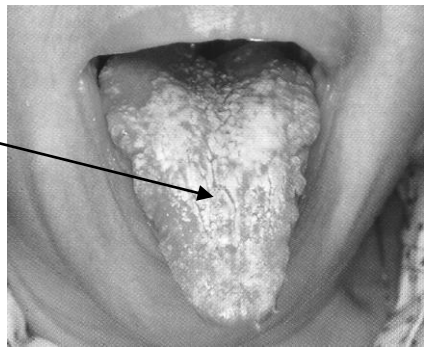

Figure 6.3
Ibsen and Phelan (1992:144)

Candidiasis is usually caused by poor oral hygiene and can especially be a problem for patients that are immunocompromised. HIV, chemotherapy, radiation therapy, mononucleosis, cancer treatments, stress, steroids and nutrient deficiencies can all be the cause, or at least a contributing factor, for candidiasis.

Symptoms include white patches on the tongue and the inside of the mouth, burning sensation, pain on the inside of the mouth and also decreased appetite. Although the flutist will still be able to play, this infection will cause irritation or even pain depending on how severe the candidiasis is and where the infected areas are inside the mouth.

Antifungal treatment (for example Nystacid drops® or Daktarin oral gel®) will most probably resolve the problem. If candida continues to create problems in the oral cavity there might be a deeper-rooted medical problem. Cytology (cells are sent for microscopic evaluation) is a useful technique for identifying candida albicans (Candidiasis 2009, Dreyer 2009 and Ibsen and Phelan1992:142-144).

6.1.6 Gingivitis and periodontitis

Gingivitis is an inflammation of the gingiva (gums) and is usually caused by accumulation of plaque in small gaps between the teeth and the gums. Gingivitis causes bleeding, pain and irritation in the mouth. Teeth and gums need to be cleaned regularly, including brushing, flossing and going to the dental hygienist every three to six months depending on your oral condition. Risk factors include stress, inadequate diet and tobacco. Andolex-C oral rinse® is recommended for a patient with gingivitis. Andolex-C is an anti-inflammatory substance and also helps to relieve pain.

Gingivitis that is not treated can eventually result in a condition called periodontitis. Periodontitis is when there is inflammation of the gums that results in bone loss around the teeth. Periodontitis is accompanied by pain, bleeding on slight pressure, unpleasant taste, bad breath, increase of saliva and poor appetite. Bone loss can cause the teeth to move and affect the flutist's sound negatively. There is also a link between periodontitis and diseases like diabetes (see Chapter 6.6.2), osteoporosis and certain cancers (see Chapter 6.6.1). Sources include *Gingivitis* (2009) and a personal conversation with Dreyer (2009).

6.1.7 Frenums

A frenum (frenulum) is tissue that secures or restricts the movement of an organ. There are frenums in different parts of the human body, including the brain and oral cavity. The length of the frenum inside the upper lip can affect a flutist's *embouchure* and hence sound. If the frenum inside the upper lip is too short the flutist will find it difficult, or even impossible, to direct the airstream so as to produce the different registers on the flute. A flutist that has received braces and has a relatively short frenum may also experience difficulty in forming a proper *embouchure*. The length of the frenum under the tongue can influence the movement and agility of the tongue and might have an influence on a wind player's articulation.

A frenectomy (removal of the frenum) or frenuloplasty (alteration of the frenum) can be done to improve mobility (Frenulum 2009 and Kluever 2009).

6.1.8 Herpes labialis

The herpes simplex infection has two major forms: Type 1 that causes oral infections and Type 2 that causes genital infections. Herpes labialis, or also more commonly known as cold sores or fever blisters, are a Type 1 herpes simplex infection. It affects a large percentage of the population and is usually recurrent. If the virus has manifested itself in the body it usually stays there forever. The frame of recurrence is anything from monthly to once a year. Herpes labialis can occur on the inside or on the outside of the mouth. If it is on the outside it is usually on the lips, although the skin around the lips can also be affected. The recurrence of infection is usually triggered by certain stimuli like sunlight, stress, fever or fatigue. The flutist's *embouchure* can be affected by the herpes virus depending on the size and location of the cold sore(s). Figure 6.4 shows an example of herpes labialis on the lips and the left cheek.

Topical treatment includes Acyclovir ointment® and Dynexan ointment®. Systemic treatment includes Acyclovir tablets® and Pyralvex paint® (Dreyer 2009 and Ibsen and Phelan 1992:147-151).

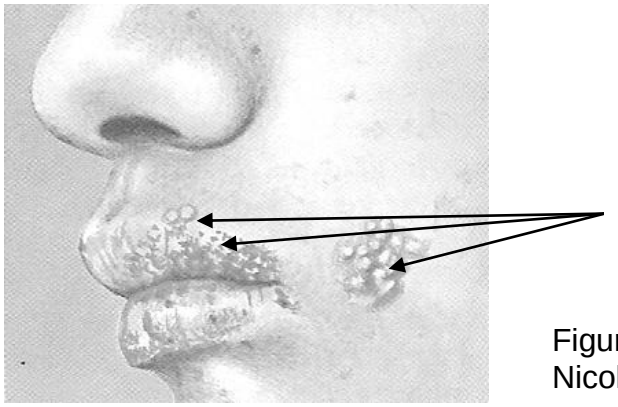

Figure 6.4
Nicolausson (1984:116)

6.1.9 Macroglossia

Macroglossia means unusual enlargement of the tongue. Although fairly uncommon, the flutist with this condition will experience difficulty with his/her articulation, *embouchure* and tone (Wilkins 1999:812).

6.2 Lips

6.2.1 Lip swelling

Lip swelling can come from an injury to the lips, e.g. as a result of falling. Someone that experiences lip swelling on a continuous basis needs to look for another possible cause, for example an allergy or a physical disorder. Flutists may be allergic to the material of their flute. Allergies to metal, wood or plastic usually present themselves in the form of a rash or irritation. Although an allergy to the material of the flute might cause swelling, it is unlikely. Should there also be swelling in other parts of the body, besides the lips, this may be an indication of a physical disorder.

Extreme heat can cause dry and swollen lips. Allergic reactions to certain medications, foods, vitamins or herbs can also cause the lips to swell. Chemical exposure, angular cheilitis (see Chapter 6.1.3) and misalignment of teeth may also cause the lips to swell. If uncertain about the cause, a doctor should be consulted. Treatment includes the use of an antihistamine, for example Loratadine® (Dreyer 2009 and Lewis 2008:1).

6.2.2 Dry and cracking lips

Lips are skin, but this skin does not have hair or sweat glands like the skin covering the rest of the body. The hair and sweat glands help to protect skin from the sun, the cold and windy conditions. Lips do not produce natural oils to aid in protection as other skin of the human body does. Therefore lips are more exposed and dry and crack more easily than other skin.

Here are some of the most common causes for dry and cracking lips: too much exposure to the sun, windy and/or cold conditions, drugs, dehydration, Sjögren's syndrome (see Chapter 6.6.10), diabetes (see Chapter 6.6.2), HIV (see Chapter 6.6.3), the use of Roaccutane, deficiency of vitamin A, B and C, smoking, allergies to cosmetic products, braces and frequent use of soaps or other chemicals.

A person with dry or cracked lips should not lick the lips. This will relieve discomfort only temporarily. As soon as the saliva evaporates from the lips the condition becomes worse and more painful. Vaseline or lip balm, preferably unflavoured, should be used to moisten the lips. Increased use of non-alcohol liquids and avoiding flavoured toothpaste is recommended. Other remedies include the use of a humidifier, covering the lips with aloe Vera gel, rubbing the lips with cucumber, applying petroleum jelly and/or vitamin E to the lips and increasing the intake of vitamin A, B and C.

People are different and different remedies work for different people. Options should be tested until a solution is found. If not successful, a doctor or dermatologist should be consulted (Home Remedies 2009 and Kluever 2009).

6.2.3 Clefts of the lip and/or palate

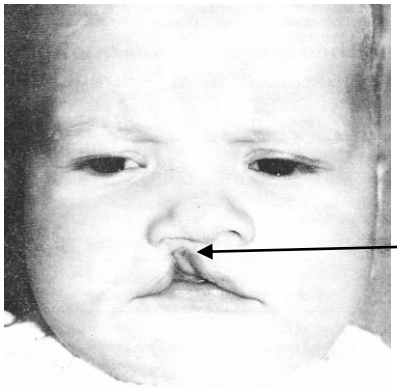

Figure 6.5
Pfeifer (1991:284)

A person with a cleft lip and/or palate will not be able to play the flute. One baby in every six hundred to eight hundred babies is born with a cleft lip and/or palate. The surgeons can, however, perform operations on these patients with results that are very successful. Most of the patients with a cleft lip and/or palate have "normal" facial attributes after the operation(s). In many cases, however, the patient's teeth are either missing or irregularly formed. Crowns, veneers and dental bonding (see Chapter 6.3.1) can help to reduce the affects of missing or irregularly formed teeth. If there are problems with the occlusion (see Chapter 6.4.1) of the patient, orthodontists may use braces or surgery to normalize the occlusion. After an operation(s) and orthodontic care most patients will be able to play the flute. Some patients will have a teardrop or inverted teardrop as a result of the operation(s). Although this will influence their *embouchure*, they will still be able to produce a sound on the flute (Kluever 2009 and Wilkins 1999:665-670).

