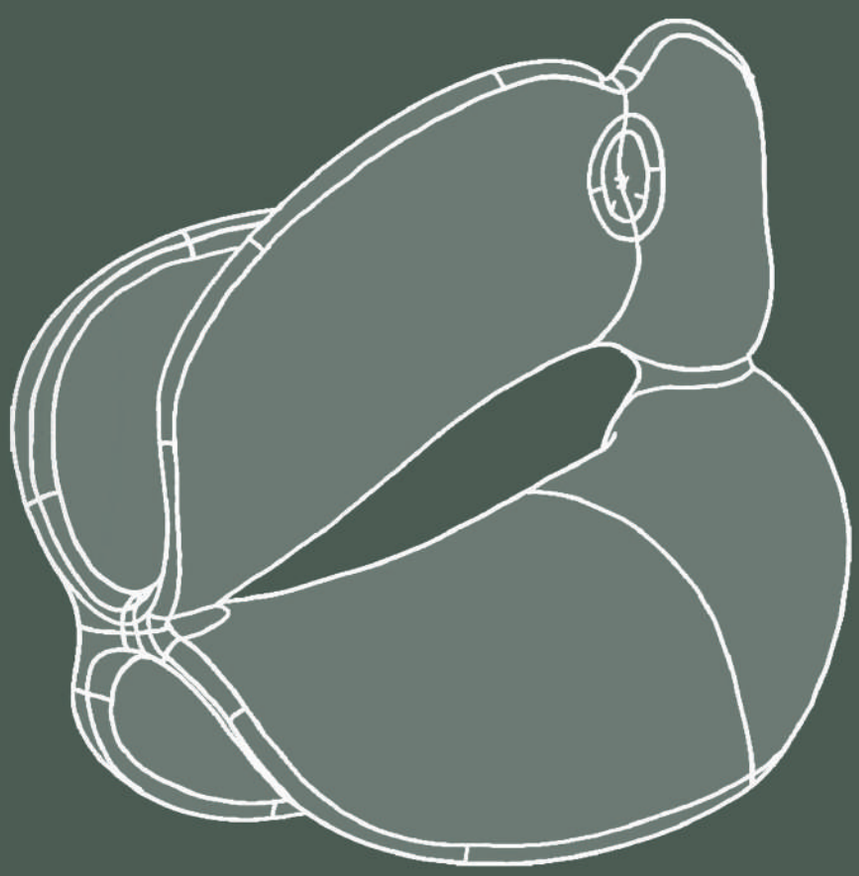
# FROGGYMOUTH SCIENTIFIC FILE



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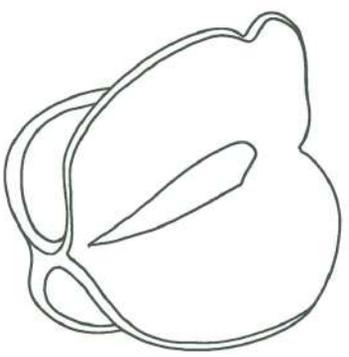

# INTRODUCTION TO FROGGYMOUTH



# How to upgrade from suction deglutition to swallowing deglutition trough cortical or subcortical networks

Dr. Patrick Fellus
France

The deformities that orth odontists have to cure are mostly caused by a lack of balance between the opposing forces produced by the cheek muscles and the forces generated by the tongue.

Whether orthopedic treatment in the deciduous dentition, orthodontic treatment in the mixed or permanent dentition, it is necessary to reach at the end of any treatment a functional balance that will ensure the stability of the results.

The transition from sucking deglutition to the physiological deglutition takes place sponta - neously for 60% of the children between the age of three and a half and four by a subcortical activation of the a pre-existing neurological wiring which have just matured.

Suction deglutition was a physiological function during the first years. It has a paleocortical origin, and the facial nerve controls it. But it becomes archaic when the full set of teeth is in place, and when the mastication appears.

- If suction-swallowing habit continues, the forces exerted by the labio-jugal muscles will disturb the physiological growth and will lead to various skeletal disorders in the three dimensions of space.

If it does not happen by itself, then, like in a computer, a new program will have to be downloaded, controlled by the trigeminal nerve

It is what the practitioner or the speech therapist is going to do through a series of exer - cises to code a new praxis. But even with an accurate cooperation of the child, it is a long and complicated process because it need a participation of the cortical brain.

According to Eric Kandel, Nobel Price of Medicine in 2000, when this action comes from the cortical area we have a stimulation of neurotransmitters in our synapses, but when it comes from the subcortical area we have a creation of new synapses.

The swallowing rehabilitation must not be based on the control of voluntary movements but on the stimulation of automatic movements:

- Froggymouth is a new appliance which helps young children at the age of 3 - 4 years to use the best swallowing method for a toothed patient through the subcortical way and not anymore the suction deglutition method.

**Figure 1.**

• This Appliance is based on the idea of deconnection between the upper lip and the lower one.

Froggymouth is not placed inside the mouth but beetwen the lips (**fig.1**).

It will prevent the upper one from touching the lower one. So, it is impossible to create the negative pressure which is necessary during suction deglutition thanks to a water-tight joint around the lips. Indeed, it will force the child to find by himself a new way for the deglutition, in the lower part of his brain, by raising the upper back part of the tongue to the palatal bone when the teeth are in occlusion.

The activity of the seventeen muscles of the tongue against the internal side of the teeth allows an optimal stimulation of the transversal and antero-posterior growth of the dental arch.

This appliance has to be worn 15 minutes per day and should not be worn during the night like a trainer as the quality of the sleep is so important for young children. Froggymouth must be worn in front of a TV screen to have a good orientation of the head and to catch the attention of the patient. It will stimulate his neuron circuits, which are related to the subconscious functions. At rest the lips are not in contact, the teeth are in occlusion and the trigeminal nerve control this program.

