Emotional Perception and Production in Facial Palsy: Respiratory, Vocal and Facial Markers.

ResPPF

National Clinical Trial (NCT) Identified Number:
N° ID RCB (ANSM) : **2018-A01043-52**

Version 1.0 du 06/04/2018

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1   Protocol Summary

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TITLE	Emotional perception and production in Facial Palsy : Respiratory, Vocal and Facial markers.
INVESTIGATEUR PRINCIPAL	Pr Peggy Gatignol
Numbers of centers	Monocentric : Groupe Hospitalier Pitié-Salpêtrière
Study Design	*Prospective study ;*
Introduction	Respiratory function, phonation and facial expressivity are related to emotional reaction through neurophysiological process. Specific emotional respiratory, vocal and facial patterns had been described in literature. Respiratory cycles variation is modulated by stimulus arousal. Furthermore, inspiratory-to-expiratory time ratio in abdominal area is modulated by emotional valence. Inextricably linked to respiration, vocal production depends on emotional arousal and valence too. According to embodied cognition, the effector pattern of an emotion initiates the corresponding subjective activation. Facial recognition is influenced by automatic mimicry and facial feedback. To our knowledge, most facial feedback studies included patients with diplegia but few studies dealt with emotional perception in Bell's palsy. Facial paralysis is a common pathology which concerns 20/100 000 inhabitants per year. Sudden and visible trauma, facial palsy affects voluntary and emotional motricity. The aim of the present study is to understand production and perception of emotion in Bell's palsy with respiratory, vocal and facial markers. What impact lack of mimicry have on physiological emotional reaction in Bell's palsy? To this end, prospective monocentric study will be conducted with 60 patients with Bell's Palsy from grade II to grade VI of House & Brackmann's scale. During production and perception of vocal and facial expression, respiratory rate and thoraco-abdominal movements will be analyzed. We hypothesize that severity of facial deficit is negatively correlated with variation of respiratory cycles, lower segmental and suprasegmental changes during vocal expression, and lower facial perception (congruency and arousal).

OBJECTIVES	**Main Outcome** 1) Effects of facial impairment on the respiratory rate. **Secondary Outcome** 2) Effects of facial impairment on pitch variation (Hz) during emotional vocal production. 3) Effects of facial impairment on perception of emotional facial displays.
Endpoints	1) Facial impairment assesed with Sunnybrook Facial Grading Scale. Respiratory rate is measured with chest and abdominal belt. [Time Frame: 1hour] 2) Acoustic measures lead with Praat Analysis software. Variation pitch between first and last segment of the emotional sentence calculated. [Time Frame: 1hour] 3) Emotional facial displays perception measured with a standardized emotional program in terms of congruency. [Time Frame: 1hour]
Inclusion Criteria	• Patients affiliated to the health care system • Patients must have been diagnosed with unilateral peripheral facial palsy stage III to VI, according to House and Brackmann international classification. • To be able to read, understand and sign a consent • To be able to understand French spoken and written
Exclusion Criteria	• Diplegia or facial graft • Visual disorders, non corrected • Respiratory or vocal disorders • Psychiatric history • Facial surgery
Number of participants	60 participants.
Statistical Analysis	Mutlivariate analyses, regression analyses as well as Spearman correlations will be conducted. An ANOVA will be carried out with severity grade, facial paralyis side, sex of the patients.
Study Duration	Participation duration : 3hours Study Duration : 20 month

2   Introduction

2.1   Title

Emotional perception and production in Facial Palsy : Respiratory, Vocal and Facial markers.

2.2   Sponsor

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2.3   Study design

It is a proscpective monocentric study.

2.4   Experimentation site

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2.5   Main Investigator

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3   Scientific Rationale

Peripheral facial palsy : facial palsy is a frequent pathology as far as it concerns 20/100 000 inhabitant a year [1]. deficits can remain in 29% of the cases : Peitersen lists 12% of mild sequellae, 13% of moderate sequellae and 4% of severe sequellae.

Visible and sudden trauma, facial impairment is multidimensional. Indeed, it concerns not only the voluntary facial motricity but also the spontaneous emotional facial motricity through the production of universal primary facial expressions [3]. Besides, the facial paralysis impacts patients' quality of life thus implying psychosocial difficulties. In acute or chronic phase, the main complaint of the patients deal with emotional expressiveness, especially happiness through a large smile. Literature highlights an increase of anxious and depressive symptoms in patients with facial palsy [5]. Inability to express a smile is involved in increased depressive symptoms [6]. Lack of facial feedback would also explain the decreasing feeling of well-being during smile production [7].

Respiratory, vocal and articulatory processing are modified by cognitive, autonomous and somatic change during emotional contagion. According to James-Lange theory [8], updated by embodied cognititon [9], somatic experiences create emotions : to be conscious of physical changes and generated proprioceptive feedback give rise to emotions. On the other hand, six basic emotions could be distinguished in Ekman's paradigms. Each basic emotion implies specific autonomous, expressive and neuronal patterns : anger, disgust, fear, joy, sadness, surprise [10]. Two neurophysiological dimensions characterize emotion : arousal (activation level) and valence (pleasing aspect of a situation) [11].