6.2.4 Focal dystonia

Focal dystonia is something that many musicians may not know about, but statistics show that as much as one in two hundred professional musicians may suffer from focal dystonia (De Lisle 2008:12). As a large number of musicians may possibly be affected in some way, we as teachers and performers need to understand what focal dystonia is.

Focal dystonia is more commonly found in pianists and guitarists than in any other instrumentalists. There are, however, many other instrumentalists that suffer from the same condition, for example flutists, violinists and clarinetists. The statistics also indicate that the problem is more commonly found in men than in women.

The muscles of someone suffering from focal dystonia don't seem to respond normally to instructions from the brain. When, for example, you tell your finger to lift up, it either goes down or doesn't want to move. For many musicians, including flutists, this obviously spells disaster.

Focal dystonia can also occur in the muscles of the lips. The instrumentalist may suddenly experience an unpredicted cramp in his/her lips. Obviously this is a big problem for creating nuances with the lips and controlling the *embouchure*.

Focal dystonia is actually a neurological condition. This means that the problem lies not with the muscles themselves (finger muscles, lip muscles, etc.), but rather in the brain. When you want a certain body part to execute a specific action, the brain gives an instruction to that part of the body. Focal dystonia is when this map of instructions gets disordered and then gives the wrong instructions to the different body parts. Normally focal dystonia is not accompanied by any pain.

Early intervention is very important in trying to uproot the problem. One thing all musicians can do to help prevent focal dystonia is to train their bigger muscles proportionately to the smaller muscles. When playing an instrument it's often only the smaller muscles that do most of the 'muscular work'. It is, however, important that the bigger muscles get enough exercise in order to support the smaller muscles. Also, one should always check for good posture and make sure hands, wrists, neck and facial muscles are all warmed up properly before practicing.

Doctors have tried different things to solve the problems of focal dystonia. They have come to the conclusion that drugs, injections and even a period of rest do not necessarily solve the problem. The body may still remember what caused focal dystonia in the first place and a return to the instrument may result in a recurrence of the problem.

Our body parts give certain feedback to the brain when playing the flute, including sensory feedback. Our lips and fingers may be triggered by materials (wood, plastic, etc.) to respond in certain ways because of sensory feedback. Allergic reactions to metals are different because they affect the lips or fingers themselves and not their function. When experiencing focal dystonia it may help to change the sensory feedback by using different materials. Sensory feedback can be changed by playing with plastic covers over the fingers, using rubber bands or by wearing a ring. To change sensory feedback from the lips, instruments made of different materials (wood, plastic, gold, etc.) should be considered.

Some of the things a flutist can do when already diagnosed with focal dystonia are:

a) use biofeedback to 're-train' the muscles
b) use physiotherapy and other treatments to relieve stress

c) revise body posture when playing the flute.

The following sources were used in this sub-section: Dannenbring 2008:7-8, De Lisle 2008:11-13, Focal Dystonia 2008, Lewis 2008:2-3 and Still 2008:19-20.

6.3 Teeth

6.3.1 Crowns, veneers, teeth whitening, dental bonding and dental implants

Crowns, veneers, teeth whitening, dental bonding and dental implants can have an influence on a flutist's *embouchure* and hence sound. People use these treatments for one or more of the following reasons: a) to improve the cosmetic appearance of their teeth, b) to strengthen a tooth, and c) to restore the shape and size of the teeth.

For teachers and flute players it is necessary to know what crowns, veneers, teeth whitening, dental bonding and dental implants are, in order to understand their influences on flute playing.

- Crowns, also called "dental caps" or "tooth caps", can be made of porcelain, a metal (for example gold) or a combination of both. A crown covers the surface of the visible part of a tooth (the part above the gum line)
- Veneers are made of porcelain. Dentists use a thin layer of porcelain to cover the surface of the tooth in order to change its colour
- Teeth whitening is done by using different methods that are available on the market, for example whitening strips, whitening paint and an at-home tray
- Dental bonding is when dentists use a restorative called "dental composite" to close small gaps, etc.

- A dental implant is the implant of an artificial tooth to replace lost teeth. Natural or synthetic materials are used for this purpose.

All of the above may have an influence on a flutist's tone quality. Flute players are advised to consider the implications these aspects can have on their flute playing. The dentist and/or orthodontist should be consulted in this regard. Veneers, dental bonding, dental implants and crowns change the surface of the teeth, therefore, they have an influence on one's playing experience (Animated-teeth 2008).

6.3.2 Mal-relations of teeth

Mal-relations of teeth can influence the flutist's *embouchure* in different ways, depending on the form and level of the mal-relation. Mal-relations include open bite, end-to-end bite, edge-to-edge bite, anterior crossbite, deep anterior overbite, crowding of teeth, spacing (gaps between teeth), overjet and underjet (Wilkins 1999:257). Figure 6.6 shows the different mal-relations.

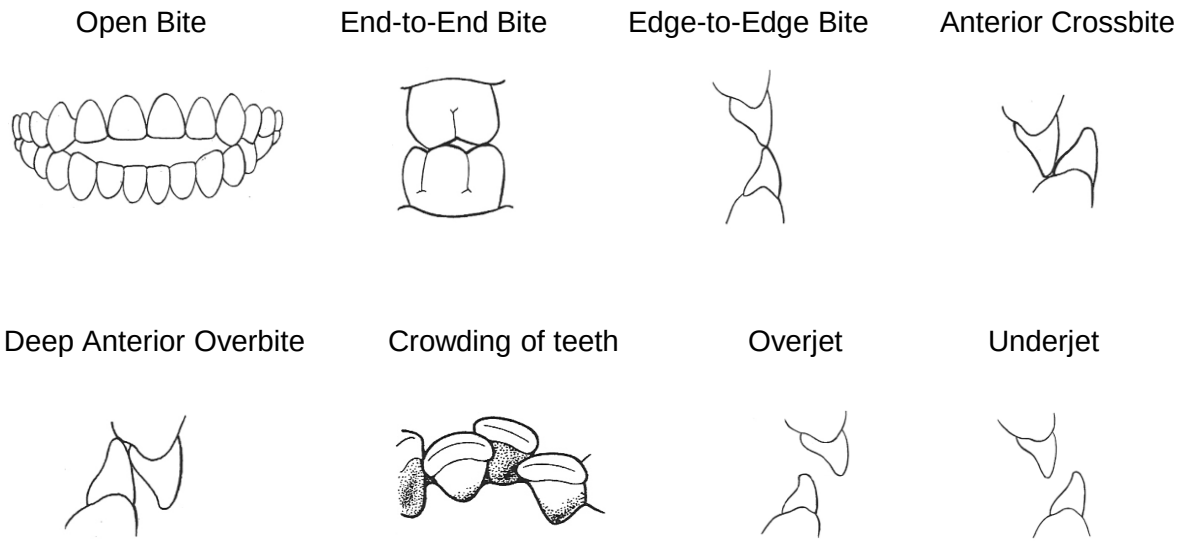

Figure 6.6
Wilkins (1999:257)

6.3.3 Braces

Braces do affect the flutist's *embouchure* and sound considerably. See Chapter 4.5.9, Chapter 4.8 and Chapter 5.2.6 for more details.

6.4 The jaw

6.4.1 Occlusion

Occlusion is the relationship between the teeth in the upper and lower arches as they come together when the mouth is closed. Mal-occlusion is when there is a deviation from the acceptable relationship between the teeth in the upper and lower arches. Mal-occlusion occurs when the two parts of the jaw (mandible and maxilla) are disproportionate to each other. There are three types of mal-occlusions; mesognathic, retrognathic and prognathic.

Mesognathic

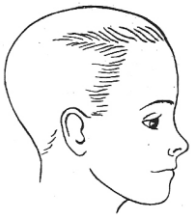

Figure 6.7
Wilkins (1999:256)

Retrognathic

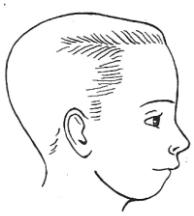

Figure 6.8
Wilkins (1999:256)

Prognathic

Figure 6.9
Wilkins (1999:256)

A patient with a mesognathic mal-occlusion has a jaw that is slightly protruding, with the forehead and chin being vertically aligned or almost vertically aligned. Retrognathic mal-occlusion (also called an overbite) is when the mandible protrudes in relation to the maxilla, more than necessary for a normal occlusion. Prognathic mal-occlusion (also called an underbite) is when the maxilla is protruded (Wilkins 1999:255-256).

