Instructions for the assessment of embouchure in brass players using *"CODE of embouchure"*

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Chapter 1: General instructions

The CODE of embouchure consists of 4 domains with 64 items:

1. Inspection of the brass player in resting position (without instrument), items 1-21.
2. Inspection of the brass player during playing, items 22-34.
3. Inspection of the positioning of the instrument/rim visualizer (during playing), items 35-42.
4. Aspects of sound-production, items 43-64.

Fig. 1: Rim visualizer.

It is recommended to record the brass player's playing on video (with sound). This enables repeated inspection of the different items of the CODE of Embouchure by the observer afterwards. It also serves as a record to enable comparison of the various items over time.

In each item there is an answering option: '*Don't know*' (e.g. in case of uncertainty about how to judge the item). The option 'Don't know' is indicated in domains 2, 3 and 4 by the letter 'Z'.

Before starting to fill in Domain 1:

- The brass player should not have played for at least one hour to avoid visible marks of previous playing in the facial area.
- The brass player may sit or stand and should be in a comfortable position.
- The inspection should be in daylight or with suitable artificial lighting.
- Requirements: a goniometer, a pen and a paper version of the CODE of Embouchure.

Before starting to fill in Domain 2:

- The brass player should start with a short warming up on his/her instrument to feel comfortable about playing the different items of the CODE of embouchure.
- The brass player may sit or stand while playing.

Filling in Domains 2-4:

- The assessments for Domains 2-4 should be performed using the instrument in combination with a rim visualizer (Fig. 1) or transparent mouthpiece. The diameter/size of the rim visualizer should be as similar as possible to the mouthpiece (The rim visualizer is available via www.thomann.de/).
- Using the rim visualizer: after playing the 'test tone' (at the pitch level to be assessed) on the brass instrument, each mouth position should be assessed with the rim visualizer.
- The mouth should be kept in the same position while switching from the instrument to the rim visualizer.

In individual cases the position of the rim visualizer on the lips can be slightly different from the position of the real mouthpiece: this should be noted in the cell marked "Miscellaneous" or "Technical aspects" in Domain 4. The observations of playing the instrument are the most relevant and take priority when filling in the form.
The scoring of all items is explained in Chapter 2 and the interpretation of all scores is indicated at the end of Chapter 3.

Additional information:
Instruction movie (1;49 hr) "The CODE of Embouchure" on YouTube: https://www.youtube.com/watch?v=Vr-FLpTcX7g.

List of terms & abbreviations:

★	This symbol used in the Classification Table means multiple options can be chosen in an item
MC:	Mouth corner(s)
MP:	Mouthpiece
NLF:	Nasolabial Fold(s)
TMJ:	Temporomandibular joint (jaw joint)
TMP:	Tongue bone Movement Pattern
Right:	The brass player's right side
Left :	The brass player's left side
Orange flags:	Indicate abnormal/deviant features, signs and symptoms in the embouchure-related body structures and/or functions of a brass player. Attention should be given to the potential negative impact of these 'orange flags' on the brass players' embouchure.

Chapter 2: Scoring the different items of the "CODE of Embouchure"

Domain 1: Body structures & functions when not playing (mouth is kept in a relaxed position).

Scoring method:

- Step 1: Circle the appropriate options in the cells. If applicable, circle right (R) or left (L).
- Step 2: Indicate for each item if an orange flag is scored.
- Step 3: After completing Domain 1, count the number of orange flags and enter at the bottom of the table for Domain 1.

MOUTH/LIPS/TONGUE (items 1-6)

Item 1

Symmetry of mouth corners (MCs) at REST:

- If one MC is lower, circle which MC is lower, right (R) or left (L). (An MC is lower when it is below the horizontal line).
- If one MC is pulled out in a forward direction, circle which MC is pulled out more, R or L.
- If one MC is more lateral than the other, circle which MC is more lateral, R or L.

Multiple options can be chosen.

Item 1: Lower MC right (light asymmetry)

Item 1: Lower MC right (severe asymmetry)

Item 2

Degree of asymmetry of MCs in item 1

This item is used to determine the degree of the asymmetry reported in item 1. This is entered using an ordinal scale: 'no' - 'light' - 'severe' asymmetry. An orange flag is scored if the asymmetry is 'severe'.
In case of different categories of asymmetry in item 1: choose the most prominent category.

Item 2: No asymmetry

Item 2: Severe asymmetry

Item 3

Scar(s) in/around the mouth/lips:

A scar should only be scored as 'yes' if it is located in the area of the mouthpiece.

- A scar is non-relevant if it can be assumed to have no influence on the embouchure.
- A scar is relevant if it can be assumed to affect the local characteristics of the lip tissue to such extent that an influence on the embouchure is likely, this is scored as an orange flag.

Scar tissue elasticity can be different from that of the surrounding tissue.
Circle R or L. Multiple options can be chosen (a maximum of 1 orange flag for this item).

Item 4

Miscellaneous/Disorders:

'Yes' is scored as an orange flag: If e.g. extremely thin lips (=i.e. lip is difficult to observe at rest) or extremely thick and weak lips. This should be entered in this cell. Red, lips, blisters, pain or small wounds should also be entered in this cell.

Item 4: Non-relevant scar upper lip

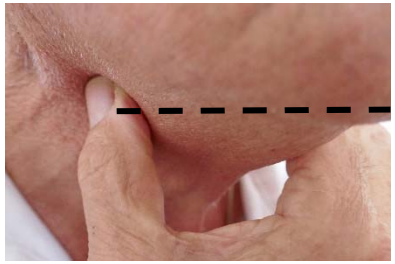
Item 4: Relevant scar upper lip

Item 5

Tongue anomalies while at REST:

A tongue anomaly should be scored as 'Yes' (= orange flag) if the tongue is asymmetrical at REST, if there is pain, wound(s) in/around the tongue or if the tongue (hyoid) bone does not change position ('fixed' tongue bone). This can be tested by palpating the tongue bone during swallowing. The hyoid bone is roughly aligned with the chin in the normal upright posture (see dotted line in the figure). During swallowing the tongue bone should move upwards and forwards.

Circle R or L if applicable and indicate observation.



