Psychophysiological facial thermal assessment of the relaxation in a patient with osteoarthrosis

David Alberto Rodríguez Medina[1], Irving Armando Cruz Albarrán[2], Benjamín Domínguez Trejo[3], Luis Morales Hernández[4], Gerardo Leija Alva[5], Patricia Cortés Esteban[6]

[1] Postgraduate in Health Psychology, Faculty of Psychology, UNAM, Mexico City, Mexico
[2] Postgraduate in Mechatronics, Faculty of Engineering, UAQ, San Juan del Río, Mexico
[3] Division of Postgraduate Studies, Faculty of Psychology, UNAM, Mexico City, Mexico
[4] Division of Postgraduate Studies, Faculty of Engineering, UAQ, San Juan del Río, Mexico
[5] Interdisciplinary Center of Health Sciences, IPN - Santo Tomás, Mexico City, Mexico
[6] National Medical Center 20 de Noviembre, ISSSTE, Mexico City, Mexico

e-mail: psic.d.rodriguez@comunidad.unam.mx

Resumen — Se presenta la evaluación biopsicosocial de un paciente masculino de 61 años de edad, con diagnóstico de osteartrosis durante 8 años. Se recolectó una muestra salival de la respuesta inflamatoria de interleucina 6 (IL-6), su variabilidad de la frecuencia cardíaca y medidas psicológicas asociadas al dolor. Se utilizó un diseño A-B-A para valorar su respuesta térmica del entrenamiento en relajación después de una prueba de estrés. Se evaluaron los músculos faciales corrugador, zigomático y la punta de la nariz. Los resultados indican una alta concentración de IL-6, un nivel alto de dolor e interferencia conductual, cognitiva; sin embargo, debido al manejo psicológico de entrenamiento en relajación también presenta una alta variabilidad de la frecuencia cardíaca, alivio moderado del dolor con adherencia terapéutica. Durante la tarea emocional aumento la temperatura de los músculos corrugador y zigomático, mientras que a temperatura de la nariz decremento. Posteriormente, durante la fase de relajación el paciente revirtió los efectos: aumento la temperatura de la nariz a la par de la disminución de térmica de los músculos corrugador y zigomático. Falta incorporar estrategias cognitivas y psicosociales para el manejo integral del dolor.

Palabras clave: termografia; osteoartrosis; perfil biopsicossocial; relajación

Abstract — The biopsychosocial evaluation of a 61-year-old male patient with a diagnosis of osteoarthrosis for 8 years is presented. A salivary sample of the inflammatory response of interleukin 6 (IL-6), its heart rate variability, and psychological measures associated with pain were collected. An A-B-A design was used to assess their thermal response from relaxation training after a stress test. The corrugator, zygomatic and nose tip muscles were evaluated. The results indicate a high concentration of IL-6, a high level of pain with a behavioral and cognitive interference; however, because of the psychological management of relaxation training, there is also a high variability of heart rate, moderate relief of pain with therapeutic adherence. During the emotional task increased temperature of the corrugator and zygomatic muscles, while temperature of the nose decreased. Subsequently, during the relaxation phase the patient reversed the effects: increase the temperature of the nose along with the thermal decrease of the corrugator and zygomatic muscles. Lack of incorporating cognitive and psychosocial strategies for the integral management of pain.

Keywords: thermography; osteoarthrosis; biopsychosocial profile; relaxation

INTRODUCTION

Treatments for the management of pain in patients with osteoarthritis should be directed at increasing daily functional capacity[1].

To assess pain management, health psychologists have evaluated the autonomic activity associated with pain, such as surface electromyography (EMG)[2] and Heart Rate Variability (HRV)[3]. The aims of psychophysiological techniques are to reduce muscle tension levels and to increase the high coherence of HRV. However, the drawbacks of this type of registration in a public health system have to do with time re-constrained clinical care. The objective of this study is to present the biopsychosocial evaluation, including the thermal infrared facial image in a patient with osteoarthrosis during a state of psychological stress and its autonomic self-management after being trained in relaxation in the service of pain psychology.

METHOD

We applied the doctoral research protocol of one of the authors[4] which consists of a biopsychosocial profile on the affective aspects of chronic pain, including psychological measures associated with pain and a salivary sample of IL-6 prior to the thermal recording. We requested the voluntary participation of a 61-year-old male patient (CB), 8 years old, after diagnosis of chronic pain due to osteoarthrosis of the hip and lumbar region. The patient was cured under fasting conditions (8h) in a room at an ambient temperature of 20°C. Upon arrival, a salivary sample of IL-6 was collected. Then the psychological scales were administered. All the psychological measures are validated for Mexican population.