All three types of mal-occlusion will affect the *embouchure*. A person with a mesognathic or retrognathic occlusion will be able to play the flute, but for someone with a prognathic mal-occlusion it will be difficult. Suzanne Lord (2009), associate professor of flute and music history at Southern Illinois University states the following: "…students who really could not function on [the] flute at all were those with a pronounced underbite - that is, a jaw that is forward so that the bottom teeth are father forward than the upper teeth. There was simply no way that they could direct an air-stream down into the flute". Although a pronounced underbite makes it difficult to produce a sound on the flute it is not impossible, also see Chapter 4.5.3.

6.4.2 Temporomandibular joint disorder

Temporomandibular joint disorder (TMJ, TMJD, or TMD) is a disorder at the joint between the jaw and the skull. Symptoms include clicking noises, pain and the occasional inability to open the jaw.

Flutists can cause TMJD by putting too much pressure on the temporomandibular joint. Flutists must keep the head balanced correctly and the neck free of tension to avoid TMJD. It is not necessary to draw the head back and down when opening the jaw and the flutist should rather release the mandible downwards (without any head movement). Opening the jaw incorrectly can cause temporomandibular joint disorder (Pearson 2002:70).

6.5 Muscle problems

6.5.1 Bell's palsy

Bell's palsy (palsy refers to the disorder of movement) is an acute paralysis of the seventh cranial nerve. The cause for this condition is not known, although the herpes simplex virus, removal of a tooth or surgery in the oral cavities may be

contributing factors. Bell's palsy can occur at any age. It is, however, more prevalent between the ages of twenty and forty. There is no known cure for this condition.

The symptoms include paralysis of the facial muscles on one side of the face, one eye that can not be closed, corners of the mouth that droop down, a lot of drooling, the narrowing of one nostril and the one side of the forehead that can not be wrinkled. It will be impossible for somebody with Bell's palsy to form a proper *embouchure* on the flute. Figures 6.10 and 6.11 show a patient with Bell's palsy.

Figure 6.10
Whiteman (1971:2140)

Figure 6.11
Whiteman (1971:2140)

Patients must be careful not to confuse Bell's palsy with a stroke (see Chapter 6.6.11). More than 80% of sufferers of Bell's palsy recover completely within a few weeks, but for other patients it may take six to twelve months, or even longer. The statistics show that at least one person out of every thousand becomes a sufferer of Bell's palsy.

Because the condition is, in most cases, not permanent the patient has some hope and motivation, therefore he/she can participate in the recovery. Through

exercises, heat treatment and massages, pain and discomfort can be reduced and the speed of recovery increased. Certain drugs are used to aid in the recovery process as well as faradic current and electrical stimulation (Whiteman 1971:2139-2140).

6.5.2 Cerebral palsy

Cerebral palsy is a disorder in which the brain's motor parts have been injured due to a variety of possible causes. Cerebral refers to the cerebrum, the injured area in the brain of a patient with cerebral palsy. The causes of cerebral palsy include maternal infections, nutritional deficiencies during pregnancy, blood type incompatibility, shortage of oxygen during pregnancy and brain damage. It is a nonprogressive disorder and although the onset is more common during pregnancy it can occur at any age.

Symptoms include tightened muscles, movement that is slow and stiff, coordination problems, involuntary contraction of a muscle(s), uncontrollable movement, drooling, difficulty in swallowing and speech problems. Mental retardation, learning disabilities and seizures may also occur.

The condition of cerebral palsy differs so much from person to person that it is impossible to say if a patient will be able to play the flute or not. In some cases the cerebral palsy may be so mild that someone else will not know, except when the person tells about his/her own condition. A person may also be affected in one or two fingers only and for another it might be so extreme that they need complete nursing care. Cerebral palsy has so many manifestations, and degrees of manifestations, that it is not possible to generalize any specific symptoms or solutions for the flutist. Teachers should treat cerebral palsy case by case and be creative and innovative in finding solutions for each player.

The *embouchure* may be affected by necessary changes in posture in order to accommodate spasticity in the arms, neck, shoulders or face. If the person experiences extensive involuntary movements of the facial muscles and/or head they may find it difficult to form and control a proper *embouchure*. In this case it might be necessary to choose a different instrument. A non-woodwind instrument might be the best option, but instruments like trombone or tuba might also work, because the *embouchure* on a trombone or tuba is more "loose" than on a flute. Drooling and difficulty in swallowing will also affect the *embouchure*.

When teaching a student whose cerebral palsy is affecting his/her *embouchure* and/or other aspects of his/her playing, the level of playing is not the important factor. Nan Raphael (2009) said the following about patients with cerebral palsy: "The important thing is that they get satisfaction from playing no matter what level they are able to obtain".

There is no known cure for cerebral palsy, although it is possible to get relief with treatment and physiotherapy (Seppa 1998:244 and Wilkins 1999:781-783).

6.5.3 Muscular dystrophy

6.5.3.1 Duchenne muscular dystrophy

Muscular dystrophy includes over 100 diseases, but the one most commonly referred to when talking about muscular dystrophy is DMD - duchenne muscular dystrophy. Most of the dystrophies only affect the skeletal muscles and very rarely affect the cardiac muscles.

DMD is a progressive disease that causes biochemical, physical and structural defects of the muscles. Lack of protein components turns muscles into connective tissue and fat. The age of onset is usually between two and six years

of age. Males are more affected than women. DMD is a genetic disorder and is caused by changes in the individual's DNA sequence.

The flutist is most affected by the wasting of the respiratory and shoulder muscles. Enlargement of muscles, for example the tongue, is a common symptom. Enlargement of the tongue (macroglossia) will affect the *embouchure* negatively (see Chapter 6.1.9). A person with DMD will experience muscle contractions and will have progressive difficulty with motor skills.

There is no known cure for DMD and treatment is focused on relieving the affect the symptoms have on the patient. Disablement is progressive and patients rarely live to reach their thirties (Wilkins 1999:777).

6.5.3.2 Facioscapulohumeral muscular dystrophy

The other common dystrophy is FSHD - facioscapulohumeral muscular dystrophy. The name of this disease indicates what areas will be affected the most: face (facio), shoulder (scapulo) and upper arms (humeral). The onset of this disease is between the ages of ten and eighteen. Males and females are equally affected.

In most cases the face muscles (facio) are affected first, especially the *obicularis oris* muscle. Flutists will know that this muscle is absolutely vital in forming a correct *embouchure*. The affected shoulder muscles (scapulo) and upper arm muscles (humeral) make it difficult to hold the flute, creating a negative influence on *embouchure* and hence on the sound.

The progress of this dystrophy is slower than that of the duchenne dystrophy. Patients usually live normal lives but become incapacitated later in life. There is no known cure for FSHD and treatment is focused on relieving the affect the

symptoms have on the patient (Facioscapulohumeral Muscular Dystrophy Society 2008 and Wilkins 1999:777).

6.5.4 Myasthenia gravis

'Myasthenia' means muscle weakness and 'gravis' means serious, therefore myasthenia gravis means 'serious muscle weakness'. Myasthenia gravis (MG) is an auto-immune neuromuscular disease and about two out of ten thousand people suffer from this disease. The problem is caused by nerve impulse transmissions that can not be received as a result of blocked receptors at the neuromuscular junctions. This disease can occur at any age and it is important to note that MG is not necessarily a progressive disorder. Symptoms can come and go and the intensity differs from patient to patient. Patients with MG have normal life expectancy.

The movement of the tongue and the muscles of the eyes, face, mastication and respiratory system can all be affected as a result of MG. Therefore difficulties in speech, mastication, swallowing, breathing, eye movements and facial expressions are all challenges for patients with MG. In severe cases of MG the patient can be completely paralyzed. The intensity of this disease will determine to what extent the flutist's *embouchure* will be affected (Wilkins 1999:778-779).

6.6 Diseases

6.6.1 Cancer

There are many different types of cancers. Oral cancer and leukemias are forms of cancer that are especially relevant for flutists because these cancers and their treatment (radiation, chemotherapy, etc.) can influence the oral environment quite considerably.

Cancer is when normal body cells turn into malignant ones (cells that can not be controlled and will most probably cause death). Risk factors for oral cancer include the following; alcohol, tobacco, poor oral hygiene and too much exposure to sunlight. Sunlight is a high risk for lip cancer.

Radiation therapy is a treatment method used for a lot of patients with oral cancer. Some of the effects radiation therapy might have on a patient are mucositis (see Chapter 6.1.4), less saliva in the mouth, sensitivity to pressure and temperature, sore mouth, trismus, dermatitis, xerostomia (see Chapter 6.1.1) and bleeding. Oral candidiasis (see Chapter 6.1.5) is also very common after radiation. All of the effects mentioned above have an influence on the flutist's *embouchure*.

Chemotherapy is when certain drugs are used to try and eliminate the cancer cells inside the body. Some of the effects that might have an influence on a flutist's *embouchure* are mucositis (see Chapter 6.1.4), xerostomia (see Chapter 6.1.1), jaw pain, gingival bleeding, herpes simplex (see Chapter 6.1.8) and candidiasis (see Chapter 6.1.5). The chief source for this sub-section was Wilkins 1999:721-732.