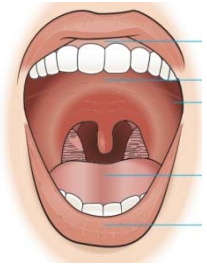
Item 5: Palpating the tongue bone

Item 5: Thin lips

swollen

Item 5: Thick lips

Item 5: Swollen upper lip



Item 5: Normal tongue

Item 5: Tongue bone

Item 6

Tongue anomalies when STICKING OUT the tongue:

A tongue anomaly should be scored as 'yes' if a person cannot lift the tip of his/her tongue up to the upper alveolar edge (e.g. because the lingual frenulum is too short) or if they cannot stick their tongue straight out. This is scored as an orange flag. If asymmetry is present: circle deviation towards R or L and

indicate observation.

(Source: Jansonius-Schultheiss, K., Coppenolle, L. Van & Beyaert, E. (2012). *Afwijkende mondgewoonten. Inleiding, onderzoek en behandeling.* Den Haag/Leuven: Acco.)

Item 6: Normal

Item 6: Lingual frenulum too short

CHEEKS & MIDFACE (item 7-10)

Item 7

Symmetry of the nasolabial folds (NLFs) at REST:

The recording of differences in symmetries of the midfacial area (the main characteristic being the nasolabial fold) is subjective in nature.

If asymmetry is visible, circle which NLF is **longest,** R or L. If the asymmetry is 'more pronounced', this is scored as an orange flag.

'No, absent' means NLF is not visible on one side. This is scored as an orange flag: circle which NLF is **absent,** R or L.

'Yes, but both absent' means the NLFs are not visible on either side. This is scored as an orange flag.

Item 7: Normal

Item 7: 'More pronounced' right

Item 7: 'Absent' right

Item 8

Midfacial activity

Differences are best observed when showing teeth.

If there is asymmetry of lip opening when showing teeth (=distance between the upper and lower lips at the level of the canines on the right and left side), circle R or L.

Item 8/9 : No asymmetry

Item 8/9: Severe asymmetry left

Item 9

Degree of asymmetry in item 8

In this item the degree of asymmetry noted at item 8 is quantified and entered using an ordinal scale: 'no' - 'light' - 'severe' asymmetry. An orange flag is scored if the asymmetry is 'severe'.

Item 8/9 : Severe asymmetry right

Item 10

Miscellaneous/Disorders:

'Yes' if e.g. scars of the cheeks hamper proper movements of the midfacial area, this is scored as an orange flag: Indicate observation.

DENTAL ARCH (Items 11-17)

Item 11

Dental Arch

'Gothic' dental arch of the maxilla: If the incisors stand at an angle relative to the adjacent teeth and the canines are placed too far backwards, this is scored as an orange flag. It can be assumed that a gothic dental arch interferes with a proper positioning of the mouthpiece.

'Miscellaneous': If you observe a shape of the dental arch (other than a gothic dental arch) which can be assumed to interfere negatively with the positioning of the mouthpiece, this is scored as an orange flag, enter your observation.

Item 11: 'Gothic' (above) and normal/round dental arch (below).

Item 12

Dental Arch

'Irregular': If the dental arch is irregular with parts of the incisors missing, dental elements inclined backwards, or turned around their axis, this is scored as an orange flag.

Item 12: Irregular dental row mandible

Item 13

Dental arch

The incisors of the maxilla are scored as 'split' (central diastema) if one can exhale air through it, this is scored as an orange flag.

Item 13: Incisors split

Item 14

Dental Arch

The dental arch is not intact if elements are missing like incisors or canines of lower (= orange flag) and/or upper jaw (= orange flag). Multiple options can be chosen (a maximum of 1 orange flag for this item).

Item 14: Missing element in dental row of upper jaw

Item 15

Teeth[1]

Teeth are scored as 'prominent' if they protrude forward, this is scored as an orange flag. An additional argument to score 'prominent' is when a change in the mucosal layer can be observed on the inside of the corresponding lip area, due to pressure between the prominent tooth and the mouthpiece. A protruding tooth outside the immediate area of the mouthpiece should be scored as 'no prominent teeth'. Multiple options can be chosen (a maximum of 1 orange flag for this item).

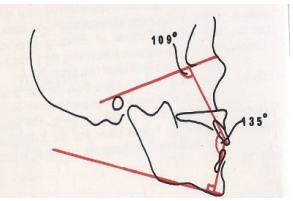
Item 15: Prominent incisor in upper (circle) and lower jaw (arrow)

[1] 'Teeth': also in case of a single tooth.

Item 16

Inclination angle of teeth

An inclination angle can be considered to be normal if between 125 and 180 degrees.
'Backward inclination': If the inclination angle of the teeth (the angle between the upper and lower incisors) is ≥ 180 degrees, this is scored as an orange flag.
'Extreme forward inclination': If the inclination angle is ≤ 125 degrees, this is scored as an orange flag.



Item 16: Principle of angle assessment

Item 16: Normal inclination angle

Item 16: Backward inclination angle

Item 16: Extreme forward inclination angle

Item 17

Dental braces/prosthesis(es)

Braces or prosthesis(es) in upper jaw (= orange flag) and/or lower jaw (= orange flag).
Multiple options can be chosen (a maximum of 1 orange flag for this item).

JAWS (Items 18-21)

Item 18

Relation between dental arches – sagittal view

'Underbite': If the incisors of the lower jaw are positioned further forward than the incisors of the upper jaw, this is scored as an orange flag.

Item 18: Underbite

'Relative underbite': If the incisors of both dental arches or incisors of the lower jaw are positioned directly behind the incisors of the upper jaw, this is scored as an orange flag.

Item 18: Relative underbite

‘Overbite’: If the incisors of the upper jaw are positioned further forward than the incisors of the lower jaw, this is scored as an orange flag.

Item 18: Overbite

Item 19

Relation between dental arches – frontal view

‘Mild asymmetry’: If the upper and lower jaws show a small deviation from the midline.

Item 19: Mild asymmetry (circle)and open bite

‘Pronounced asymmetry’: If asymmetry of upper and lower jaws and/or deviation from midline is obvious, this is scored as an orange flag.