**Figure 2.** *Position of the lips during suction déglutition and during swallowing deglutition.*

At the opposite, when the lips are closed, the teeth will not be in contact, and the facial nerve will be the leader, the child will use the old swallowing pattern.

This Appliance is only an auxiliary that you will be able to use during your treatments for a few weeks whatever the techniques you apply (functional or mechanical).



**Figure 3.** *Case treated by G.Altounian.*

It is obvious that results will be achieved much faster if the muscles and the appliance are both working in the same direction rather than if they are fighting against each other.

Froggy mouth is perfectly adapted to young children and it can even be used alone if the deformity is slight:

- The simple fact to rebalance the functions will allow a spontaneous correction of slight deformity when the child still has deciduous teeth.

**Figure 4.** *This little girl of three years old had been wearing Froggy Mouth for only two weeks. She is perfectly at ease with it. she is not dribbling saliva, her face and muscles are relaxed, and the deformity is less significant than it was at the beginning.*

## CONCLUSION

Froggymouth will not only reduce the length of your treatments but much more important; it will ensure its durability when the treatment will be over and then reduce the risk of relapse.

# CLINICAL RESULTS

Journal of
*Clinical Medicine*

MDPI

*Article*

# Short-Term Effects of a Myofunctional Appliance on Atypical Swallowing and Lip Strength: A Prospective Study

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**Abstract:** Atypical swallowing needs treatment in order to eliminate harmful interferences of the tongue, which prevent the harmonious growth of the stomatognathic system. The purpose of this study was to assess the effects of a functional appliance on the presence of atypical swallowing, analyzing the lip strength and the altered facial mimics. The effects of a myofunctional appliance (the Froggy Mouth) were evaluated on 40 children (6 males; 24 females; mean age 9.6 ± 2.17) with atypical swallowing—with tongue thrust diagnosed by an expert orthodontist—before and during a 6 month treatment. Data were analyzed over time with a paired samples t-test for normally distributed data. After 6 months of treatment, 33 children out of 40 achieved clinical correction of atypical swallowing due to their good compliance, even at an early stage. Seven children showed low compliance and did not obtain any result. Lip strength in compliant subjects went from 190.30 ± 86.04 cN to 489.39 ± 123.36 cN ($t = p < 0.001$). Facial mimics improved in 28 out of 33 compliant subjects, and four children with the initial diagnosis of labial incompetence achieved correction. This observational study demonstrates the short-term efficacy of this myofunctional appliance in the treatment of atypical swallowing, achieving correction of the facial mimics and labial incompetence with a significant improvement of the lip strength.

**Keywords:** interceptive orthodontics; orthodontic removable appliance; myofunctional appliance; atypical swallowing; lip strength; orthodontics

# CLINICAL CASES


## Incisal open bite treatment wearing the Froggymouth during 2 months

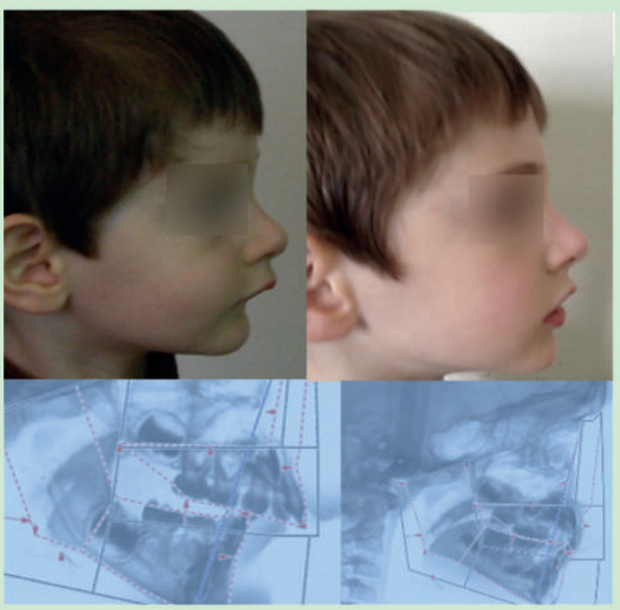
*Julia,* **4 years old** - treated by Dr P. Fellus

Julia showed an isolated incisal open bite. She wore the Froggymouth between 31st of March and 1st of June to correct the tongue position. Thanks to restoring orofacial functions, the dysmorphic feature continued to spontaneously correct itself without appliance, and the result obtained on 11th of October lets us foresee definitive physiological dental occlusion.

## Severe retromandibulia treatment with Froggymouth

*Marc,* **4 years old** - treated by Dr P. Fellus

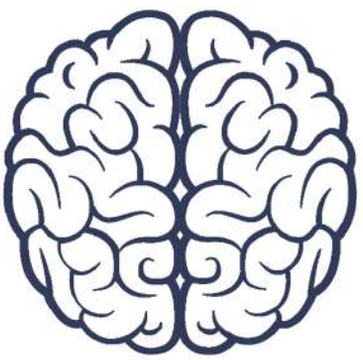
Since Marc was 2½ years old, every practitioner they saw told his parents that there was nothing they could do and they would have to wait until he was old enough to undergo surgery.
Dr Fellus decided to renew mandibular growth with non-invasive techniques and wearing Froggymouth daily during 3 months and once a week during 3 more months. Two year later, Marc is class I and will not be needing surgery.



## Froggymouth and Aligners

*Michelle,* **50 years old** - treated by Dr D. Couchat

She had a wide anterior open bite (5 mm) from canine to canine with maxillary endoalveolia. These two signs testify to the patient's lingual dysfunctions, notably atypical swallowing, in which an excessive contraction of the buccinator muscles can be observed (causing endoalveolia) along with tongue thrust (leading to the anterior open bite).
Dr Couchat suggested an aligner treatment to correct the dysmorphosis and in the meantime a Froggymouth to stabilize the treatment and avoid relapse.