6.6.2 Diabetes

Diabetes is when a person has high blood sugar (hyperglycemia) as a result of insulin shortage. Insulin is a hormone produced in the pancreas. Insulin affects all the organs in the human body to some extent. There are two types of diabetes. Diabetes I is when a patient has an absolute insulin deficiency. Diabetes II is when a patient is insulin resistant (i.e. the body does not respond to insulin secreted).

Diabetes can cause peripheral neuropathy. Peripheral neuropathy is a disorder concerning the peripheral nervous system and not the central nervous system.

As a result of diabetes, neuropathy can cause a limb amputation and can also be responsible for oral and facial symptoms. Some of these symptoms include muscle weakness, cramps and involuntary actions.

Other oral problems that may occur with diabetes could be an increase in gingival inflammation (see Chapter 6.1.6), periodontitis (see Chapter 6.1.6), dry and cracking lips (see Chapter 6.2.2), angular cheilitis (see Chapter 6.1.3), decrease of saliva, xerostomia (see Chapter 6.1.1) as a result of some medications and oral candidiasis (see Chapter 6.1.5). All of the facial and oral symptoms mentioned above can influence a flutist's *embouchure*.

When diabetes is kept under control the oral cavities will be healthy and minimal problems will be experienced. When, however, diabetes is unstable the oral cavities can be negatively influenced. Antibiotics may be necessary when the diabetic patient's body can not resist infection on its own (Wilkins 1999:880-888).

6.6.3 HIV/AIDS

HIV (human immunodeficiency virus) and AIDS (acquired immune deficiency syndrome) can have considerable influence on the oral cavities. Some of the oral problems that may be experienced by an HIV/AIDS patient are candidiasis (see Chapter 6.1.5), herpes simplex (see Chapter 6.1.8), herpes zoster (shingles), gingivitis (see Chapter 6.1.6), periodontitis (see Chapter 6.1.6), mucosal pigmentation, salivary gland enlargement, gingival bleeding and xerostomia (see Chapter 6.1.1). The chief source for this sub-section was Wilkins 1999:35-38.

6.6.4 Arthritis

Arthritis is when a person has inflammation in a joint. There are two major types of arthritis; rheumatoid arthritis and osteoarthritis.

In rheumatoid arthritis joints may experience pain and swelling. For flutists this is a problem, especially in the fingers and hands. *Embouchure* is also directly influenced if pain occurs at the TM joint (temporomandibular joint). In some cases ankylosis (immobility because of unity between parts) can occur at the TM joint.

Treatment includes a pain relief program for each individual, therapy and looking at each individual's overall health. Anti-inflammatory drugs and other drugs are also used in order to stabilize the disease as much as possible.

Rheumatoid arthritis can also occur in children and differs somewhat from rheumatoid arthritis in adulthood. Typical symptoms are enlargement of the spleen and lymph nodes. Inflammation of joints can also occur in the wrists, knees, spine, etc. For the young flutist pain and limited movement at the TM joint may affect his/her *embouchure*.

Exercise forms a crucial part of the treatment plan in order to maintain as much function of the joints as possible. Drugs are also used in order to relieve some pain.

Osteoarthritis is also called degenerative joint disease (DJD). The onset for osteoarthritis is usually between fifty and seventy years of age. In the beginning stages of osteoarthritis, stiffness of joints is the basic symptom. Later, however, this becomes much worse. The joints have less movement and pain is part of the individual's daily life. Deformation of joints is also a common symptom. For flutists, osteoarthritis in hands, fingers and vertebrae may have an influence on their playing, depending on the different stages of this degenerative disease. In osteoarthritis the TM joint is less of a problem for flutists than in the case of rheumatoid arthritis. Although clicking or snapping may occur at the TM joint it is usually without pain.

Treatment includes a pain relief program for each individual, therapy and looking at an individual's overall health. Anti-inflammatory drugs and other drugs are also used in order to stabilize the disease as much as possible. Joint replacement is also a possibility. For a flutist it may be necessary to have a good warm-up session before each rehearsal, especially morning rehearsals so as to relieve stiffness (Wilkins 1999:784-785).

6.6.5 Parkinson's disease

Parkinson's disease is a degenerative movement disease. It is caused by a shortage of the brain chemical dopamine in the basal ganglia of the brain (the part that controls motor function). Parkinson's disease mostly affects people after the age of sixty, although it may occur before the age of fifty. Symptoms and intensity of symptoms differ from person to person.

For the flutist the following symptoms will affect their *embouchure* and tone: slower movements, decreased facial movement, trouble with swallowing, rigidity (increased during movement) and tremors in the mouth and chin.

A person with Parkinson's disease will struggle with facial expression and movement. Magee (1955:814) says "…this is known by the excellent descriptive term 'mask like-face', for a mask remains fixed [and] so does the facial expression of a patient with Parkinson's disease". The muscles in the face can not move voluntarily, therefore this disease will eventually make it impossible to form an *embouchure* on the flute.

Exercise is one of the key methods to try and reduce the affects of Parkinson's disease on the individual. Other treatment methods include drugs, surgery and brain stimulation (Magee 1955:814 and Wilkins 1999:784).

6.6.6 Epilepsy

Epilepsy is a disorder of the central nervous system and the term describes specific symptoms rather than a disease. Symptoms include seizures with or without loss of consciousness.

Epilepsy itself does not cause any problems for the flutist's *embouchure*, but the medicine taken for epilepsy and the accidents that may occur during a seizure can have an affect on the *embouchure*.

Anticonvulsant drugs may induce gingival overgrowth, especially drugs containing phenytoin. When certain drugs are used for epilepsy, gingival overgrowth may occur within weeks, or years may pass before overgrowth becomes evident. Gingival overgrowth may influence a flutist's *embouchure* because the person can not necessarily place the flute on the bottom lip as securely as before. The oversized gingiva will change the distance between the lips and teeth and the smooth surface usually enjoyed for flute placement will also be compromised.

Accidents that occur during seizures may also include scars or damage to the tongue, cheeks, lips or even the teeth. Damage to these body parts will have an affect on the *embouchure* (Wilkins 1999:801-806).

6.6.7 Multiple sclerosis

Multiple sclerosis is a chronic disease of the central nervous system. It is characterized by relapses and remissions because of disturbances in the central nervous system. Relapses are usually followed by a period of progressive disability. Women are affected twice as much as men.

The symptoms of multiple sclerosis and their intensity and time frame differ considerably from individual to individual. Typical symptoms include cognitive disturbances, decrease in attention, numbness in limbs, decrease in memory, and changes in motor and sensory skills. Vision can be lost as a cause of multiple sclerosis and the disease can also ultimately result in death. One of the most famous cellists of all times, Jacqueline du Pré, died of this disease in 1987.

Although the flutist will be affected by other symptoms, the *embouchure* will be more affected by the symptom of facial paralysis. The onset of multiple sclerosis is usually between twenty and forty years of age. Therefore facial paralysis as a result of multiple sclerosis might be a possibility for a flutist at the peak of his/her career.

Treatment includes good nutrition, avoidance of stressful situations, enough exercise (although not too strenuous), psychotherapy and medications. Early diagnosis is important to prevent the disease from advancing too fast (McDonald and Ron 1999:1615-1616 and Wilkins 1999:779-780).

6.6.8 Scleroderma

Scleroderma, also called progressive systemic sclerosis, is a chronic auto-immune disease. The body of someone with scleroderma, produces more collagen than necessary. The onset of this disease is between thirty and fifty years of age and it is more common in females than in men.

The *embouchure* will be most affected by the following symptoms: a) lips that are thin and rigid, resulting in difficulty with their opening and closing, b) a face that becomes expressionless (muscle movement is affected considerably), c) movement at the TM joint is limited, d) the tongue's movement is negatively affected and e) teeth that can move from their normal positions.

Other symptoms include hardened skin and pain and/or swelling in certain joints. The cause of scleroderma is not known and therefore the treatment is directed towards minimizing the affects and improving the quality of life (Wilkins 1999:786-787).

6.6.9 Tourette's syndrome

Tourette's syndrome causes involuntary movements or sounds called tics. Tics that will affect the flutist's *embouchure* include biting of the lips, facial contortions, facial grimacing, licking the lips constantly, lip pouting, lip smacking, mouth opening, eye blinking, clearing one's throat or involuntary tongue movements.

As many as ten people per thousand have some form of a tic disorder. The onset of Tourette's syndrome is usually between the ages of five and seven. While the tics may last through childhood and young adolescence they do not usually continue into adulthood. Only about 10% of patients having Tourette's syndrome in childhood will still have the disease as an adult. The patient with Tourette's syndrome in adulthood may experience tics that are quite severe.

A person might also experience tics as a result of stress or autism. To confirm the disorder of Tourette's syndrome the patient must experience tics for at least a period of one year. There are medications available as treatment for Tourette's syndrome, but for patients experiencing only mild tics medication is usually not necessary. People with Tourette's syndrome have a normal life expectancy (Boshes 1976:1637-1638).