‘Open bite’: If the incisors of the upper and lower jaws do not meet, this is scored as an orange flag.
Multiple options can be chosen (a maximum of 1 orange flag for this item).

Item 19: Pronounced asymmetry

Item 20

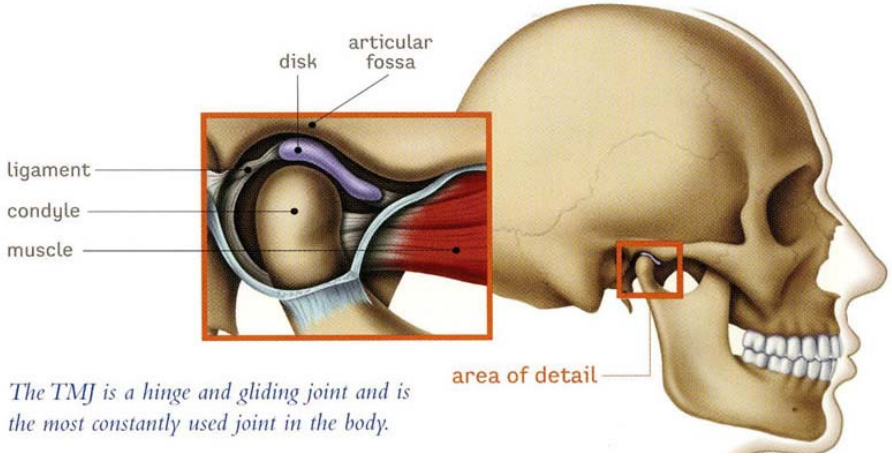
Jaw opening - vertical direction

Item 20: Limited mouth opening (two fingers)

'Normal': If the brass player can open his/her mouth to an extent that the tips of the index, middle and ring finger together can be positioned in the mouth opening between the central incisors of the lower and upper jaw.
'Limited': If the brass player cannot put the tips of his/her index, middle and ring finger together in the mouth opening between the central incisors of the lower and the upper jaw, this is scored as an orange flag.

(Source: Zawawi, K.H., Al-Badawi,E.A., Lobo Lobo, S., Melis,M.& Mehta, N.R. (2003). An Index for the Measurement of Normal Maximum Mouth Opening. *J Can Dent Assoc 2003; 69(11):737–41)*

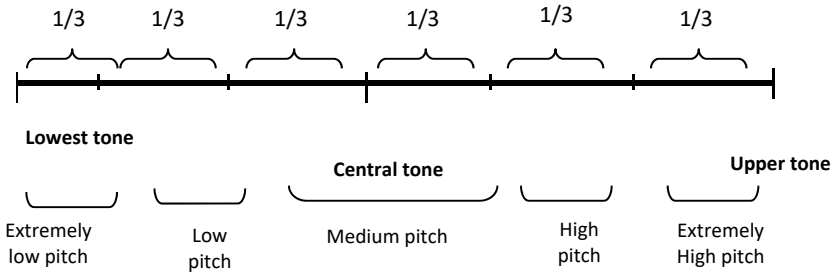
Item 21
Miscellaneous/Disorders:
'Yes' if e.g. loosening teeth, pain, abnormal lip movements and/or swollen temporomandibular Joint (TMJ) that hinders proper movements of jaw, this is scored as an orange flag. Indicate observation.



Item 21: Temporomandibular Joint (TMJ)

Domain 2: Body Structures & functions while playing

NOTE:
The following steps should be performed to determine the pitch-categories from 'extremely low' to 'extremely high'.
Step 1: Determine the highest and lowest pitched tones the brass player can play (=range of tones):
The brass player starts with playing a tone from the middle register and then going into downward pitch direction until the lowest pitched tone what can be played in the same way as the middle register tone. This tone is the lowest pitched tone. As a next step follow the same procedure in the opposite way to determine the tone with the highest pitch. This is the highest pitched tone.
Step 2: This range should be divided into 5 categories, first by determining the central tone. Next, the range of tones on each side of the central tone should be divided into three parts. The middle third parts are taken together as the medium pitch area; see figure and example.
Ask the player to play one tone within each category. Indicate this tone on the dotted lines of the 'playing tones' in the table.



Example:
Lowest tone = a1 and highest tone = cis4; range of tones = 3.2 (c or cis = the same decimal) octaves.
The central tone is (the middle): 3.2/2= 1.6 octave: a1 + 1.6 octave gives f2.
Each 1/3 of 1.6 octave is 0.5 octave.
Extremely low pitch is: a1-e1. Low pitch is e1-b2 etc.

Playing tones of different pitches means:

- Medium pitch = the tones in the central part (≤ 1/3 below and ≤ 1/3 above the central tone of the range of tones),
- Extremely low pitch= in the lowest 1/3 below the central tone,
- Low pitch = in the next higher 1/3 below the tones of the medium pitch,
- High pitch = in the next 1/3 above the tones of the medium pitch,
- Extremely high pitch = in the highest 1/3 above the central tone.

In some items of Domain 2 (item 22, 25, 26, 27 and 31) one can indicate 'different patterns'. 'Different patterns' should be circled if the way of performing over the different pitch levels for that embouchure item is in the opposite way as described in the Fundamentals of Embouchure (Woldendorp et al. (2016)); e.g. playing low tones with a small lip opening and tensed thin lips.

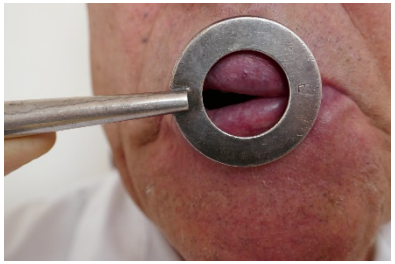
Scoring method:

- Step 1: Fill in all cells for the different pitches using the options provided in column 3.
- Step 2: For each row, identify if there is an orange flag pattern or symptom. These miscellaneous symptoms or different patterns are described in the explanation section below.
- Step 3: If an orange flag is identified in one cell/row, enter this in column 5 ('orange flag score').
- Step 4: After completing Domain 2, count the number of orange flags for this domain and enter at the bottom of the table for Domain 2.