# NEUROSCIENTIFIC APPROACH

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Review

# How biochemistry and neurophysiology are involved in the re-education of deglutition

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**Abstract**

The transition from suction-type deglutition to dental-type deglutition needs to occur spontaneously between 3 and 4 years of age, but the genetic information for this is not expressed systematically. When this transition does not occur spontaneously, the new program needs to be engrammed by conscious actions or by stimulation of the sensory-motor areas.

Keywords: deglutition, short-term memory, procedural memory

## Prolegomenon

Suction-type deglutition, which is a physiological mode for swallowing saliva in young infants, is an automatization that develops at the level of the brainstem in utero. Dietary alteration progressively integrates a cortical activity for control of the programming of deglutition, although this first mode of deglutition remains physiological as long as the primary dentition has not come in and mastication has not begun. Beginning at four years of age, the implementation of mastication sets off a new programming of deglutition in 60% of children referred to as dentition-type deglutition. It takes place naturally (bottom-up approach), stimulating the sensory-motor areas: "The anatomical components are the same but the programming of deglutition is reconfigured" [4]. It involves developmental plasticity. By way of the muscle forces that it generates, this new mode of deglutition promotes optimal growth of the maxilla [5].

But the endogenous or innate factors only give rise to potentialities. "It is only expressed when adequate exogenous conditions occur in a timely manner" (JP Changeux) [1]. Dawson Church stated that "genes are activated or inactivated by our beliefs, our emotions, and our attitudes".

Two main causes for the persistence of suction-type deglutition: the child has never had the opportunity to discover this new mode of functioning as their dietary habits did not elicit mastication; the child discovered it but the limbic system, a prerequisite for engramming a new program, did not retain it, generally for psychological reasons (emotional immaturity, continued thumb sucking, use of a pacifier or bottle). Most of the children requiring orthodontic treatment are found in the latter category. Re-education of orofacial functions (plasticity linked with experience) is hence a necessity recognized by nearly all practitioners when undertaking orthodontic treatment, but it is necessary to properly understand the neuroanatomy as well as the physiology to achieve reproducible and controllable results.

## Re-education of Deglutition

### What strategies should be implemented?

1) Hope that normalization of the dental arches will lead to an alteration in function. This is all the more feasible when using a removable retainer. Indeed, the use of an item that alters the proprioceptive feelings will automatically lead to an alteration of the afferent signal and hence facilitate alteration of the efferent signal. Alteration of the anatomical setting by the treatment will allow the program to engage naturally, although without monitoring the new praxis could well remain dysfunctional. However, care must be taken with fixed retainers.

If functional alteration occurs, there are no adverse consequences, although if there is dysfunction, the pathological muscle forces will be iatrogenic not only at the level of the alignment of the teeth blocked by the wire but also at the level of the supporting bone tissues, and this can be the origin of a pathology that ultimately affects the periodontium. Uncontrolled movements of the roots of

the lower incisors can also occur in a short amount of time [11].

2) Use of a functional devices, generally at night, aimed at alteration of tongue posture: LEN type, Robin device, tongue elevator, Farrell or Bergensen-type gutters, although the outcomes remain inconsistent as long as the dysfunctional commands are not inhibited, although wearing of such devices (between 12 and 14 hours per day) could be a difficult experience for the child and rejected by the limbic system. Being worn for an extended period of time is all the more unnecessary as the period of encoding is diurnal, only the consolidation is nocturnal. "Functional brain imaging has revealed electrical reactivation during sleep, as if the brain replays the daytime neuronal activities"[10].

3) Consultation with professionals such as speech therapists or physiotherapists (top-down approach). First of all, the child needs to become aware of the movement that they make and the movement that they should be making, the repetition before automization can occur. Knowing what one needs to do is, however, not enough to be able to do it (e.g., consider the difficulties with learning a new sport). This is a deliberate learning process by repetition and sensory-motor adjustment.

Eric Kandel, Nobel laureate in Medicine in 2000 for his work on short- and long-term memory, has shown that in the latter case there is an increase in the activity of neurotransmitters at the level of the synapses involved, but what we are dealing with here is short-term memory [8].

**Schema Eric Kandel**

"Memory is not based on the properties of the nerve cells as such, but on the nature of the connection between neurons and how they process the sensory information received". Learning consists of tracing new circuits, and this plasticity arises either due to reconfiguration of existing programs or by the creation of new ones.

**Reconfiguration of existing circuits**

Understanding of the conversion of short-term memory into long-term memory was elucidated by the work of Kandel on Aplysia:

1. Light stimulation releases neurotransmitters at the level of the synapse, while the nucleus is not involved in short-term memory (e.g., weekly speech therapy sessions). This information only remains available for a relatively short period of time.

2.When the stimulations are repeated in a short period of time (e.g., several weekly sessions and daily exercises at home), a dialogue is generated between the synapse and the nucleus that activates CREB* and it produces a new protein indispensable for the transition to long-term memory. This new protein, CPEB**, in the synapse functions as a prion and ensures transmission of the message in a permanent manner.

**Creation of new circuits**

In parallel, a highly emotional state can short-circuit the normal constraints and produce a sufficient quantity of MAP-kinase* molecules that are then sent to the nucleus to inactivate CREB-2** molecules, thereby promoting activation of CREB-1** and direct imprinting of this experience in the long-term memory. *MAP-kinase: acts in conjunction with protein kinase A to initiate long-term memorization.

Froggy Mouth® is a device that, when worn for 15 minutes per day over a relatively short period of time and while watching television (a reward recognized by the limbic system), forces the child to discover a new way of deglutition by the subcortical route; thus, not by stimulation of the activity of neurotransmitters but by the creation of new synapses. Indeed, by not being able to purse their lips, they are unable to swallow by suction, aspirating between the front of the mouth and the rear of the mouth, triggering an abrupt and immediate reaction at the level of the brainstem: find a new program for deglutition.