6.6.10 Sjögren's syndrome

Sjögren's syndrome is a chronic progressive auto-immune disease. The disease affects the salivary and lacrimal glands which causes a decrease in saliva and tears. Although dryness of the mouth and eyes are the most common symptoms,

dryness of skin, nose and vagina may also be symptoms experienced by the patient with Sjögren's syndrome. The disease can also affect other organs in the body for example the lungs, liver, kidneys, pancreas and the brain. A patient with Sjögren's syndrome can also have other auto-immune diseases like rheumatoid arthritis (see Chapter 6.6.4). Nine out of ten patients are women and the average age of onset for Sjögren's syndrome is the late forties.

Symptoms that affect the flutist's *embouchure* are xerostomia (see Chapter 6.1.1), decreased salivary flow (see Chapter 6.1.1), the sensation of a sticky mouth and lips that are cracked and dry (see Chapter 6.2.2). Remedies for these conditions are discussed in other parts of this chapter as indicated. Patients with xerostomia are also at high risk for periodontitis (see Chapter 6.1.6) and oral candidiasis (see Chapter 6.1.5). The chief source of this sub-section was Ibsen and Phelan 1992:126-128.

6.6.11 Stroke

Cerebrovascular accident, also called a stroke, is not a disease but a manifestation of a cerebrovascular disease. A stroke is when the brain function is compromised because of interference with the blood supply to the brain. Strokes may last a few minutes, an hour or a whole day. Patients may recover fully from a stroke, others suffer long-term defects and some die as a result.

A stroke can cause paralysis of the arm, leg or the face. It may influence the movement of the tongue and the normal function of the throat may also be compromised. The patient might experience difficulty in controlling his/her saliva and/or swallowing. All of the above-mentioned symptoms will influence the flutist's *embouchure*. A stroke usually affects one side of the body, the side opposite to that of the brain injury.

Some of the risk factors that increase the chance of getting a stroke are hypertension, cigarette smoking, cardiovascular diseases, diabetes (see Chapter 6.6.2) and drug abuse (Wilkins 1999:775-776).

6.7 The use of alcohol and tobacco

6.7.1 Alcohol

Too much alcohol consumption can have consequences for the flutist. Some of the consequences are listed below (Wilkins 1999:843):

- Xerostomia (see Chapter 6.1.1)
- Angular cheilitis (see Chapter 6.1.3)
- Glossitis
- Tremors in the hands and tongue
- Erosion of teeth because of frequent vomiting
- Chipped teeth as a result of falls and injuries.

6.7.2 Tobacco

Tobacco has certain oral consequences that may influence the flutist's *embouchure*. The extent of the damage is determined by the type of tobacco products used, the time-scale and the quantity used daily.

Some of the oral consequences of tobacco use are listed below (Wilkins 1999:429-430):

- Periodontal infections/diseases
- Potential tooth loss
- Oral cancer (see Chapter 6.6.1)
- Candidiasis (see Chapter 6.1.5)

- Bone loss
- Attachment loss
- Hairy tongue.

6.8 Allergic reactions

Flutes are made of different materials for example silver, wood, gold and platinum. Although relatively rare, a person might be allergic to the material his/her flute is made of, and as a result experience a painful rash or irritation where the body makes contact with the flute, for example the lips. The allergy may also cause the lips to swell, although that is not usually the case (Lewis 2008:1). Also see Chapter 6.2.1.

CHAPTER 7

FLUTE OPTIONS AND HOW THEY INFLUENCE EMBOUCHURE AND TONE

There are a few optional mechanisms available on the flute that have an influence on *embouchure* and tone. Although a lot can be written on these aspects a short discussion follows on some of these options. A discussion related to *embouchure* and tone on flutes larger than the concert flute is also included in this chapter.

7.1 Open- or closed-hole

When buying a new flute a flutist needs to decide on an open-hole flute (also called ring keys or the French system) or a closed-hole flute (also called Plateau). There are certain extended techniques that are possible to produce on the open-hole flute that are not available on the closed-hole flute. These include glissandi, quarter-tones, microtones and certain multiphonic fingerings. These added extended techniques broaden the spectrum of tonal colours available to the flutist.

When basic tone quality is compared, it appears that the differences between open- and closed-hole flutes are not easily recognisable, if at all. The open-hole flute does have slightly more tonal flexibility due to the fact that certain notes can be manipulated through the extra venting. The open-hole flute also offers a different sense of resonance for the flutist because of the sense of contact with the vibrating air underneath five of the fingers, and this probably weighs more for the professional flutist than the added extended techniques available on the open-hole flute.

During the Baroque era, flutists used what is called finger vibrato (see Chapter 4.15.2) on the Baroque flute. Finger vibrato is more readily available on certain notes on the open-hole flute than on the closed-hole flute.

The closed-hole flute does have slightly better intonation because of more regular air flow as a result of the similarity of the internal surfaces of the pad-cups (Botha 2008:2 *Flute Options*). On an open-hole flute this discrepancy can be overcome by a good ear and *embouchure* control.

7.2 B footjoint or C footjoint

On modern short-scale flutes (see Chapter 7.9 for more information on flute scales), whether a B or a C footjoint is used does not have a major impact on the tone quality or the responsiveness of the flute. The B footjoint does affect C7 but a gizmo-key is normally added to improve the quality and response of this note. The advantage of the B footjoint is that it extends the range of the flute. On traditional long-scale flutes (also see Chapter 7.9), the B footjoint does influence tone quality and responsiveness negatively.

D footjoints are also available on the market. The D footjoint is a good option for young beginner flutists with short arms as this shortens the length of the flute; this makes the production of the lowest notes much easier, thus lessening the chance of tension in the facial muscles.

7.3 Materials

“Although musicians uniformly reject this principle, acousticians unanimously state that the acoustical characteristics of a wind instrument are primarily due to its dimensions, bore size and the smoothness of the walls, tone hole size and placement [...] and that the material from which the instrument is made makes a very small contribution to the musical result” (Lacy in Bosman: 1999:162).

Although musicians and acousticians differ in opinion on the degree of influence the material has on tone quality, it is commonly accepted that the material the instrument is made of does influence tone quality. Tone quality is affected by the

density of the material as well as its resonant frequency, i.e. the rate at which a vibrating body resonates.

There are a variety of materials for flutists to choose from. These materials are commonly nickel silver, silver, stainless steel, wood, ebonite, carbon fibre, gold and platinum. Flute makers also use different metals and combinations of metals to form new alloys. These metals include palladium, titanium, iridium, copper, zinc, brass, germanium, bronze, pewter and aluminium.

Nickel silver (an alloy of copper, zinc and nickel) produces a bright and loud tone but does not lend itself to the refinement of tonal colours. The spectrum of nuances available to the flutist is therefore very limited. Solid or sterling silver, however, is heavier and softer making it possible to play with many shades of tonal colours. Solid silver flutes also offer a strong, powerful sound if needed. Silver has a wide dynamic range and tends to favour the middle and bottom registers. For those that can not afford a solid silver flute other options are available, for example a solid silver headjoint with silver plated body, a solid silver lip-plate and riser with the rest of the flute plated, or a plated headjoint and body.

Modern wooden flutes are generally lighter than the metal flutes and have a sweet tone. Wooden flutes, however, need to be oiled on a regular basis, but that is still no guarantee that the flute won't crack. The smell of the oil is unpleasant and the pads are often damaged by the oil, affecting tone quality negatively.

Gold and platinum are expensive metals and also require *embouchure* refinement and stamina. Gold and platinum provide a wider spectrum of tonal colours than silver. These two metals are heavier than silver and are thus more demanding, especially to somebody with a small physique. Gold and platinum tend to favour the tone quality and responsiveness of the middle and high

registers of the flute. Professional flutists can expect a high tone quality with warmth, added depth, power and a wide dynamic range. The visual appeal of gold and platinum may also be a deciding factor.

Any alteration to any of the parameters listed above necessitates a (albeit minute) concomitant adjustment to the *embouchure*.

7.4 Wall thickness

This is another option flutists need to consider when buying a flute. There are a variety of thicknesses available that will still produce a high quality tone. The tone becomes progressively darker as the wall becomes thicker. The thinner the tube is, the more responsive the flute will be. Tube thicknesses (George 2006:32) usually vary between .012 mm (thin-wall) and .018 mm (thick-wall).

7.5 Split E or the E ring

The split E is a mechanism used on closed-G# instruments. It closes an extra tone hole for E6 in order to improve the venting and thus the tone quality of that specific note. Most closed-G# instruments come standard with a split E. However, an instrument with a split E is slightly more expensive than one without. The quantity of flutes selling with the split E mechanism gives an indication of its popularity. See Chapter 7.6 for a discussion on the disadvantages of the split E mechanism.