Mouth & Lips (items 22-30)

Item 22

Lip opening (relative width)
A, B, C, D = 'Relative width' of the lip opening is the width of the lip opening while playing tones of the pitch/intensity category to be tested, in comparison with playing tones in the other pitch/intensity categories. An orange flag is scored if a different pattern is visible while playing tones of different pitches, in which the lip opening becomes smaller while playing lower pitched tones (and vice versa).



Item 23: Severe asymmetry

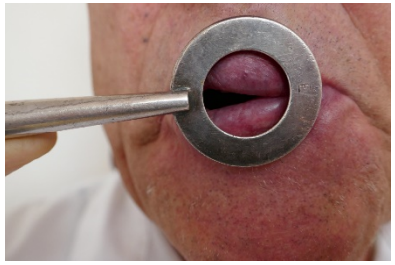
Item 23

Lip opening
A = If asymmetry of the lip opening is visible.
B = If the lip opening is outside the MP/rim visualizer, this is scored as an orange flag.

Item 23: Lip opening outside rim visualizer

Item 24

Degree of asymmetry in item 23
This item determines the degree of asymmetry in de lip opening assessed by item 23; it is entered using an ordinal scale:
A = no asymmetry
B = light asymmetry
C = severe asymmetry. An orange flag is scored if the asymmetry is 'severe'.



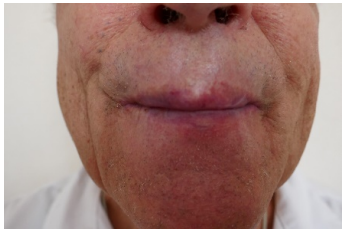
Item 24: Severe asymmetry

Items 25 and 26

Lower / Upper lip (relative thickness)

A, B, C = 'Relative thickness' of the lip is the thickness of the lips while playing tones of the pitch/intensity category to be tested, in comparison with playing tones in the other pitch/intensity categories.

An orange flag is scored if a different pattern is visible while playing tones of different pitches, in which the upper and/or lower lip becomes relatively thinner while playing lower pitched tones (and vice versa).



Item 27: Rolled in lips frontal view

Item 27: Rolled in lips lateral view

Item 27

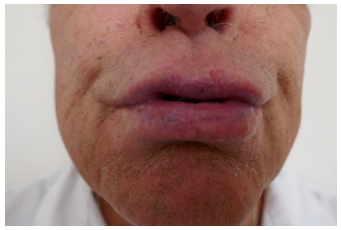
Lips rolled inwards/outwards

Lower lip rolls inwards to create higher lip tension for the production of higher tones and vice versa.

A = If lips are curved around the incisors

B = If lips are rolled out and inside mucosa is visible

An orange flag is scored if a different pattern is visible while playing tones of different pitches, with lips rolled inwards at low pitches or rolled outwards at high pitches.



Item 27: Rolled out lips frontal view

Item 27: Rolled out lips lateral view

Item 28

Mouth corners (MCs) (horizontal direction)

A = If differences between right and left side of the mouth are absent or small.

B = If differences in changes between right and left side of the mouth are clearly visible, more tothe right and left, respectively. This is scored as an orange flag.

C = If one MC deviates severely in lateral direction, this is scored as an orange flag.

D = If one MC is pulled out severely in frontal direction, this is scored as an orange flag.

If applicable, indicate R or L in the cell(s).

Multiple options can be chosen (a maximum of 1 orange flag for this item).

Item 28: MC (right) severely deviation to lateral direction

Item 28: MC (left) of small deviation to lateral direction

Item 28: MC (right) pulled out severe in frontal direction

Item 29

Mouth corners (MCs) (vertical direction)

Observed relative to the middle of the lip closure while playing the different tones as indicated in Domain 2.
A = If both MCs are at equal levels (in middle and low pitched register)
B = If one MC is obviously lower. Indicate R or L in the cell(s).
C = If one MC is obviously higher. Indicate R or L in the cell(s).
D = If both MCs are at equal levels in high position and the lips kept tensed, while playing a medium or (extremely) low tone (e.g. smile & press: this means if the brass player plays with lips spread wide (= MCs shift to lateral in a slight upward position). This phenomenon is functional during high/extremely high playing, but some brass players also apply this technique when playing medium and/or low pitched tones. The corresponding tones sound squeezed.

Item 29: MC left obviously lower and MC right obviously higher

Item 30

Abnormal lip movements: features like vibrations, tremors, twitching, shaking.
A = No
B = Yes. This is scored as an orange flag.

Item 29: Both MC high position

Jaw (item 31)

Item 31

Jaw position

The position of the jaws should be considered relative to each other.
Options A and D are the most extreme positions in which the mandible can be actively positioned.

Orange flag is scored if one of the following miscellaneous symptoms or different patterns is visible while playing tones of different pitches; moving the jaw position backward when playing low and/or forward when playing high (not extremely high).

Cheeks (items 32 & 33)

Item 32

Cheeks

Recording differences in symmetries of the midfacial area (main characteristic being the nasolabial fold) is subjective in nature.

B = If asymmetry in the NLFs length is visible, indicate R or L in the cell(s), for the **longest** NLF.

C = If 'miscellaneous', this is scored as an orange flag. Indicate observation, e.g. puffed cheeks.

Multiple options can be chosen.

Item 33

Degree of asymmetry in item 32

This item determines the degree of asymmetry of the phenomena in item 32; this is recorded using an ordinal scale:

A = no asymmetry

B = light asymmetry

C = severe asymmetry. An orange flag is scored if the asymmetry is 'severe'.

Item 32/33: NLF severe asymmetry left

Tongue (Items 34 & 35)

Item 34

Visual aspects of Tongue

A = No abnormalities (no tongue visible), or tones are continuously ended by putting the tip of the tongue in the lip opening
(this phenomenon should be indicated in Domain 4, item 47 ('tongue stopping')).

B = If the tongue is visible during playing, this is scored as an orange flag.

Domain 3: Instrument/rim visualizer position

Not all items in Domain 3 have red numbers after the options. If 'miscellaneous symptoms' or 'different patterns' are visible (see below), these should be scored as orange flags.