3.1 Emotions and Breathing

Breathing is modulated by arousal of a stimulus [12]. During pictures displays, an intense activation increases the variability of respiratory cycles [13]. According to Boiten's review [14], increased respiratory rate would appear in high arousal emotions. Change in respiratory rate would result more from arousal effect than valence. Besides, there would be six different respiratory patterns. Inspiratory and expiratory time ratio increase in thoracic level and decrease un abdominal level during highly negative emotion. Opposite pattern is observed for positive emotion [15].

According to Glaus and al., (1983) [16] and Kotses et al. (1987), airflow resistance is correlated to increased facial muscle tension, measured by electromyography, which suggests an influence of facial muscles on the air resistance through a neuronal reflex In chronic phase of facial palsy, it would be relevant to study respiratory capacity and facial hemispasm.

3.2 Emotions and Vocal production

Breathing and vocal production are indissociable ways to convey emotions. In a segmental framework, highly activation such as fear, anger or joy increases intensity and pitch whereas segment length decreases. On the contrary, sadness outputs decreased pitch and intensity and lengthening segment duration [18].

3.3 Emotions and facial expressivity

Emotional facial display perception implies an automatic neuronal activation in premotor cortex of the observers, the same as the one they would have conceived, if they were their own actors of the emotional facial expression observed [19]. Furthermore, emotion is processing by inconscious facial mimicry, which allow the observer to understand mental

state of others. Sensorimotor simulation is an other input of emotional percept construction [20].

Facial palsy affects non verbal communication by impairing emotional facial displays contagion [21]. Facial palsy implies cortical sensorimotor changes because of acute peripheral deafferentation [22]. To our knowledge, studies aboud facial mimicry and facial feedback in patients with facial palsy deal with diplegia [23-24]. Few studies explore emotional perception in unilateral peripheral facial palsy.

Multidimensional assessment of physiological activity is required to describe somatic states of basic emotion. We would like to study emotion encoding and decoding in patients with facial palsy by focusing on respiratory and vocal markers as well as facial expressivity and perception.

4   Objectives

4.1.1   Main Outcome

Effects of facial impairment on the respiratory rate.

4.1.2   Secondary Outcomes

- Effects of facial impairment on pitch variation (Hz) during emotional vocal production.
- Effects of facial impairment on perception of emotional facial displays.

5   Study Design

5.1   Study Duration

Participation duration : 3hours

Study duration : 20 months

5.2   Définition de la population étudiée

Recruitement process will be carried out in the ENT department of Pitié-Salpetriere Hospital.

5.2.1   Critères d'inclusion
- Patients affiliated to the health care system
- Patients must have been diagnosed with unilateral peripheral facial palsy stage III to VI, according to House and Brackmann international classification.
- To be able to read, understand and sign a consent
- To be able to understand French spoken and written

5.2.2 Critères de non-inclusion

- Diplegia or facial graft
- Visual disorders, non corrected
- Respiratory or vocal disorders
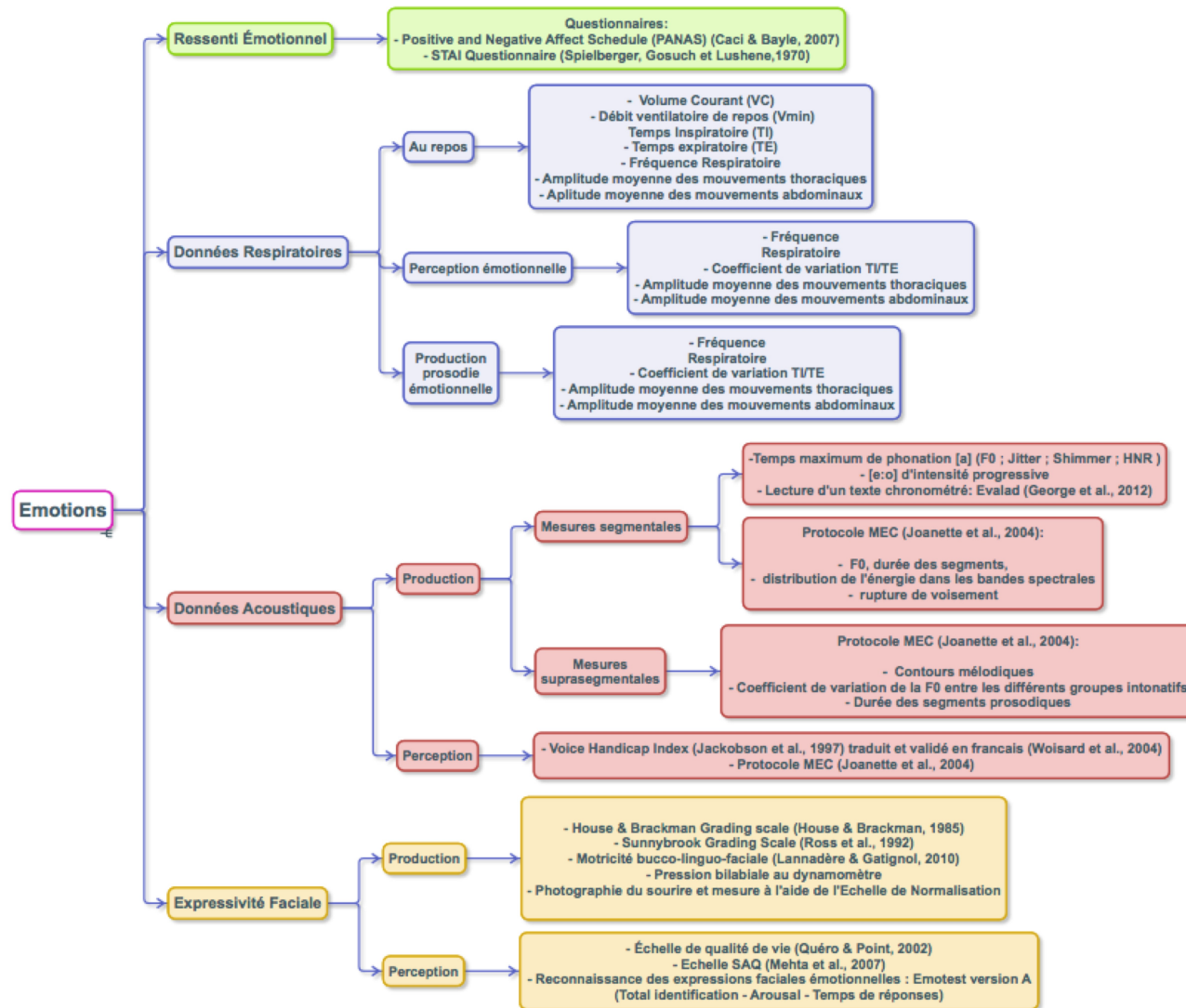- Psychiatric history
- Facial surgery