Faced with this new situation, the child employs the patterns that they have available. If they do not have a pattern suitable for the new situation, they will need to generate one. This amounts to incidental and nearly immediate learning.

The concurrence of the contraction of the levator muscles of the mandible in a stable and comfortable dental occlusion with those of the soft palate and the styloglossus allows peristaltic movement of the tongue (provided that the transverse and vertical anatomical environment are compatible) and disconnection of the lip-tongue synkinesis. This new program of deglutition immediately becomes integrated into long-term memory by the creation of a new neuronal circuit. It is, however, only the first step, which is necessary but not sufficient to transition to automatization.

**Automatization**

The child then has two programs available to swallow saliva. Just like on a computer when two programs are available, it is the activation of one or the other icon that initiates its execution. The therapist, therefore, needs to monitor the posture at rest to obtain relaxation of the perioral muscles and dental occlusion upon deglutition. The control by the trigeminal nerve that is solicited at this step substitutes for the control by the facial nerve and it inhibits the role of the latter.

The trigeminal nerve, which also controls the respiratory centers in the pontine tegmentum by its sensory nucleus, promotes restoration of nasal breathing, allowing the posterior part of the tongue to adopt an elevated posture (a lingual dome).Similarly, contraction of the tensor tympani muscle of the hammer, which is innervated by the trigeminal nerve, allows the middle ear to be ventilated by dilation of the Eustachian tube, thereby reducing serous otitis problems.

Figure 1. The icon for suction-deglutition is activated by the facial nerve: "my lips are spread, my teeth are not touching each other".

**Figure 2.** The icon for dentition-type deglutition: "my lips are pursed, my molars in occlusion" is activated by the trigeminal nerve, which not only allows molar occlusion but also protects the tongue from being bitten due to the abundance of trigeminal nerve endings in its epithelial lining.

Figure 3. Contrary to what speech therapists recommend, it is not the apical part of the tongue that needs to gain the child's attention but the posterior part. Obsessed with the sensory search for the retro-incisive papilla, the child risks raising the lingual apex, leading to a lowering of the posterior part that will prevent engagement of the styloglossus, which is the levator muscle of the lingual dome [6].

**Figure 4.** Worn for 15 min per day while watching television, Froggy Mouth® allows relaxation of all of the anterior facial muscles.

Control can be transferred to the parents, who need to take note of the labial posture five times per day and congratulate or correct the child. These two actions are not similar, as they involve the cortico-cortical circuits that traverse the basal ganglia and the cortico-cortical circuits that traverse at the level of the cerebellum.

The work by Robert Bjork (UCLA) affirms that the number of monitoring sessions is more important than the number of learning sessions for engrammation of a new pattern. This requirement for inhibition of the wrong circuit is fundamental to automatization of the correct program.

**Learning is Eliminating**

Only Froggy Mouth® allows this double action: by only controlling the labial posture it allows postural alteration of the tongue and the pharyngeal-velar muscles by a cross-talk effect. "This dual posterior and occlusal functional lingual necessity, too often forgotten by re-educators of oral functions, is likely one of the causes of the too frequent failures of re-educations" (Delaire) [5]. Wearing a Froggy Mouth® from 3 years of age onward does not present any contraindications. It is compatible with all types of orthodontic devices in adolescents and is still effective in adults (neurogenesis or enrichment of the extensions of existing neurons). It also allows intervention in the re-education of disabled children.

**Conclusions**

Re-education can be based on two different approaches: a bottom-up approach that directly targets the deficit or the anomaly, but that does not require becoming aware of this deficit or anomaly, and a top-down approach that aims to generate awareness of the deficit or of this anomaly and the explicit acquisition of new corrective or compensatory strategies.

Early normalization of orofacial functions allows prevention to be approached at its three stages irrespective of the selected technique are preventing deformations from occurring, once they have occurred, preventing them from becoming worse, once corrected, preventing them from recurring.

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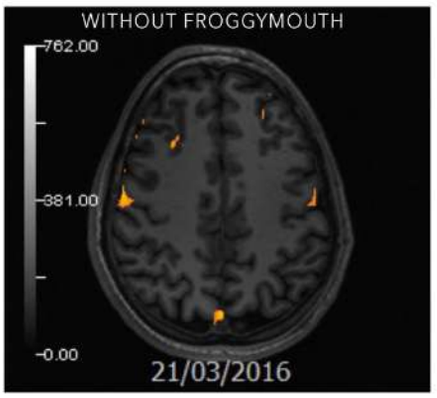
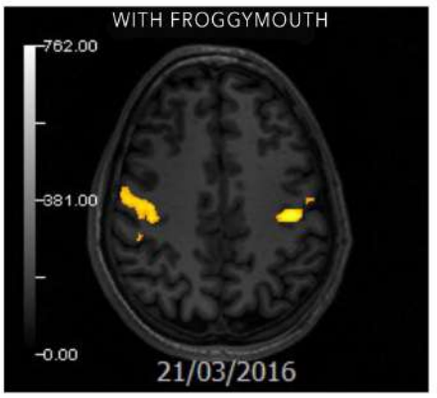
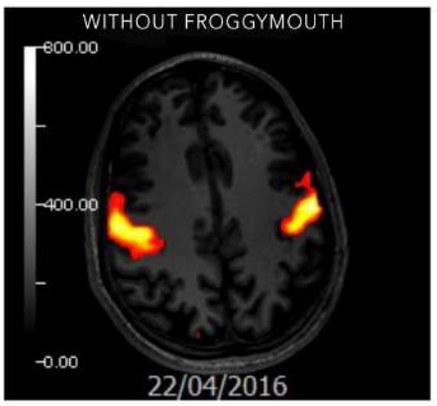
# MRI