The E ring, also called a donut because of its shape, is another way of improving the venting for E6 on a closed-G# instrument. The donut is not necessary for an instrument with a split E mechanism as the split E already closes the “extra” hole when E6 is fingered. The donut is a round plate, with an opening in the middle of the plate, fitted into the G# tone hole. Its purpose is to reduce the size of the G#

tone hole improving the tone quality of E6. These plates should be fitted by accomplished technicians only. The fitting of a donut is inexpensive.

7.6 Open- or closed-G#

A flute with a closed-G# has one tone hole more than a flute with an open-G#. Michael Botha (2008a:7) says the following: “The extra tone hole in a closed-G# flute causes turbulence at a critical point in the flute-bore”. This turbulence affects the stability and tone quality of certain notes. It is argued that the open-G# flute has a better quality of tone in the left hand notes and the high register.

On an open-G# instrument the pinkie has to work harder than on a closed-G# instrument. Therefore the pinkie gets more exercise and becomes more agile.

The tone quality of E6 is affected negatively on a closed-G# instrument because of extra venting. This is due to an additional tone hole being opened for E6. Flute makers added an additional mechanism to the closed-G# flute, called the split E (see Chapter 7.5), to close the extra tone hole when E6 is fingered. Although the split E mechanism solves the problem of the extra venting it adds additional weight to the flute, the mechanism becomes less reliable and the split E removes three of the five trill fingerings for G6-A6.

Most flutes today are made as closed-G# instruments with a split E, but flutists differ in opinion on whether or not an open-G# flute, as in Theobald Böhm’s original design, is in fact a better option for tone quality and technical fluency on the flute.

7.7 Pads

Traditional pads are made of felt and covered by animal membrane. The pads need to be at the correct height with a smooth surface to ensure the best

possible tone quality and intonation. If the pads are skew, lose their shape or the surface of the pads is damaged in any way it will affect the tone quality negatively.

An alternative to the traditional pads made of felt is Straubinger pads. These pads are made of a nylon cup, with a ring of ultra-suede and then covered by animal membrane. The advantage of Struabinger pads is that they do not shrink over time as the traditional pads do, attaining much better durability. Straubinger pads also improve the dynamic range of the flute, tonal variety and ultimately tone quality. Straubinger pads are more expensive than traditional pads.

7.8 Headjoint design

Headjoint design is probably the most crucial element when flute options and tone quality are considered. The design of the headjoint has a direct influence on the tone quality, volume of sound and the intonation on the instrument. The flutist will also need to adjust his/her *embouchure* to the specific headjoint design.

7.8.1 *Embouchure* hole

According to Botha (2008b:1) the size as well as the depth of the *embouchure* hole affects tone quality and responsiveness. A small *embouchure* hole makes it easier to produce notes in the high register with tonal flexibility throughout the flute, while a large *embouchure* hole will favour ease of response in the low register and produce a powerful, darker sound. If the *embouchure* hole is shallow it will favour the high register. If the *embouchure* hole is deep it will favour the low register.

7.8.2 Headjoint taper

Headjoint taper comes standard on most modern flutes. Baroque flutes were made conical with cylindrical headjoints, but Theobald Böhm introduced the cylindrical tube with at first a conical headjoint but later the improved parabolic headjoint. The headjoint taper helps to control the pitch of the third register.

Professional flutists can, together with a flute maker, experiment with headjoint taper to fit their own style and tonal qualities.

7.8.3 Overcut and undercut

Overcut refers to the rounding and shaping of the top sides of the *embouchure* hole. Undercut refers to the rounding and shaping of the edges on the bottom of the riser. The amount of material that has been cut away, the way the edges are shaped and rounded and how concave or convex the edges are all affect the tone quality and responsiveness of the flute (Botha 2008b:1-2).

7.8.4 Riser

The height of the riser, also called the chimney, has an influence on tone quality. George (2006:32) claims that lower risers are very responsive while the higher risers need more *embouchure* refinement and stamina to articulate notes clearly. Higher risers produce a darker tone quality.

7.8.5 Cork and crown

When the cork is fitted flute makers are careful not to over-tighten it as this will cause the tone to become dry and flat. Good flute makers will also taper the cork proportionately to the taper of the headjoint for best results in tone quality. There is some controversy on whether or not an O-ring (plastic material that replaces

cork unit) improves quality of tone in general. Whether or not it improves the tone might depend on factors like the material or the headjoint design of the specific instrument.

Even the crown (screw at the end of the cork) affects the tone quality. "A thin, pressed, domed crown will make a flute more bright. A heavy cast crown will make a flute darker, an open dome crown will add resonance" (Botha 2008b:3).

7.9 Flute scales

The traditional scale (long-scale) were used for instruments playing at the level of A4 = 435 Hz. Today, orchestras around the world are playing at a higher frequency. Therefore a new scale was necessary. Albert Cooper designed the modern scale (short-scale) and although there are other short scales they are in conception very similar to that of the Cooper Scale. When buying a new flute there are two major short-scales to consider; the Cooper Scale and the Bennett Scale (Botha 2008a:5).

The Cooper Scale has smaller tone holes with very precise placement. The result is a flute with impeccable intonation over all the registers, also under dynamic extremes. The Bennett Scale uses slightly larger tone holes thus affecting the placement of the tone holes. It produces a darker tone quality that is very popular. The darker tone quality is, however, at the cost of the good intonation of the Cooper Scale.

7.10 *Embouchure* on big flutes

Alto, bass and contrabass flutes need a larger volume of air than the concert flute. The larger the flute, the more air is required to produce and sustain an acceptable tone quality. Therefore the flutist's aperture needs to become increasingly wider as the flute gets larger.

Many of the bigger flutes do not have good intonation over all the registers (Louke 2005:13). *Embouchure* control is therefore crucial, in order to play in tune.

CHAPTER 8

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

8.1 Summary

Students and listeners are attracted to the flute mainly because of the tone quality and tone colour(s) of the flute. Thus, in my opinion, tone should be the most important aspect for performers, teachers and students to focus on during their practice time and lessons. Because tone and *embouchure* are closely integrated terms this dissertation provides extensive information on tone and *embouchure* so that performers, teachers and students have the necessary 'tools' to improve this crucial aspect of flute playing.

There are many aspects that influence *embouchure* and tone. Knowledge of these aspects is crucial for performers, teachers and students in order to improve their quality of playing and teaching. This dissertation provides the necessary information on these aspects in a single source.

Teachers and students do not necessarily have the same perspectives on the various aspects relating to *embouchure* and tone. Teachers and students can also broaden their outlook about *embouchure* and tone from reading the teachers' and students' perspectives in this dissertation.

Neither teachers nor students are generally equipped to identify and give advice on medical problems that affect *embouchure*. The information provided in Chapter 6, together with the sources provided, should provide a teacher with a starting point for addressing these problems.

Thus, the research question can be answered: *Embouchure* formation and quality of sound are influenced by a) different aspects, concepts and perspectives regarding *embouchure* and tone (Chapter 2, Chapter 4 and Chapter 5), b) the anatomy, function and use of the human body relevant to *embouchure* and tone (Chapter 3), c) diseases, medical conditions, medicine, physical attributes and infections (Chapter 6) and d) different flute options (Chapter 7).

Sub-questions can be answered thus:

Teachers and students have many different perspectives on a variety of aspects relating to *embouchure* and tone. To learn more about these perspectives of teachers and students Chapter 4 and Chapter 5 should be consulted.

Embouchure and tone are influenced by xerostomia, hyper salivation, angular cheilitis, mucositis, oral candidiasis, gingivitis, periodontitis, frenums, herpes labialis, macroglossia, lip swelling, dry and cracking lips, clefts of the lip and/or palate, focal dystonia, crowns, veneers, teeth whitening, dental bonding, dental implants, mal-relations of teeth, braces, mal-occlusions, temporomandibular joint disorder, Bell's palsy, cerebral palsy, Duchenne muscular dystrophy, facioscapulohumeral muscular dystrophy, myasthenia gravis, cancer, diabetes, HIV/AIDS, arthritis, Parkinson's disease, epilepsy, multiple sclerosis, scleroderma, Tourette's syndrome, Sjögren's syndrome, stroke, alcohol, tobacco and allergic reactions.

8.2 Conclusion

After analyzing the teachers' and students' questionnaires as well as conducting interviews with leading flute teachers, the conclusion drawn was that teachers and students only deal with the very basic information on *embouchure* and tone during lessons. Through an experiment conducted, my conclusion drawn was that when students are taught more comprehensively on the subject of tone (and *embouchure*) they aquire a better tone concept. This will help students to ultimately play with a more mature tone quality.

8.3 Recommendations

Performers should use the information made available in this dissertation to improve their tone quality and ultimately their standard of playing.

Teachers have a responsibility to be comprehensive when teaching *embouchure* and tone to their students. Teachers should incorporate the information made available in this dissertation in their lessons. They should use their own discretion, when teaching *embouchure* and tone, regarding the timing of making specific information available to each individual student.

A student can also use the information made available in this dissertation, but should discuss it with his/her teacher in order to prevent any misconceptions.