Subsequently, we evaluated facial temperature in the Observable Interest Regions (RIO) of the corrugator and zygomatic major muscles (in the same areas where the EMG sensors are placed). Additionally, the tip of the nose, which has been an emergent zone to assess sympathetic activity[5, 6]. A N=1 design was used, which consists of: acclimatization (15 min); Baseline (sitting at rest with his eyes open for 2 min); Psychological stressor (consists of a reaction time task of the valence of emotional facial discrimination, positive, negative or neutral face, known as Emotional Facilitation Paradigm[7] (duration 2 min); and finally, a recovery phase with his abilities learned of Relaxation by Diaphragmatic Respiration (2 min) (Figure 1). The thermal recording procedure was established with a constant ambient temperature of 20°C.

The capture of images was with the thermal camera FLIR A320, at a distance of 1m from the tip of the nose. The images were captured every 20 seconds for each condition.

RESULTS

Table 1 presents the biological and psychological characteristics of pain in the CB patient.

Table 1. Biopsychosocial Profile of Pain in Patient

Dimensions of pain	Results
Biological	
- IL – 6 saliva sample	8.6 µg/ml
- HVR: High	80%
Low	8%
Very low	12%
Behavioral	
- Number of Drugs for pain	4
- Intensity of pain (NAS)	8/10
- Relief	6/10
- Behavioral interference	8/10
- Interference in your mood	9/10
- Social interference	8/10
Qualities	**Pts.**
- Continuous	7
- Intermittent	9
- Neuropathic	4.5
- Affective	5
Psychosocial	**Pts.**
- Anxiety	9 (moderate)
- Depression	11 (moderate)
- External anger control	15 (high)
- Internal anger management	12 (moderate)
- Alexithymia	22 (high)
- Cognitive reevaluation	32 (high)
- Emotional suppression	25 (high)
- Social isolation	59(high)
- Social support	53 (moderate)
Cognitive	**Pts.**
- Loss or Damage	10 (high)
- Threat	7 (moderate)
- Challenge	2 (low)

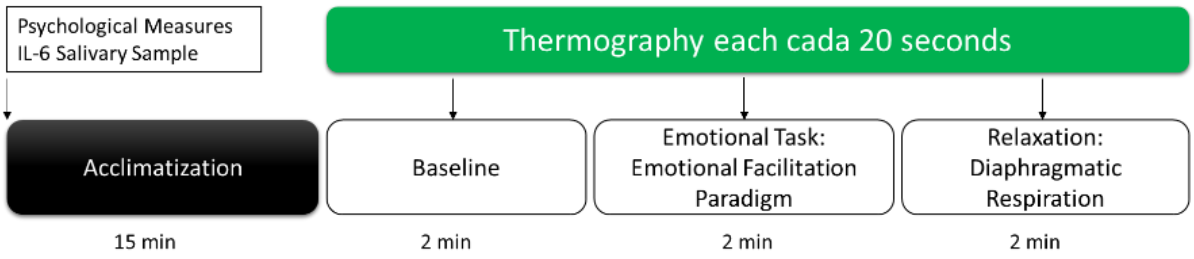

Figure 1 Design study

The figure 2 shows the RIOs selected for thermal recording on the corrugator, zygomatic and nose tip facial muscles.

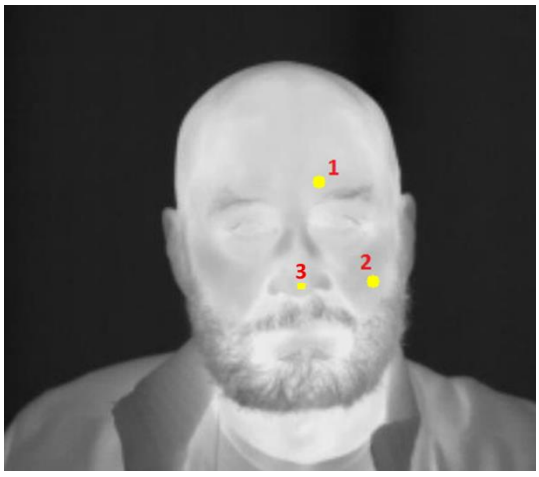

Figure 2 Areas of Interest Observable. 1 = Corrugator, 2 = zygomatic, 3 = Tip of the Nose.