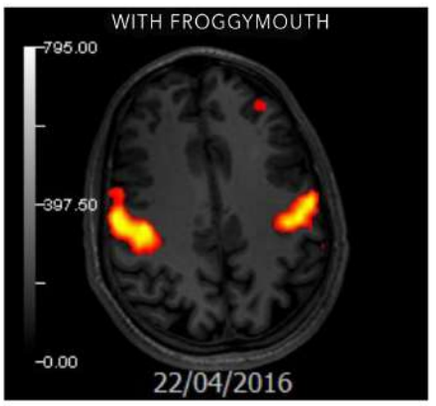


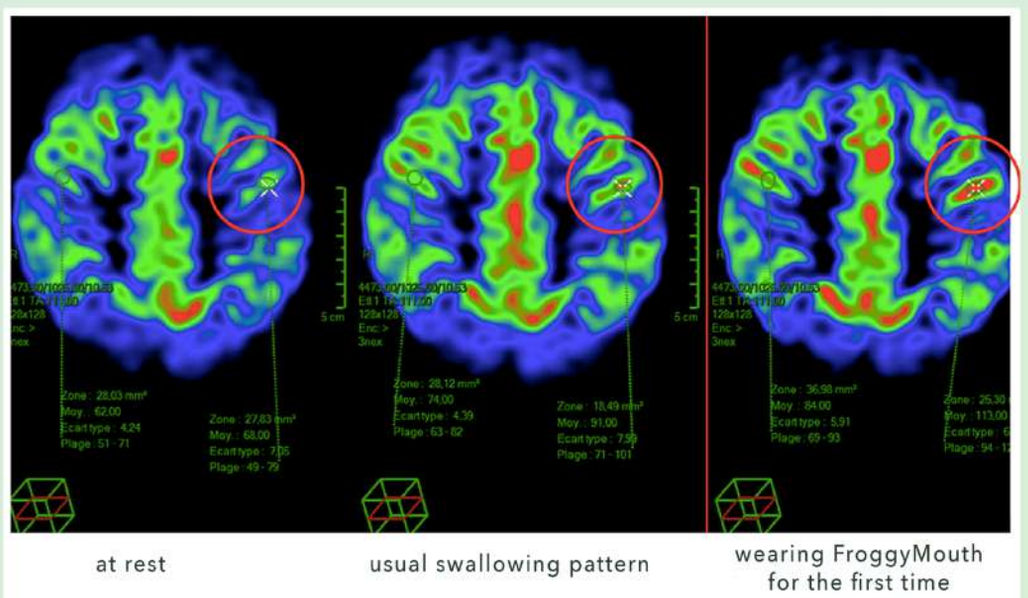




This functional MRI was performed on a 35-year-old patient by Dr. Pans at the Liège University Medical Center. It highlights the sensorimotor areas of secondary swallowing and shows automation of the praxis after 1 month.

**1 MONTH LATER**




This functional MRI was performed on a 6-year-old child by Dr. Gaillard at Necker Hospital in Paris.

It shows stimulation of the areas of the brain when swallowing. The red circle highlights the area controlling secondary swallowing. It shows its stimulation when starting to use Froggymouth for the first time.

le journal de froggy

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Froggymouth inventor

# The stress factor: serving or at the expenses of memory?

As a practitioner who uses Froggymouth, you may ask yourself, why we constantly indicate stress notion regarding neuronal learning processes, which has not yet been described in the literature.
Clinical observations led us to new investigations on this subject.

How is it possible for a child with deep cerebral palsy to modify its lingual posture in such few times, taking into account its motor difficulties?
Another clinical experience shows a second case of a 2 year old child with lymphangioma of the posterior part of the tongue and multi-cysts in the oropharynx leading to permanent protrusion of the tongue posture: how can he react to the stimulations triggered by Froggymouth in less than 5 minutes ?

The aim of this study is to assess why neuronal processes elected by the use of Froggymouth occur so fast.

As previous studies have reported stress is mainly considered a negative impact on learning processes.
A chronic stress leads to an overactivation of the HPA axis (Hypotalamus, pituitary gland, and adrenaline), which may atrophy the dendrites located in these structures, degrade synaptic plasticity and diminishes neurotransmitters sensitivity (Joëls et al, 2006). An extended period of stress is harmful for the structures in charge of the normal function of the patient and for the learning possibilities because neuronal connections are damaged.
But according to Olivier Bégin-Caouette's blog and Freddy Janneteau's studies (leader of "stress, hormones and plasticity"; functional genomic institute of Montpelier) a positive effect can be observed regarding stress.
Kim et al, (2001) describe stress as a factor with great impact on synaptic plasticity and hippocampus, structure in charge of information storage.
Investigations by Joëls et al (2006) highlighted that stress was able to activate the memory mechanisms only when the organism has to memorize the event and only when hormones and neurotransmitters activate the same pathways that have been activated by leaning processes.

Thus, a combination of the time frame and the intervals between learning processes and the cause of stress created by the device is crucial. We have to keep in mind that the positive effect of the stress, can only be induced if the stress intensifies the connections affecting learn processes and not those linked to other events. Stress seems to have an accentuated effect on neural connections. Shors (2004) showed that these effects happen on a macroscopic level. This can be explained by the fact of the major role of mineralocorticoid hormones which are involved in all the tasks characterizing the consolidation of learning processes (Zorawski et al., 2005). Indeed, those hormones, like the cortisone directly intervene on the encoding, integration, selective attention, and cognitive efficiency, what allows an increased memory consolidation.
In the course of a stress event norepinephrine, peptides and corticosteroids are released and generate greater activity of hippocampal neurons (Joëls, Pu, Wiegert, Oitzl et Krugers, 2006).