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APPENDIX A

STUDENTS' QUESTIONNAIRE

The information in this survey will be used for the research I am doing for my MMus studies. The research topic is; *THE FLUTIST'S EMBOUCHURE AND TONE: PERSPECTIVES AND INFLUENCES*. This information is confidential, and no names will be mentioned in my dissertation.

Questions that can not be answered by a student because of the lack of knowledge should be left out.

Die inligting in die opname sal gebruik word vir die navorsing wat ek doen vir my MMus studies. Die navorsingsonderwerp is; *THE FLUTIST'S EMBOUCHURE AND TONE: PERSPECTIVES AND INFLUENCES.* Die inligting is konfidensieel, en geen name sal genoem word in my skripsie nie.

Vrae wat nie deur 'n student beantwoord kan word nie a.g.v. 'n tekort aan kennis, moet uitgelaat word.

Questionnaire For Students/Vraagstuk Vir Studente

1. General Information/Algemene Inligting

Age/Ouderdom: _____

Fill in the following if applicable/Vul die volgende in indien van toepassing:

Grade (school)/Graad (skool): _____

Study year (University)/Studie jaar (Universiteit): _____

_____

Study direction/Studie rigting: _____

2. Questions on Background/Vrae oor Agtergrond

2.1 For how long have you been playing the flute?
Vir hoe lank speel jy al fluit?

_____

2.2 Is the flute your main instrument?
Is die fluit jou hoof instrument?

_____

2.3 Do you play any other instruments? If so, name the other instrument(s) below.
Bespeel jy enige ander instrumente? Indien wel, noem ander instrument(e) hieronder?

_____

Questions concerning the Research Topic/Vrae wat handel oor die Navorsingsonderwerp

3. General Questions/Algemene Vrae

3.1 *Embouchure*/*Embouchure*

3.1.1 What is the meaning of the word *embouchure*?
Wat beteken die woord *embouchure*?

_____

_____

3.1.2 From what language does the word *embouchure* originate?
Van watter taal het die woord *embouchure* sy oorsprong?

_____

3.1.3 Is there any Afrikaans or English word for the term *embouchure*?
Is daar enige Afrikaans of Engelse woord wat dieselfde betekenis as *embouchure* het?

_____

3.2 Tone Quality/Toonkwaliteit

What are the characteristics of a good tone quality?
Wat is die eienskappe van ‘n goeie toonkwaliteit?

_____

_____

_____

3.3 Basic Principles/Basiese Beginsels

3.3.1 Name the basic principles of a) the *embouchure* formation b) direction of the airstream and c) the speed of the airstream.
Noem die basiese beginsels van a) *embouchure* formasie b) rigting van die lugstroom en c) spoed van die lugstroom.

_____

_____

_____

_____

_____

3.3.2 What is the influence of the tongue placement on the *embouchure*.
Wat is die invloed van die tong se plasing op die *embouchure*.

_____

_____

_____

3.3.3 Does the positioning of the jaw have an effect on the *embouchure*?
Het die posisie van die kaak ‘n invloed op *embouchure*?

_____

3.3.4 If we turn out the flute, does the pitch stay the same or get sharper or get flatter?
As ons die fluit uitdraai, bly die toonhoogte dieselfde of verhoog dit of verlaag dit?

_____

3.3.5 If we lift up our head, keeping the arms constant, does the pitch become sharper or flatter or stay the same?
As mens jou kop op lig, en die arms bestendig hou, verhoog dit of verlaag dit die toonhoogte of bly die toonhoogte dieselfde?

_____

3.3.6 In which register is it most easy to play at too sharp a pitch?
In watter register is dit die maklikste om te hoog bo die ware toonhoogte te speel?

_____

3.3.7 Draw the size and shape of the aperture in a) the low and b) the high register. Also provide a description in the form of a keyword.
Teken die grootte en vorm van die opening tussen die lippe in a) die lae en b) die hoë register. Verskaf ook ‘n beskrywing in die vorm van ‘n sleutelwoord.

_____ _____

Low Register /Lae Register High Register/Hoë Register

3.3.8 What influence do you think the physical characteristics of the human body (for example face muscles, neck muscles, jaw, etc.) have on flute playing, especially its influence on *embouchure*?
Wat dink jy is die invloed wat die fisiese eienskappe van die mens se liggaam (byvoorbeeld gesigspiere, nekspiere, kaak, ens.) het op fluitspel, veral die invloed daarvan op *embouchure*?

_____
_____
_____
_____
_____

3.3.9 Why is it important to know about these basic principles?
Hoekom is dit belangrik om van hierdie basiese beginsels te weet?

_____
_____
_____

3.4 Braces/Draadjies

3.4.1 Braces do affect a flute player's playing. Name some of these influences.
Draadjies het 'n invloed op 'n fluitspeler se spel. Noem 'n paar van dié aspekte wat 'n persoon se fluitspel beïnvloed.

_____
_____
_____
_____
_____

3.4.2 What can be done to eliminate/reduce the effect(s) braces have on a flutists' playing?
Wat kan gedoen word om die effek(te) wat draadjies op 'n fluitspeler se spel het te elimineer of te verminder?

_____

_____

_____

4. Experiments/Eksperimente

What did you learn from the experiments?
Wat het jy geleer uit die eksperimente?

4.1 Analysing your teacher's *embouchure*.
Die analisering van jou onderwyser se *embouchure*.

_____

_____

_____

4.2 Analysing another student's *embouchure*.
Die analisering van 'n ander leerder se *embouchure*.

_____

_____

_____

5. Overtones (Harmonics)/Botone

5.1 Overtones (Harmonics) can be used as exercises for *embouchure* control, as a specific effect in a piece, or to gain more control over a note, for example, dynamic control or to improve intonation. How do we play overtones on the flute?

Botone kan gebruik word as oefening vir *embouchure* beheer, om 'n spesifieke effek in 'n werk te verskaf, of om meer beheer te kry oor 'n noot, dinamies- of intonasie-gewys. Hoe word botone op die fluit geproduseer?

_____

_____

_____

5.2 Name the notes in the overtone series? Use the fundamental note C as an example.
Noem die note in die botoonreeks? Gebruik die fundamentele noot C as 'n voorbeeld.

_____

6. <u>Breathing and Posture/Asemhaling en Postuur</u>

6.1 What influence does breathing have on *embouchure* and tone quality?
Watter invloed het asemhaling op *embouchure* en toonkwaliteit?

_____

_____

6.2 What influence does posture have on *embouchure* and tone quality?
Watter invloed het postuur op *embouchure* en toonkwaliteit?

_____

_____

6.3 To support the airstream (which moves from the lungs, through the lips and onto the strike edge of the hole in the headjoint) flute players use the diaphragm, intercostal muscles and abdominal muscles. How are dynamics influenced by the use of these muscles?

Om die lugstroom (wat beweeg vanaf die longe, tussen deur die lippe en tot op die 'strike edge' van die opening in die kopstuk) te ondersteun, gebruik fluitspelers hul diafragma, tussenrib spiere en abdominale spiere. Hoe word die dinamiek beïnvloed deur die gebruik van hierdie spiere?

_____

_____

_____

7. Vibrato and Intonation/Vibrato en Intonasie

7.1 Vibrato could be produced by using the lips or jaw. Is this the best way to produce vibrato? Please provide reasons for your answer.
Vibrato kan geproduseer word d.m.v. die lippe. Is dit die beste metode om vibrato te produseer? Verskaf asb. redes vir jou antwoord.

_____

_____

7.2 Another method of producing vibrato is by using the throat. If the throat is being used, how will it effect the tone quality?
'n Ander metode wat gebruik kan word om vibrato te produseer is d.m.v. die keel. As die keel gebruik word, hoe sal dit die klank kwaliteit beïnvloed?

_____

_____

7.3 What is the correct method for producing vibrato on the flute?
Wat is die korrekte metode om vibrato op die fluit te produseer?

_____

_____

7.4 Is there any correlation between *embouchure* and intonation? Please provide reasons for your answer.
Is daar enige verband tussen *embouchure* en intonasie? Verskaf asb. redes vir jou antwoord.

_____

_____

_____

8. Contemporary Techniques/Kontemporêre Tegnieke

8.1 What are contemporary techniques?
Wat is kontemporêre tegnieke?

_____

_____

8.2 Do contemporary techniques have an influence on *embouchure*?
Het kontemporêre tegnieke 'n invloed op *embouchure*?

_____

9. Your Own Opinion/Jou Eie Opinie

Do you think your knowledge about *embouchure* is sufficient?
Dink jy jou kennis i.v.m. *embouchure* is voldoende?

_____

_____

_____

_____

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APPENDIX B

TEACHERS' QUESTIONNAIRE

The information in this survey will be used for the research I am doing for my MMus studies. The research topic is; *THE FLUTIST'S EMBOUCHURE AND TONE: PERSPECTIVES AND INFLUENCES*. This information is confidential, and no names will be mentioned in my dissertation.