Scoring method:

- Step 1: Fill in all cells for the different pitches, using the options provided in column 3.
- Step 2: Identify miscellaneous symptoms or different patterns for each row. These symptoms or patterns are described in the explanation section below.
- Step 3:
    - For **items 36 and 40:** If an orange flag is scored in a particular cell (per row) enter this in column 5 ('orange flag score'). For these items a score of 1 orange flag is the maximum. *Example: Position of centre of Mouthpiece (horizontal), item 36: if the centre of the mouthpiece is beyond the canines while playing at medium pitch, high pitch and extremely high pitch, these are scored with 1 orange flag each per cell. The total score for item 36 is also **1** orange flag.*
    - For **items 35, 37-39:** The final interpretation of the observations of these items focuses on a change in pattern, e.g. shifting or pivoting of the instrument relative to the brass player, when playing at a certain pitch level. It is likely to be precisely at these moments of changing embouchure pattern that the brass player might be especially vulnerable for developing embouchure problems. These descriptions are included in the final interpretation.
- Step 4: After completing Domain 3, count the number of orange flags for this domain and enter at the bottom of the table for this domain.

Position of mouthpiece (MP) (items 35 and 36)

Item 35

Position of centre of MP (vertical)

Fill in the cells with the options provided in column 3.

Item 35/36: Position of centre of MP in midline

Item 36

Position of centre of MP (horizontal)

A = Centre of MP in the midline

B = If the centre of the MP is at or beyond the canines left (L) or right (R), this is scored as an orange flag.

Indicate L or R in the cells.

Item 35/36: Position of centre MP at the canines

Position shift of MP (item 37)

Item 37

Shifting MP (movement)
Shifting is the upward or downward movement of the MP during playing. The position shift of the MP is relative to the lips.
A = If playing a low pitched tone, the upper lip flap in the rim visualizer should vibrate more freely, and more space is needed in/around the rim visualizer. The MP shifts upwards.
B = A reverse pattern is visible during a high pitched tone: the upper lip flap becomes shorter in the MP and the MP shifts downwards.

Position shift of MP & lips relative to teeth (item 38)

Item 38
Embouchure motion
In 'embouchure motion' the lips and MP shift together relative to the teeth.
A = Clearly visible 'shift'
B = If no embouchure motion is observed

Angle of MP relative to head (items 39 and 40)

Item 39
Pivoting instrument
Pivoting of the instrument is if the instrument is tilted relative to the head, this can be seen when the cup of the instrument is turned upward or downward, or (especially in the larger brass instruments) when the head is bent forward/ backward, while the instrument is kept in the same position.
A = Forward bending of the head or upward movement of the cup of the instrument.
B = Head is not bent and the cup of the instrument is at the same level as the mouth.
C = Backward bending of the head or downward shifting of the cup of the instrument.

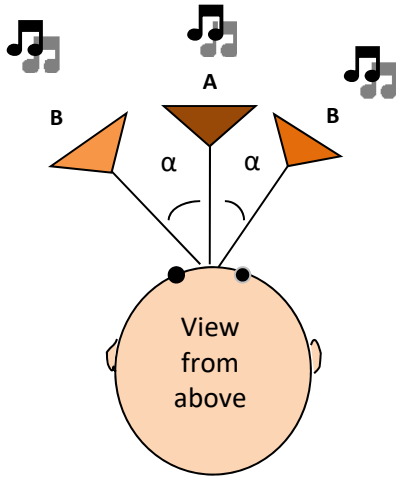

Item 39 : Pivoting (score A)


Item 39: No pivoting (score B)


Item 39: Pivoting (score C)

Item 40

Frontal deviation
A = 'Straight forward' is scored if the brass instrument is positioned at a right angle (α= 0) to the general facial plane.
B = If deviations to the right or left are clearly visible, this is scored as an orange flag. Indicate R or L.



Item 40: Frontal deviation

MP pressure (Item 41)

Item 41
Amount of MP pressure on the lips
After the brass player has played, the researcher observes the colouring of the lips, to get an impression of the MP pressure on the lips.
A = No discolouring of lips
B = Discolouring (whiteness/redness) of the upper and/or lower lip(s). This is scored as an orange flag.

Miscellaneous (Item 42)

Item 42
If anything unusual is observed during playing it can be written down at item 42, e.g. *difference between position of rim visualizer and playing on MP.*
An orange flag is scored if it can be assumed to impedes embouchure. Describe your observation.

Domain 4: Aspects of tone production

This domain consist of **three subdomains**:
The 'Technical aspects' subdomain consists of items that do not depend on the level of pitch, but belong to the main techniques of playing a brass instrument. Some phenomena from the subdomains of 'Performance characteristics' and 'Sound artefacts' might occur generally or only at specific levels of pitch.

Scoring method:

Technical aspects:

- Step 1: Circle the correct options in the cells. If applicable, circle right (R) or left (L).
- Step 2: Indicate for each item if an orange flag is scored.

Performance characteristics and sound artefacts:

- Step 1: Fill in all cells for the different pitches using the options provided in column 3.
- Step 2: Identify miscellaneous symptoms or different patterns for each row. These patterns or symptoms are described in the explanation section below.
- Step 3: If an orange flag is scored in one box (per row), record it in column 4 ('orange flag score'). For these items, a score of 1 orange flag is the maximum. *Example: 'Air leakage', item 59: Air leakage via nose at 'low pitch' and 'extremely low pitch' should be scored as 1 orange flag per cell; Total orange flags score for item 59 is **1** orange flag.*
- Step 4: After completing Domain 4, count the number of orange flags for this domain and enter in the bottom row of this domain.

Technical aspects (items 43-57)

Item 43

Range of tones

Indicate the range of tones in octaves and tones: calculate the number of whole octaves played from the lowest up to the highest playable tone. The remaining number of whole tones within a partial octave should be recorded as a decimal. *Example: if the lowest tone = a1 and the highest tone = cis4, the range of tones is 3.2 (c or cis = the same decimal).*

Item 44

Production of clear tone intervals

'No problem' = Playing of intervals of tones in steps of fourths or fifths is possible without limitations
'Uncertain' = Playing is possible, but with limitations in sound production and/or facial grimaces
'Problem' = If playing of intervals is not possible, this is scored as an orange flag.

Item 45

Lip stopping

'Lip stopping': If the brass player regularly terminates tones (or does so at specific pitch levels) by stopping the airstream through the lip opening by closing the lips.