Figures 3, 4 and 5 shows the autonomic activity of each facial RIO according to the thermal evaluation protocol.

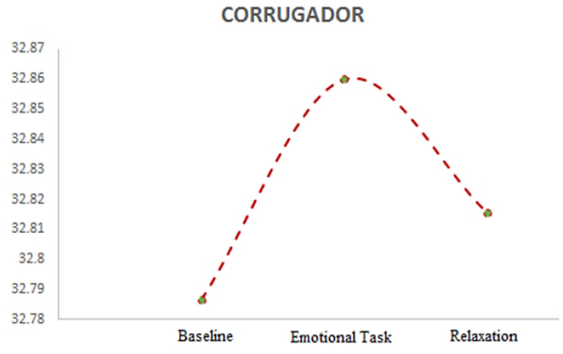

Figure 3 Temperature changes in muscle corrugator

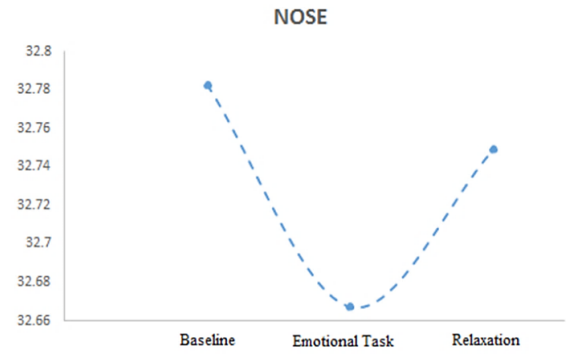

Figure 4 Changes in temperature in the nose.

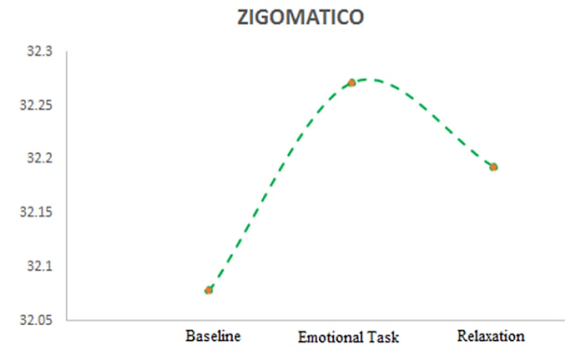

Figure 5 Temperature changes in muscle zygomatic.

The results showed that changes in the temperature of the corrugator and zygomatic muscles are symmetrical, although of different intensity (corrugator > zygomatic).

In contrast, an inverse behavior of the temperature changes in the tip of the nose with respect to the corrugator and zygomatic muscles is observed. That is, as the temperature of the corrugator increases in the emotional task, the temperature of the nose decreases, and vice versa during the relaxation phase.

DISCUSSION

The biopsychosocial assessment of pain in the CB patient is consistent: he presents high levels of pain, high level of inflammatory activity, behavioral interference, cognitive and affective alterations. However, relaxation training and therapeutic drug adherence allow the patient to achieve moderate relief. This means that the therapeutic goals provided by the health personnel have been partially fulfilled and

a cognitive and psychosocial treatment is still pending for the management of pain in this patient.

The thermal results found are consistent with the literature[5] on the increase of somatic and autonomic activity during an episode of stress in facials RIO. The effect of relaxation training on the patient, previously evaluated with high heart rate variability was also found with the thermal image, increasing the temperature at the tip of the nose and decreasing it in the defensive facial muscles. This patient stands out among the group of patients with chronic pain treated in the hospital for their adaptive management of pain. The purpose of presenting this case was to show that even patients with a high level of pain and psychological difficulties, it is possible that the patient has autonomic control and a moderate relief, both for their self-report and for the level of salivary IL-6, as well moderate.

CONCLUSION

The data indicate the need for comprehensive management of chronic pain (medical and psychological). Continuous weighting of the patient's therapeutic goals is required.

The thermal imaging results show that the patient can modify his autonomic activity at will. The psychophysiological activity associated with the striated musculature can also be studied by infrared thermal imaging without the need to attach an external sensor to the patient, which allows optimizing the time of clinical attention from the arrival of the patient in the hospital waiting room until its evaluation and Psychophysiological training. The inflammatory activity of IL-6 is associated with changes in mood[8]. Our clinical research evidenced that, depending on the level of IL-6, the efficacy of psychological relaxation treatment for pain management can be determined.

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