

PSYCHOPHYSIOLOGICAL USE OF THE LOW COST INFRARED THERMAL CAMERA AS A CLINICAL TOOL FOR THE EVALUATION OF AUTONOMIC AFFECTIVE FUNCTIONING

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Resumo: Câmeras térmicas infravermelhas com baixo custo e resolução geralmente não são usadas em estudos clínicos de comportamento humano. Apresentamos a proposta do uso da imagem térmica infravermelha (ITF) como uma ferramenta de avaliação psicofisiológica para coletar e analisar dados sobre o funcionamento afetivo autônomo em pacientes com doenças crônicas não transmissíveis. Durante um período de três anos, propõe-se analisar sua utilidade clínica no campo da Psicologia da Saúde para a identificação de pacientes com necessidades clínicas especializadas.

Palavras-chave: imagem térmica infravermelha de baixo custo; respiração diafragmática; dor

Abstract: Infrared thermal cameras with low cost and resolution have not usually been used in clinical studies of human behavior. We present the proposal of the use of the infrared thermal image (iTF) as a psychophysiological evaluation tool to collect and analyze data on autonomic affective functioning in patients with chronic noncommunicable diseases. During a period of three years, it is proposed to analyze its clinical utility in the field of Health Psychology for the identification of patients with specialized clinical care needs.

Keywords: low cost infrared thermal image; diaphragmatic breathing; pain

Recently experts In Thermoscience published an article about medical potential uses of the low-resolution thermal image (80X60 pixels) for the clinical assessment of Regions of interest (ROI), when less facial¹. Various psychological investigations have also used the facial infrared thermal image for the psychophysiological clinical evaluation of various positive and negative affective states^{2,3}.

However, it is not known if the infrared thermal image of low resolution could be a clinical tool of office for any clinical psychologist. Psychological procedures that are aimed at behavior modification, emotional-social regulation, or even cognitive rehabilitation could benefit from this tool to increase the level of evidence of psychological therapy, even when their primary objective is not to evaluate the psychophysiological effect of his intervention, if a psychological therapy is really useful, the

autonomic activity underlying the various processes and psychological states will be modified. For example, from the psychological point of view in health, the clinical management of pain⁴; the cognitive processing of problem solving^{5,6}, or the arousal level of the valence of a thought⁷; social interactions⁸, among others.

The conventional biofeedback equipment for psychophysiological recording has been useful in the treatment of various clinical and health disorders. However, these devices require contact with the patient's skin restricting the free movement of a patient during a psychological session, or they can be uncomfortable for the patient with hyperalgesia, such as fibromyalgia, skin burns, or that patient embedded in bed. The infrared thermal image represents an alternative for the psychophysiological evaluation of affective self-economic functioning (the capacity for autonomous regulation) that goes hand in hand with the capacity for emotional regulation.

Infrared thermal cameras on the market have a large calibration backup of the equipment they trade; however, there are few clinical studies that are useful for monitoring a body or facial ROI during a clinical procedure.

With the financial support of a university research project, during the period 2019-2021 we have proposed to develop the clinical and experimental validation of infrared thermal imaging equipment for the affective assessment of patients with chronic diseases with the objective to identify patients who require specialized psycho-