'Yes': If this lip stopping is followed immediately by opening of the lips or without opening afterwards, this is scored as an orange flag.
Circle 'with' or 'without' lip opening afterwards where applicable.

Item 46

Tongue stopping

'Tongue stopping': 'Yes': If the brass player regularly terminates tones (or does so at specific pitch levels) by stopping the airstream through the lip opening by positioning the tongue in the opening for a short time, this is scored as an orange flag. Normally the tongue is not visible during playing (or simulation of playing).

Item 47

Soft Tone Jazz

In jazz, soft tones can be produced by playing with softly tensed and outwardly rolled lips.
Score 'Yes, impossible to play without soft tones': If this play technique cannot be adapted, this is scored as an orange flag.

Item 48

Miscellaneous/ disorders

Score 'Yes' only if it can be assumed that the observed feature interferes with embouchure, this is scored as an orange flag. Indicate observation.

Item 49

Lip buzzing

'Only air': Simulation of playing on the rim visualizer without any noise (only air stream)

'With noise': If the brass player produces noise by pushing the airstream through tensed vibrating lips, this is scored as an orange flag.

Items 50, 51, 52 and 53

Staccato – Glissando

Different forms of playing a single or a few tones: A single tone should last at least 3 seconds.
'Problem': If the playing of staccato-glissando tones is performed with difficulties, this is scored as an orange flag.

Item 54

Breath attack

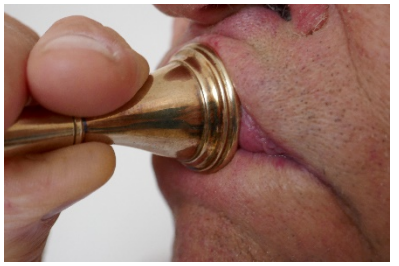
Difficulties or hesitations while starting to play a single tone. If 'Yes', this is scored as 'problem' and scored as an orange flag.

Items 55 and 56

Double/triple tonguing
Technique of the tongue. Each tone is played two or three times, respectively, the tones being separated by a tongue movement.
'Problem': If a problem is heard or visible during playing, this is scored as an orange flag.

Item 57
'Inset' embouchure
'Inset' embouchure is often used by French horn players, mostly in case of a too narrow MP in combination with relaxed lips. The MP sinks in the central part of the lips. The lip on which the MP is mainly placed, is sometimes kept in a curled position. Inspection of the lip and instrument movements (in items 36-38) is hardly possible.


Item 57: 'Inset' embouchure positioned mainly at the lower lip


Item 57: 'Inset' embouchure positioned mainly at the upper lip

Performance characteristics (items 58-61)

Item 58
Air leakage
Options 2, 3, 4: If air is heard escaping while playing, this is scored as an orange flag. This can occur through the nose and/or mouth. In case of leakage through the mouth, opening of the lips outside the MP may be visible.


Item 59: puffed lips

Item 59
Puffed lips
'Yes': If one or both of the lips is puffed up by an air cushion during playing; this is seen by a rounding of the lip(s). This is scored as an orange flag.

Item 60
Puffed cheeks
'Yes': If one or both of the cheeks is puffed up by an air cushion during playing; this is seen by a rounding of the cheek(s). This is scored as an orange flag. If applicable circle R/L or both.


Item 60: puffed cheeks

Item 61
Pucker
'Yes': If brass players play with pouted/puckered lips. The lips are tensed and positioned forward. The attack of the tones is somewhat 'popping' and not smooth. This is scored as an orange flag.


Item 61: Pouted/puckered lips

Sound artefacts (items 62-64)

Item 62

Faulty intonation

B = Yes, to a mild degree: there are occasional faulty tones, but they do not interfere with the performance.

C = Yes, to a strong degree: if there are persistent faulty tones which interfere with the performance. This is scored as an orange flag.

Item 63

Superimposed tones

B = Yes, to a mild degree: if extra tones or noise (not air leakage) can be clearly heard while playing, but they are not interfering with the performance.

C = Yes, to a strong degree: if extra tones or noise (not air leakage) can be clearly heard while playing, which interfere with the performance. This is scored as an orange flag.

Item 64

Blurred tones

B = Yes, to a mild degree: if tones are played in an uncontrolled way, with no clear attack and termination, but this does not interfere with the performance.

C = Yes, to a strong degree: if tones are played in an uncontrolled way, with no clear attack and termination, interfering with the performance. This is scored as an orange flag.

Chapter 3: Interpretation of scores

The 'CODE of embouchure' enables recording the clinical assessment of embouchure.

Please note:
Future research into the clinical assessment of embouchure in brass playing may lead to the discovery that certain signs or patterns of change observed during embouchure assessment are associated with an increased risk for developing embouchure problems.
The instrument provides a summary of the findings assumed so far to be relevant. It will become possible to present numbers of 'orange flags' in reference to a population of brass players in future research. Using findings derived from the assessment instrument, it will be possible to show characteristics of the population of brass players. This may indicate whether certain movement patterns seen in individual brass players will put them at greater risk of developing embouchure problems. All of this remains to be investigated. At this stage of the instrument's development, it is not possible to make judgements about certain movement patterns. It should also become possible to define therapy effectiveness, e.g. as 'After therapy the mean number of orange flags in a sample of brass players is decreased by at least 5.'

Anomalies in the embouchure-related 'body structures & functions' (International Classification of Functioning, Disability and Health (WHO, 2001[2]) can be recorded by marking so-called 'Orange flags'. Orange flags indicate anomalous features, signs and symptoms in a brass player's embouchure-related body structures and/or functions. Attention should be given to the assumed potential negative impact of these orange flags on brass players' embouchure.
Recording of the anomalies in all domains is possible by:

- counting the number (and nature) of orange flags,
- indicating sides (R/L) and degree of the differences or asymmetries,
- adding extra information in the 'miscellaneous/disorders' cells.

Observations made with the CODE of Embouchure can be reported in the following way; e.g.: Domain 1-4: *6 orange flags, Severe Left MC dropped, blister on left upper lip, range of tones 2,1 octave; dysfunctional embouchure*.