5.3 Methods

5.3.1 Schedule of activities

The schedule of activities below shows the assesments that will be accomplished at each study visit. (X) means assessment usually conducted in facial palsy rehabilitation and (R) means assessment specific for the research.

	Facial Rehabilitation	Research
Information and consent		R
Inclusion and Exclusion Criteria verification		R
History of health	X	
Objective assessment		
Grading House & Brackman	X	
MBLF Informatisée	X	
Bilabial pression (dynamomètre)	X	
Photos and videos recording	X	
Smile Scale	X	
Subjective questionnaires		
STAI questionnaire		R
PANAS scale		R
Voice Handicap Index		R
Synkinesis Assessment Questionnaire	X	
Respiratory assesments		
Chest and abdominal belt		R
Spirometer		R
Vocal assesment		
Acoustic measures		R
EVALAD reading		R
MEC tests		R

5.3.2 Collecting Data

Figure 1 : Collecting Data

5.3.3 Endpoints

5.3.3.1 Main outcome

1) Facial impairment assesed with Sunnybrook Facial Grading Scale. Respiratory rate is measured with chest and abdominal belt.

[Time Frame: 1hour]

5.3.3.2 Secondary outcomes

2) Acoustic measures lead with Praat Analysis software. Variation pitch between first and last segment of the emotional sentence calculated.

[Time Frame: 1hour]

3) Emotional facial displays perception measured with a standardized emotional program in terms of congruency.

[Time Frame: 1hour]

5.3.4 Statistical consideration

5.3.4.1 Sample size determination

There is lack of precise data in the literature on this theme, it is impossible to make a calculation of sample size. With the aim of an exploratory study, we would like to study at least 60 patients in order to be able to conduct multivariated analysis.

5.3.4.2 Analysis of endpoints

Respiratory data are collected with the software Labchart whereas acoustic analyses are conducted with Praat Software (Boersma & Weenik, 1996). Satistical analyses will be made with Excel Spreadsheet and JMP.10 software.

In order to analyse endpoints, multivariated analalyses, regression analyses will be conducted. Spearman and Pearson correlation will be carried out in order to determine potential emotional markers. ANOVA analyses would be made to show any differences among patients according to severity of their palsy, facial palsy side, sex or questionnaire score.

5.4 Ethical consideration

5.4.1 Protocole and Participation consent

Consent forms describing in detail the study procedures and risks are given to the participant and written documentation of informed consent is required prior to starting study. This consent associated with the protocol description was already approved by ethical committee CPP TOURS Region Centre Ouest 1

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5.4.2 Risks for patients

Evaluations (questionnaires, computerized tests) and collecting data (acoustic recordings, respiratory recordings) imply no significant risk, and have no residual persistent effects.Risk of participation

5.4.3 Data collecting and confidentiality

The people having a direct access according to the current legal and statutory measures, in particular the articles L.1121-3 and R.5121-13 of the public health code (for example, the investigators, the people in charge of the quality control, the assistants of clinical research, and every collaborators in the study) take all the necessary precautions to assure the confidentiality of the information relative to the trials, to the people who lend themselves to it in particular as regards their identity as well as in the obtained results. The data collected by these people during the quality controls or audits are then made anonymous.

All the documents of the study will be kept for 15 years.

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