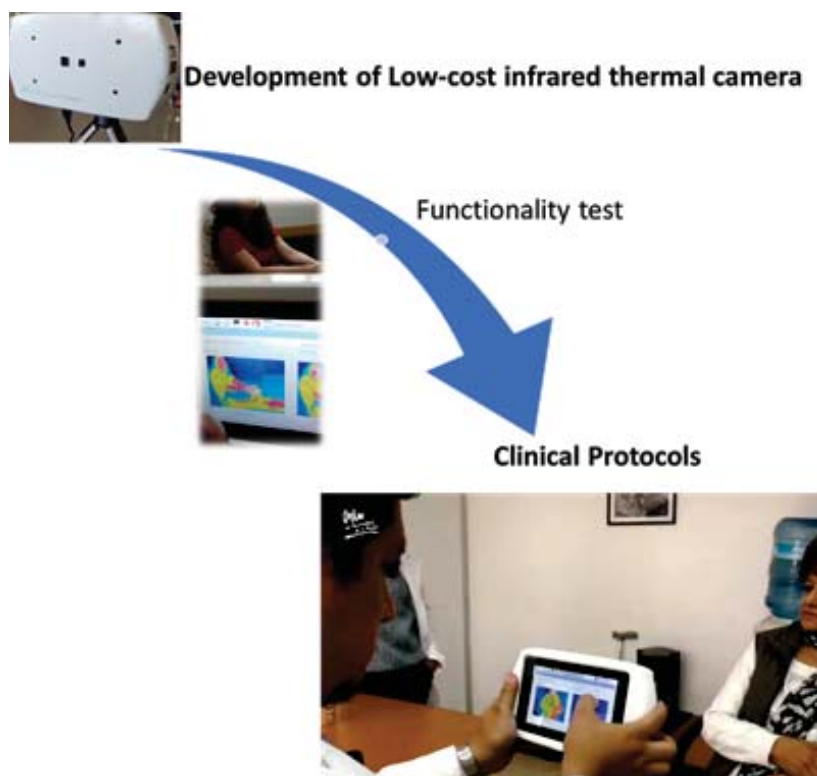


Figure 1. Psychophysiological studies to evaluate the affective autonomic functioning

logical treatment and distinguish them from those patients who can continue with their usual treatment (**Figure 1**).

Based on our own protocols and some pre-established ones on stress-relaxation assessment^{7,9}, physical and social pain^{10,11}, and the induction of emotions⁴, we have already explored the capacity of thermal measurement with a low-cost equipment. **Figure 2** shows the psychophysiological effect of relaxation by diaphragmatic breathing of a 46-year-old female patient with a diagnosis of fibromyalgia before and after the psychological intervention.

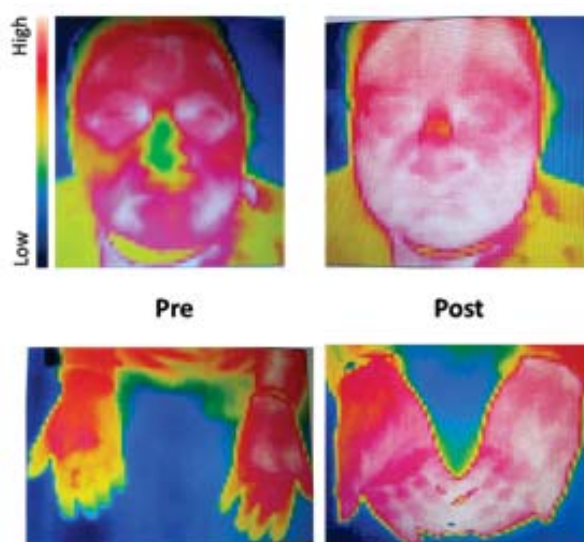


Figure 2. Psychophysiological intervention: diaphragmatic breathing in a patient with a diagnosis of fibromyalgia

Through a series of studies with qualitative infrared thermal image (changes of temperature in the color palette) and quantitative it is suggested to provide evidence and clinical significance to propose the infrared thermal camera of low cost as an office tool in the office psychological.

What have we learned from the iTF?

- Identify patients or participants with differential clinical needs⁴.
- Evaluate autonomic activity in a non-invasive way in real time of different affective states, including pain.
- Ponder the affective resources with which a patient with pain counts.

Challenges: what is needed to improve?

Validation with high resolution equipment.

- Establish clinically and quantitatively useful measurement distance ranges.
- Obtain measurements from different clinical populations in community centers, clinics and hospitals.
- Develop guides or manuals of different psychophysiological protocols to obtain valid data.

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