In Domain 4 the scores can be added up to obtain a sum score to classify the embouchure as 'functional' or 'dysfunctional'.
Classification:

- Functional if: 0 orange flag
- Dysfunctional if: ≥ 1 orange flag

[2] *World Health Organization (2001). International Classification of functioning, disability and health: ICF. Geneva: World Health Organization.*

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Domain 1: Body Structures & functions when not playing

Circle the relevant answer(s)

Circle Right (R) or Left (L)

The orange numbers behind the options indicate an orange flag. In case of an orange flag: Enter into the cells below each item (max. 1 orange flag per item).

★ : *This symbol means multiple options can be chosen*

 # = numbering in right corner of each box corresponds to numbering of instruction

Mouth/lips	**Symmetry of mouth corners (MCs)**				**Scars** ★		**Miscellaneous/Disorders around/in lips?** *(e.g. pain, blistering in area of mouthpiece, abnormal lip movements)*	
	Symmetry? ★		**Degree of asymmetry in MCs item 1**					
	Yes	0			No	0		
	No:		No	0	Yes, non-relevant upper lip R/L	0	No	0
	MC lower R/L and/or	0	Light	0	Yes, non-relevant lower lip R/L	0	Yes R/L, namely	1
	MC pulled out/up R/L and/or	0	Severe	1	Yes, relevant upper lip R/L	1	Don't know	-
	MC lateralization R/L	0	Don't know	-	Yes, relevant lower lip R/L	1		
	Don't know	-			Don't know	-		
Orange flag score	**1** ..		**2** ..		**3** ..		**4** ..	
Tongue	**Tongue anomalies while at rest?** *(e.g. asymmetry, wound, pain, 'fixed' tongue bone)*				**Tongue anomalies 'when sticking out?** *(e.g. lingual frenulum too short, asymmetry)*			
	No	0			No	0		
	Yes (R/L), namely	1			Yes R/L, namely	1		
	Don't know	-			Don't know	-		
Orange flag score	**5** ..				**6** ..			
Cheeks / Midface	**Symmetry of nasolabial fold**		**Midfacial activity**		**Degree of asymmetry item 8**		**Miscellaneous/Disorders around/in cheeks or midface?** *(e.g. scar(s) (tissue elasticity is different from surrounding tissue), wound(s)*	
	Yes	0						
	No, less pronounced R/L	0	Symmetric facial activity	0	No	0	No	0
	No, more pronounced R/L	1	Symmetric at rest, asymmetry		Light	0	Yes R/L, namely.....	1
	No, absent R/L	1	when showing teeth R/L	0	Severe	1	Don't know	-
	Yes, but both absent	1	Don't know	-	Don't know	-		
	Don't know	-						
Orange flag score	**7** ..		**8** ..		**9** ..		**10** ..	

Dental Arch/Teeth	**Dental Arch**				**Teeth**	**Inclination Angle Teeth**	**Dental Braces/ Prostheses** ★
	Shape Normal/round 0 Gothic 1 Miscellaneous e.g. ..... 1 Don't know -	**Regularity** Regular 0 Irregular 1	**Split?** Incisors not split 0 Incisors split 1 Don't know -	**Missing teeth?** ★ Intact frontal arc 0 Teeth missing upper jaw 1 Teeth missing lower jaw 1 Don't know -	No prominent teeth 0 Prominent teeth upper jaw 1 Prominent teeth lower jaw 1 Don't know -	Normal Inclination 0 Backward Inclination 1 Extreme Forward Inclination 1 Don't know -	No frontal braces or prostheses 0 Prosthesis upper jaw 1 Prosthesis lower jaw 1 Braces upper jaw 1 Braces lower jaw 1
Orange flag score	**11 ..**	**12 ..**	**13 ..**	**14 ..**	**15 ..**	**16 ..**	**17 ..**

Jaws	**Relation between dental arches: sagittal view**	**Relation between dental arches: frontal view** ★	**Jaw opening, vertical direction**	**Miscellaneous/Disorders Dental Arch and/or Jaws?** *(e.g. loosening teeth, pain, swollen TMJ, impeding proper movements of jaw)*
	Normal 0 Relative underbite 1 Underbite 1 Overbite 1 Don't know -	Normal 0 Mild asymmetry 0 Pronounced asymmetry 1 Open bite 1 Don't know -	Normal 0 Limited 1 Don't know -	No 0 Yes R/L, namely..... 1 Don't know -
Orange flag score	**18 ..**	**19 ..**	**20 ..**	**21 ..**

Total number of orange flags Domain 1:	**..**

Domain 2: Body Structures & functions while playing

Enter in each cell of each column the letter of your choice
Indicate Right (R) or Left (L) if applicable
The orange numbers behind the options indicate presence of an orange flag: maximum score is 1 orange flag per cell and per item

= numbering in right corner of each box corresponds to numbering in instructions

Playing tones			No. of Item	Orange flag score		Medium pitch ..	High pitch ..	Extremely high pitch ..	Low pitch ..	Extremely low pitch ..		Low & loud ..	Low & soft ..	High & loud ..	High & loud ..
Mouth/ Lips	**Lip opening (relative width)**	A. Wide open 0 B. Open 0 C. Small 0 D. (Nearly) closed 0 Z. Don't know - Different pattern 1	22	..											
	Lip opening	A. Symmetrical 0 B. Asymmetrical 0 C. Outside the MP/rim visualizer 1 Z. Don't know -	23	..											
	Degree of Asymmetry item 23	A. No 0 B. Light 0 C. Severe 1 Z. Don't know -	24	..											
	Lower lip (relative thickness)	A. Thin 0 B. Medium 0 C. Thick 0 Z. Don't know - Different pattern 1	25	..											
	Upper lip (relative thickness)	A. Thin 0 B. Medium 0 C. Thick 0 Z. Don't know - Different pattern 1	26	..											
	Lips rolled inwards/ outwards	A. Rolled inwards 0 B. Rolled outwards 0 C. Neutral 0 Z. Don't know - Different pattern 1	27	..											
	Mouth corners (MC) (horizontal direction)	A. Symmetrical 0 B. Lateral shift MC R/L 0 C. Severely lateral shift MC R/L 1 D. Pulled out R/L 1 Z. Don't know -	28	..											