All these conditions pertain when the patient applies Froggymouth for the first time. The impossibility to properly seal the lips prevents a development of the motor sequence of swallowing suction, provoking a major stress in the brainstem, swallowing being a vital praxis. These processes take place on an unconscious level because the patient has been instructed to follow a television program while wearing the appliance. The inhibition of the facial nerve activity will promote trigeminal activation, allowing dental occlusion, which enables the lingual dome and the palatal arch to touch. This allows discovery and engrammation of toothed subject type swallowing (secondary deglutition).
In this situation, there is a concomitance of stress release and the learning of a new procedures.

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# BEYOND SWALLOWING

le journal de froggy

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# Simultaneous rehabilitation of tongue position and of breathing: a physiological necessity

The progress and popularization of neuroscience have caused upheaval for all the usual fields, whether it be neuromarketing, neuroleadership, or neuroeducation. Our specialty also benefits from these scientific advances, which allow us to better understand the problem of functional rehabilitation.

But it is especially important to understand that it is not the rehabilitation of a specific praxis that must be taken care of—swallowing for us orthodontists, breathing for sleep medicine, inner ear drainage for ENT specialists, speech for speech therapists—but the totality of orofacial praxes to ensure a global dynamic balance. Fortunately, nature can come to our aid if we take into account the physiological acquisition processes.

*Four approaches currently govern these protocols, but how should the most effective therapy be chosen?*

## ENGRAMMATION

**I.** Sixty percent of children spontaneously discover a new swallowing method around the age of 4 in a totally natural and unconscious way that is referred to as the anoetic way.

Genes and epigenetics intervene spontaneously at the time of the appearance of mastication and provoke an increase of Nerve Growth Factor, producing new neurons and thus new neuronal circuits.

A short review of some basic principles will allow us to better understand the influence of physiology and biochemistry.

*"Memory is not based on the properties of nerve cells as such, but on the nature of the connections between neurons and the way they process the sensory information received."*

**KANDEL Eric**

Functional balance is not a stable state but a state of perpetual remodeling.

Information is constantly analyzed and is generally ignored very quickly, but it can lead to an anoetic reorganization if it is relevant.

**II.** Many practitioners prefer to ignore the correction of orofacial praxes in their treatment plans, and hope that normalization of the dental occlusion will allow the acquisition of a balanced functional result at the end of the treatment. This random approach will also be anoetic.

**III.** However, it is now more and more accepted that dysfunction leads to dysmorphosis and that it must be treated just as much as the deformities of the dental arches.

The most used technique involves a voluntary approach of these acquisitions. Practitioners, speech therapists, and physiotherapists will try to make the patient aware of the movements they usually carry out and then of the movements they must learn. This is a top-down approach (voluntary, noetic) where communication starts from the cortical area and goes down to the motor areas.

Eric Kandel, winner of the Nobel Prize for Medicine, showed that effectiveness depends on the frequency of these stimulations and the daily practice of the prescribed exercises. If the sessions are spaced out, they will modify the messages transmitted to the synapses, but this will only involve short-term memory. On the other hand, if the information is repeated regularly, the nucleus will intervene to ensure its passage into long-term memory.

**IV.** Froggymouth, by activating the emotional system, opens up a new method of immediate consolidation to long-term memory that the researchers call "*now print*" (printing in memory the current content of neuronal activity). (2)

## INTERACTION BETWEEN THE DIFFERENT CIRCUITS

The other neuronal circuits managing other orofacial praxes could also be involved thanks to communication between these different elements, called "connectionism," a role assigned to glial cells that are 4 to 5 times more numerous than neurons and whose role is essential in learning. (1)

Around the synapse, the glial cells pick up the conversation like a telephone call and will broadcast the information to all the other neuronal circuits by means of gliotransmitters as if the information were broadcast by radio to all the circuits. This allows other circuits that were not involved in the rehabilitation process to take advantage of this information to improve their efficiency.

This "connectionist" system is reminiscent of the domino effect and the simple act of controlling lip position will activate the swallowing circuit which will activate the control of nasal breathing and so on, allowing the rehabilitation of praxes that are difficult to access.

The tongue will adopt a high position in its posterior part (lingual dome) which will stimulate the transverse growth of the superior maxilla, thus improving its comfort in cases of narrowness.

A return to physiological breathing will promote inhibition of the meta-circuits managing oral breathing.

These interactions are necessary to establish a permanent balance.

## AUTOMATION

*"It has to be said that lingual, labial, and functional neuromuscular rehabilitation relapses frequently. But is it really a relapse? That would assume that there had been a recovery. It seems more likely that the desired goal, the automation of the function's position, has not been achieved. Yet this is real healing. We are not meticulous enough to carefully control whether automation has been achieved. Most of the time, we confine ourselves to observing the neuromuscular responses to given orders. Instead, it should be about achieving automation, in other words a praxis without awareness."*

**FOURNIER Maryvonne**

This is why we must take as much interest in automation as in engrammation, a stage that Björk's work allows us to better understand.

He described 4 learning protocols:

**A. A. A. A. E**

**A. A. A. T. E**

**A. A. T. T. E**

**A. T. T. T. E**

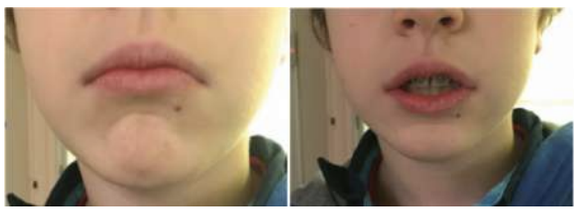
For example, **A** represents a traditional learning session, **T** intermediate tests to assess progress, and **E** the final evaluation.

He asks the participants to choose what they consider to be the best protocol. Most will choose program 1, but the most effective is program 4.
This strategy 4 will be carried over into the game programs managed by artificial intelligence.