Die inligting in die opname sal gebruik word vir die navorsing wat ek doen vir my MMus studies. Die navorsingsonderwerp is; *THE FLUTIST'S EMBOUCHURE AND TONE: PERSPECTIVES AND INFLUENCES.* Die inligting is konfidensieel, en geen name sal genoem word in my skripsie nie.

Questionnaire For Teachers/Vraagstuk Vir Onderwysers

General Information/Algemene Inligting

Occupation/Beroep: _____

Involvement in flute teaching:

Full-time: ☐ Part-time: ☐

Educational Institution: ☐ Private: ☐ Both: ☐

How many years of teaching experience do you have? _____

_____

1. General Questions/Algemene Vrae

1.1 What do you as a teacher think is the importance of *embouchure* in teaching flute to a beginner?
Wat dink u as onderwyser is die belangrikheid van *embouchure* wanneer u ‘n beginner onderrig in fluit?

_____

_____

_____

1.2 What do you think is the importance of *embouchure* in teaching flute to a more advanced student?
Wat dink u is die belangrikheid van *embouchure* wanneer u ‘n meer gevorderde student onderrig in fluit?

_____

_____

_____

1.3 On what aspects do you focus, regarding *embouchure*, in the first year of a student’s flute lessons?
Op watter aspekte fokus u, t.o.v. *embouchure*, tydens die eerste jaar van ‘n student se fluitlesse?

_____

_____

_____

_____

_____

_____

_____

1.4 Explain in a few words what your view is on the following aspects:
Verduidelik kortliks wat u mening is oor die volgende aspekte:

1.4.1 The basics of lip formation/Die basiese beginsels van lip formasie.

_____
_____
_____
_____

1.4.2 Placement and position of the jaw/Plasing en posisie van die kaak.

_____
_____
_____
_____

1.4.3 Direction of the airstream/Die rigting van die lugstroom.

_____
_____
_____

1.4.4 The influence that the placement of the tongue has on the *embouchure*/Die invloed van die tong se plasing op die *embouchure*.

_____
_____
_____
_____

1.4.5 The influence of register on the *embouchure*/Ons speel in verskillende registers, watter invloed het dit op *embouchure*?

_____
_____

_____

_____

_____

1.4.6 Name any other aspects, that in your opinion, influence *embouchure*?
Noem enige ander aspekte, wat na u mening, *embouchure* beïnvloed?

_____

_____

_____

_____

1.4.7 Why is it important to know about all the above influences?
Hoekom is dit belangrik om van al die bogenoemde aspekte te weet?

_____

_____

_____

_____

2. <u>The Student/Die Student</u>

2.1 From your own experience: What are some of the most common *embouchure* 'mistakes' students usually make?
Vanuit u eie ervaring: Wat is van die mees algemene *embouchure* 'foute' wat studente maak?

_____

_____

_____

_____

2.2 What exercises would you recommend for developing a student's *embouchure*?
Watter oefeninge sou u aanbeveel vir die ontwikkeling van 'n student se *embouchure*?

_____

_____

_____

3. The Anatomy of the Human Body/Die Anatomie van die Mens se Liggaam

3.1 What influence do you think the physical characteristics of the human body (for example face muscles, neck muscles, jaw, etc.) have on flute playing, especially its influence on *embouchure* and the quality of tone?
Wat dink u is die invloed wat die fisiese eienskappe van die mens se liggaam (byvoorbeeld gesigspiere, nekspiere, kaak, ens.) het op fluitspel, veral die invloed daarvan op *embouchure* en klankkwaliteit?

_____

_____

_____

_____

_____

_____

_____

3.2 How do you go about testing and selecting new students? Do you take physical attributes, for example lip type, into consideration?
Hoe gaan u te werk wanneer u nuwe studente moet toets en selekteer? Neem u die student se fisiese eienskappe, byvoorbeeld lip tipe, in ag?

_____

_____

_____

_____

4. Braces/Draadjies

4.1 Braces do affect a flute player's playing. Name some of these influences.
Draadjies het 'n invloed op 'n fluitspeler se spel. Noem 'n paar aspekte wat mens se fluitspel beïnvloed.

_____

_____

_____

4.2 What can be done to eliminate/reduce the effect(s) braces have on a flutist's playing?
Wat kan gedoen word om die effek(te) wat draadjies op 'n fluitspeler se spel het, te elimineer of te verminder?

_____

_____

_____

4.3 If a pupil wants to start flute lessons and he/she has braces, would you encourage them to begin only after the braces are taken off? Motivate your answer.
Indien iemand met fluitlesse wil begin, maar hy/sy het draadjies, sou u hom motiveer om eers te begin wanneer die draadjies afkom? Motiveer u antwoord.

_____

_____

_____

_____

_____

5. Nationality and Language/Nasionaliteit en Taal

5.1 What is your opinion on the influence of nationality and language on a flute player's *embouchure* and sound?
Wat is na u mening die invloed van nasionaliteit en taal op 'n fluitspeler se *embouchure* en klank?

_____
_____
_____

5.2 Name any vowel formations a teacher can teach his/her students in order to increase their variety of tone colours. When would you teach these?
Noem enige vokaalformasies wat 'n onderwyser vir sy studente kan leer om hul verskeidenheid van toonkleure te vergroot. Wanneer sal u hierdie vir u studente aanleer?

_____
_____
_____
_____

6. Overtones (Harmonics)/Botone

6.1 What, in your opinion, is the value and importance of incorporating overtones (harmonics) in your students' lessons?
Wat is, volgens u, die waarde en belangrikheid van die inkorporering van botone in u studente se lesse?

_____
_____
_____

6.2 Do you think it is necessary for students to practise overtones (harmonics) on a regular basis? Motivate your answer.
Dink u dis nodig vir studente om botone op 'n gereelde basis te oefen? Motiveer u antwoord.

_____

_____

_____

6.3 What role does the student's level of playing have on this matter?
Watter rol speel die standaard (van die student se spel) in hierdie verband?

_____

_____

_____

7. Different types of Flutes/Verskillende tipe Fluite

7.1 There are many different types and sizes of flutes for a beginner to start with. What is your opinion on the following flutes? Please make references to the age of the student, *embouchure* formation on the specific instrument and availability of the instrument.
Beginner studente kan op verskillende tipes en grootte fluite begin. Wat is u opinie omtrent die volgende fluite? Verwys asb. na die ouderdom van die student, *embouchure* vorming op die spesifieke instrument sowel as die beskikbaarheid van die instrument.

7.1.1 Concert Flute in C/Konsertfluit in C

_____

_____

_____

_____

7.1.2 Piccolo/Piccolo

_____

_____

_____

_____

7.1.3 E^b Soprano Flute/E^b Sopraanfluit

_____

_____

_____

_____

7.1.4 Flute with curved headjoint/Fluit met gedraaide kopstuk

_____

_____

_____

_____

7.1.5 Fife/Fife

_____

_____

_____

_____

7.1.6 Recorder/Blokfluit

_____

_____

_____

_____

7.2 What, in your opinion, does the Pneumo Pro have to offer in teaching students the correct *embouchure* formation? Can the Pneumo Pro help students with braces?
Watter bydrae, na u mening, kan die Pneumo Pro maak om studente te help met die korrekte *embouchure* vorming? Kan die Pneumo Pro studente help wat draadjies het?

_____
_____
_____
_____
_____
_____

8. Contemporary Techniques/Kontemporêre Tegnieke

8.1 There are various contemporary techniques that have an influence on *embouchure*. Briefly explain in your own words how the following techniques are related to *embouchure*.
Daar is verskeie kontemporêre tegnieke wat ‘n invloed het op *embouchure*. Verduidelik kortliks, in u eie woorde, tot watter mate *embouchure* met die volgende tegnieke verband hou.

8.1.1 Singing and playing simultaneously/Sing en speel gelyktydig

_____
_____
_____

8.1.2 Pitch bending/Toonbuiging

_____
_____
_____

8.1.3 Whisper and Residual (difference) tones/Fluister of Residuele (verskil) tone

_____

_____

_____

8.1.4 Flutter tonguing/Fladdertongslag

_____

_____

_____

8.2 Some teachers are incorporating contemporary techniques as early as beginners' level. From what age or level, in your opinion, can/should contemporary techniques be taught?
Sommige onderwysers inkorporeer kontemporêre tegnieke alreeds so vroeg as beginnersvlak. Van watter ouderdom of vaardigheidsvlak kan/moet kontemporêre tegnieke, na u mening, deel uit maak van die leerproses?

_____

_____

_____

_____

9. Throat Tuning/Keelstemming

Throat tuning is an effective way to improve the quality of tone. From what age should students be introduced to throat tuning? Please provide reasons for your answer.
Keelstemming is 'n effektiewe manier om die kwaliteit van toon te verbeter. Van watter ouderdom af behoort studente daarmee kennis te maak? Verskaf asb. redes vir u antwoord.

_____

_____

_____

_____

10. Discuss any general aspects of *embouchure* that you feel also have an influence on teaching *embouchure* to students.
Bespreek enige algemene aspekte wat u dink ‘n invloed het op die onderrig van *embouchure*.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

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