Playing tones			No. Item	Orange flag score		Medium pitch ..	High pitch ..	Extremely high pitch ..	Low pitch ..	Extremely low pitch ..		Low & ..	Low & soft ..	High & loud ..	High & loud ..
Mouth/ Lips	**Mouth corners (vertical direction)**	A. Symmetrical/neutral 0 B. One MC lower R/L 0 C. One MC higher R/L 0 D. Both MCs in symmetrical high position 0 Z. Don't know -	**29**	..											
	Abnormal lip movements	A. No 0 B. Yes 1 Z. Don't know -	**30**	..											
Jaw	**Jaw position**	A. Extremely forward 0 B. Forward 0 C. Mid position 0 D. Backward 0 Z. Don't know - Different pattern 1	**31**	..											
Cheeks	**Visual aspects -nasolabial folds**	A. Symmetrical 0 B. Asymmetrical R/L 0 C. Miscellaneous: ..... 1 Z. Don't know -	**32**	..											
	Degree of asymmetry item 32	A. No 0 B. Light 0 C. Severe 1 D. Don't know -	**33**	..											
Tongue	**Visual aspects of Tongue**	A. No abnormalities 0 B. Tongue appears 1 Z. Don't know -	**34**	..											
Total number of orange flags Domain 2:			..												

Domain 3: Instrument/rim visualizer position

Enter in each cell of each column the letter of your choice
Indicate Right (R) or Left (L) if applicable
The orange numbers behind the options indicate presence of an orange flag
Write down the number of orange flags; maximum score is 1 for each cell and row

= numbering in right corner of each item corresponds to numbering in instructions

Playing tones			No of item	Orange flag score		Medium pitch ..	High pitch ..	Extremely high pitch ..	Low pitch ..	Extremely low pitch ..
Position of Mouthpiece (MP)	**Position of centre of MP (vertical)**	A. Centre of MP at upper lip 0 B. Centre of MP in the middle 0 C. Centre of MP at lower lip 0 Z. Don't know -	35	..						
	Position of centre of MP (horizontal)	A. Centre of MP in the midline 0 B. Centre of MP at or beyond the canines R/L 1 Z. Don't know -	36	..						
MP position shift	**Shifting (MP movement)**	A. Yes 0 B. No 0 Z. Don't know -	37	..						
Position shift of MP & lips relative to teeth	**Embouchure motion**	A. Yes 0 B. No 0 Z. Don't know -	38	..						
Angle of MP	**Pivoting instrument**	A. Upwards 0 B. Straight 0 C. Downwards 0 Z. Don't know -	39	..						
	Frontal deviation	A. Straight forward 0 B. ≥ 1 Z. Don't know -	40	..						
MP pressure	**Amount of MP pressure on the lips**	A. No discolouring 0 B. Discolouring 1 Z. Don't know -	41	..						
Miscellaneous		E.g. Difference between position of rim visualizer and playing on MP 1	42	..						
Total number of orange flags Domain 3:	..									

Domain 4: Aspects of tone production

= numbering in right corner of each item corresponds to numbering in instructions

Circle the relevant answer

The orange numbers behind the options indicate presence of an orange flag In case of an orange flag: Enter into the cells below each item (maximum of 1 orange flag per item).

Technical aspects	**Range of Tones** Lowest tone–highest tone number of octaves and extra tones (decimal place)	**Production of clear tone intervals** No problem 0 Uncertain 0 Problem 1 Don't know -	**Lip stopping** No 0 Yes, with/without lip opening afterwards 1 (Circle 'with' or without') Don't know -	**Tongue stopping** No 0 Yes 1 Don't know -	**Soft tone jazz** No 0 Yes 0 Yes, impossible to play without soft tones 1 Don't know -	**Miscellaneous/ disorders** No 0 Yes, namely ..... 1 Don't know -	**Lip buzzing** Only air 0 With noise 1 Don't know -
Orange flag score	**43**	**44 ..**	**45 ..**	**46 ..**	**47 ..**	**48 ..**	**49 ..**

Technical aspects	**Staccato** No problem 0 Problem 1 Don't know -	**Portato** No problem 0 Problem 1 Don't know -	**Legato** No problem 0 Problem 1 Don't know -	**Glissando** No problem 0 Problem 1 Don't know -	**Breath attack** No problem 0 Problem 1 Don't know -	**Double tonguing** No problem 0 Problem 1 Don't know -	**Triple tonguing** No problem 0 Problem 1 Don't know -	**Upset embouchure (in French Horn)** Not applicable 0 Yes 0 No 0 Don't know -
Orange flag score	**50 ..**	**51 ..**	**52 ..**	**53 ..**	**54 ..**	**55 ..**	**56 ..**	**57 ..**

Playing tones

Indicate in each cell the letter of your choice

Indicate in the column marked 'orange flags score' if an orange flag is scored

			No of item	Orange flag score
Performance characteristics	**Air leakage**	A. No 0 B. Via nose 1 C. Via mouth 1 D. Via both 1 Z. Don't know -	**58**	..
	Puffed lips	A. No 0 B. Yes 1 Z. Don't know -	**59**	..
	Puffed cheeks	A. No 0 B. Yes, R/L or both 1 Z. Don't know -	**60**	..
	Pucker	A. No 0 B. Yes 1 Z. Don't know -	**61**	..

Medium pitch ..	High pitch ..	Extremely high pitch ..	Low pitch ..	Extremely low pitch ..

Playing tones *Indicate in each cell the letter of your choice* *Indicate in the column marked 'orange flags score' if an orange flag is scored*			No of item	Orange flag score		Medium pitch ..	High pitch ..	Extremely high pitch ..	Low pitch ..	Extremely low pitch ..
Sound artefacts	**Faulty intonation**	A. No 0 B. Yes, to a mild degree 0 C. Yes, to a strong degree 1 Z. Don't know -	**62**	..						
	Superimposed tones	A. No 0 B. Yes, to a mild degree 0 C. Yes, to a strong degree 1 Z. Don't know -	**63**	..						
	Blurred tones	A. No 0 B. Yes, to a mild degree 0 C. Yes, to a strong degree 1 Z. Don't know -	**64**	..						
Total number of orange flags in Domain 4:	..									