*"It is usually only at the end of the game that we know whether it is won or lost… The trick that computer scientists have found is to learn 2 things at once: to act and to evaluate oneself. One half of the system, called the critic, learns to predict the final score. At each moment, this neural network evaluates the state of the game and tries to predict the reward: am I winning the game or losing it? Thanks to the criticisms that it builds up over the course of the game, the system can evaluate its actions at each moment, not just at the end of the game. The other half of the network, the actor, can then use this evaluation to correct itself. Over the course of the game, the actor and the critic progress together, one learning to act wisely by focusing on the most effective actions while the other learns to evaluate the consequences of their actions."*

**DEHAENE Stanislas**

These control sessions can be entrusted to the parents who will have to tell the child three times a day if their lips are in a correct position (the correct circuits will be unconsciously reinforced by the release of dopamine) and three times a day if they notice a contraction of the orbicularis.



Under the direction of the premotor and motor cortex, the motor sequence will be managed by the circuits of the grey matter of the spinal cord and the tegmentum of the brain stem (alpha motor neurons). It will be controlled at the level of the cerebellum, which detects and corrects the difference between the executed movement and the desired movement, and the basal ganglia, which suppresses erroneous data and prepares for future movements.
A simple test will allow us to judge if our rehabilitation has been effective: ask the child to count up to 60, if you see the tongue between the dental arches, then automation has not yet been obtained; if the tongue stays well inside the dental arches, you will be able to space out your monitoring sessions more and more.
Nasal breathing rehabilitation is a necessary condition for tongue rehabilitation, which is necessary for respiratory function. This approach is in line with the work published by Takashi Ono who even emphasizes the intervention of the diaphragm muscles and the phrenic nerve. Only the anoetic route will promote the natural implementation of this approach.

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Case Study

# Swallowing Rehabilitation in a Child with Narcolepsy and Cataplexy

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## Abstract

Narcolepsy with cataplexy is a rare and highly debilitating neurological disorder characterized by excessive daytime sleepiness, sleep attacks and cataplexy which correspond to sudden loss of muscle strength and preserved consciousness and are mainly triggered by positive emotions such as laughter or excitement or telling a joke). Cataplexy may range from a slackening of the facial muscles that is barely perceivable to a drop of the jaw or head, weakness in the neck, shoulders, knees or total collapse.

A high number of pediatric cases are diagnosed and treated at the Reference Centre for narcolepsy at University Hospital Robert-Debré in Paris.

Keywords : Swallowing Rehabilitation; Child; Narcolepsy; Cataplexy

## Introduction

It is of interest to observe that, among all the patients examined in an orthodontic setting, 50% failed to show abnormalities whereas deformations were major in the other half. Questioning the parents revealed that when occlusion was correct at the time when the first symptoms of the disease were expressed, no doubt related to physiological swallowing, there was no occlusal modification. On the other hand, pre-existing dysmorphic features were almost systematically worsened [1-3].

## Case Study and Discussion

Related attention-deficit disorders make rehabilitation difficult, with a high rate of failure.

All conventional rehabilitation approaches involving increased awareness of the gestures performed and then of the gestures to be performed are doomed to failure, especially as only a very large number of repetitions could manage to engram the new practice in the long-term memory.

There was major incisive open bite, but it regressed progressively, reaching normal conditions of occlusion in 18 months.

The patient is very absent-minded and does not feel concerned with her therapy and the very wide gap related to her tongue dysfunctions must be treated.

She did, however, accept to wear the Froggymouth for 15 minutes a day while watching television. The limbic system will assimilate this fun activity with a reward, a decisive element in automation. Placed at a distance from the receiver, the gaze is horizontal as is the lingual plane. Once the device is installed, she can no longer swallow her saliva with her usual programme, but swallowing is a vital function that will lead to an immediate reaction in the brain stem to find another muscle dynamic to be able to swallow. The patient continues to watch her programme and doesn't even notice these changes; as the facial nerve's activity is inhibited the trigeminal nerve takes over, facilitating dental occlusion, and the styloglossus comes into play for the physiological progression of the swallowing programme in a subject with teeth.

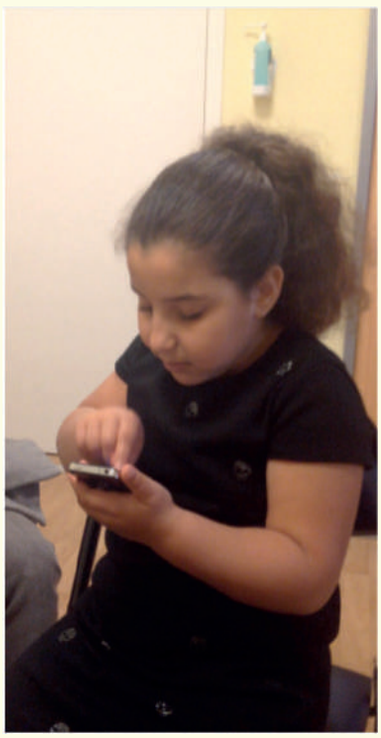

Figure 1: Related attention-deficit disorders.

Figure 2: Open bite at the beginning of the treatment.

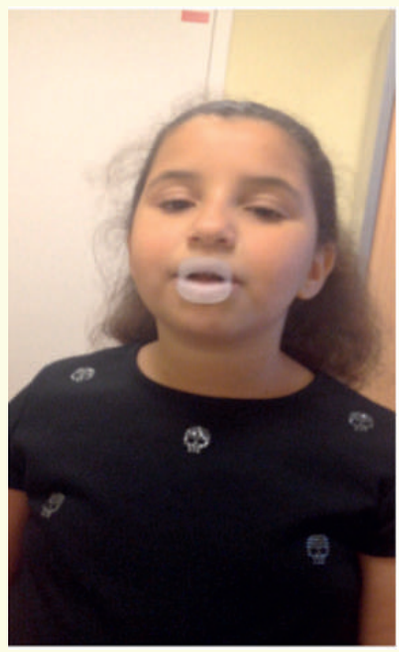

Figure 3: Six month later.

Figure 4 and 5: 15 month later.

## Conclusion

This bottom-up approach can be used successfully in children with sensory-motor disabilities. Froggymouth is the best approach to rehabilitating these children The effectiveness of this approach will, of course, be greater in children with no particular problems,

Citation: Fellus Patrick and Lecendreux Michel. "Swallowing Rehabilitation in a Child with Narcolepsy and Cataplexy". Scientific Archives Of Dental Sciences 2.6 (2019).

starting at age 4; it could even be proposed to adults, more than 30% of whom have atypical swallowing and whose work does not leave them enough time to undertake rehabilitation over several months.

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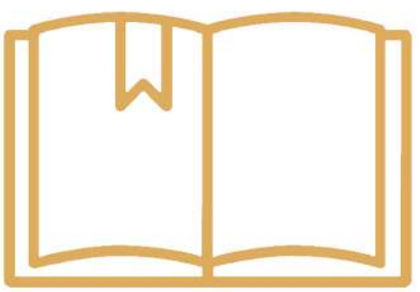


# LECTURES AND BOOKS

# LECTURES

**The Froggymouth concept and its fundamental principles have been presented during lectures at international dental congresses.**
**These lectures are intended for General Practitioners, Orthodontists and Myofunctional Therapists.**

**AAO 2021**
(10 min video)

**2021 dedicated webinar**
(45 min video)

**2021 dedicated webinar**
(45 min video)

**AAMS 2019**
(40 min video)
presentation awarded
with the Nightingale prize

**FDI 2021**

**IPOS 2020**

**WFO 2020**

**IFUNA 2016**

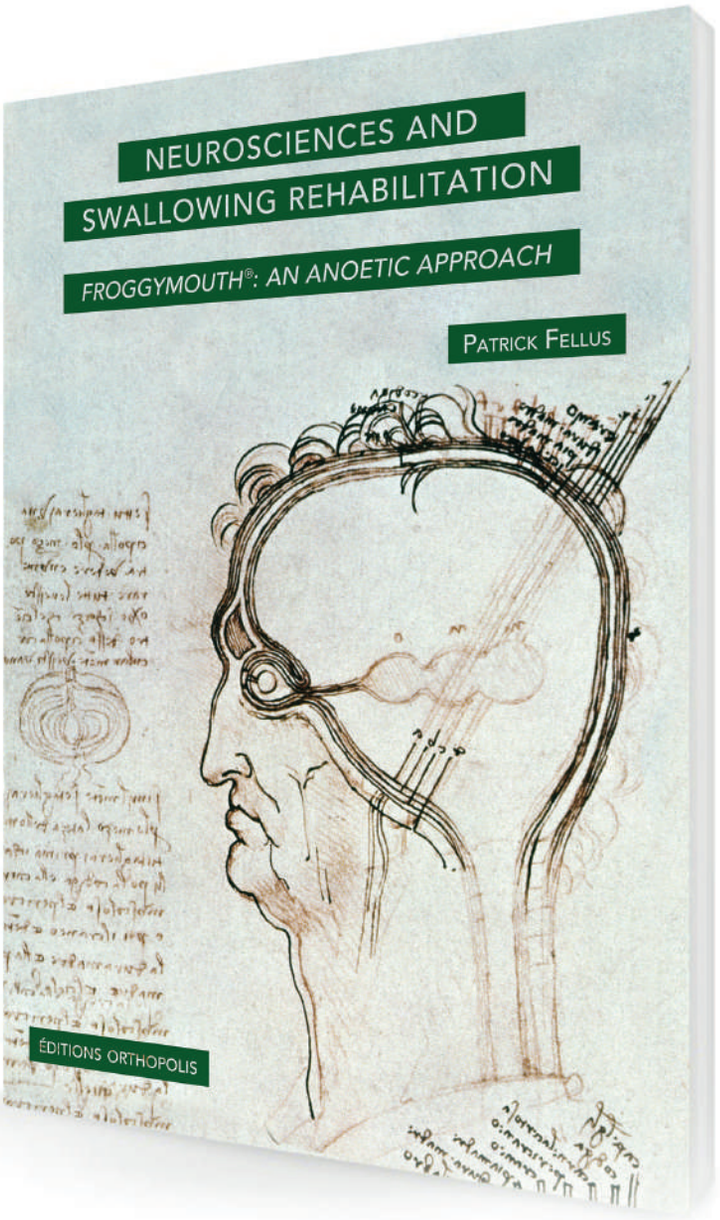
In a 90 minutes Masterclass, Dr Fellus has synthetized his approach toward functional rehabilitation and treatments stability.

I/ Reminders on the development of orofacial praxis since in utero (30 minutes)
II/ The stake of rehabilitation's automation: long-term memory (30 minutes)
III/ Passive rehabilitation with Froggymouth (30 minutes)

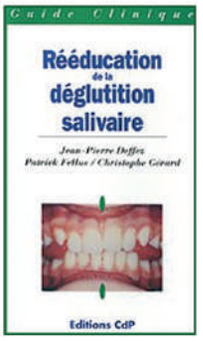
## Watch the FroggyMouth Masterclass


**find it on froggymouth.com**
**or by scanning this QR code**

# DR FELLUS' LATEST BOOK




## FROM THE SAME AUTHOR

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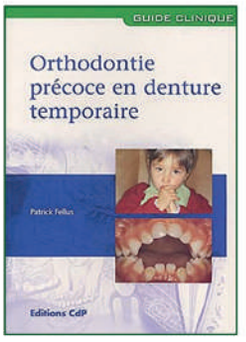


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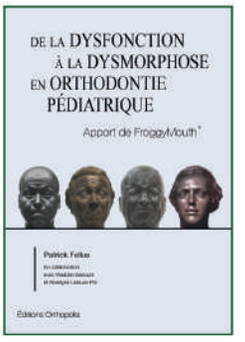


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