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A METHODOLOGY BASED ON INFRARED THERMOGRAPHY FOR THE STUDY OF STRESS IN HANDS OF YOUNG PEOPLE DURING THE TRIER SOCIAL STRESS TEST

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ABSTRACT

This work presents a non-invasive semiautomatic methodology through infrared thermography for the study of human stress in hands of young people (fingertips and palms) once the Trier Social Stress Test is completed. The regions of interest were the fingertips (these are influenced by the sympathetic nervous system) and the palms. The analysis of these parts of the hands was done through the thermal matrix, that is, at the temperature level. Once the analysis was made, significant differences were found between the pre-post test on the tips of the fingers, but not on the palms. A comparison between hands and a comparison between genders were made, however, no significant differences were found, which shows the thermal asymmetry of the body. With the differences found in the fingertips, a thermal index of emotions was proposed. For a better visualisation of the index, a colour palette for the ROI's was proposed; one for men and another for women, this was due to the fact that a higher basal temperature was found in men compared to women. The study was carried out on 30 men and 30 women.

Keywords: infrared thermography, stress, region of interest, colour pallet, thermal index of stress

1. Introduction

Stress is a fundamental part of the daily life of human beings since it allows the body to prepare to deal with possible situations of threat [1]. However, chronic stress is harmful to health [2], because when experiencing a state of stress, different biological consequences take place, such as: tension, muscle pain, headache, nervous tics, insomnia, diarrhoea, colitis, increased heart rate, sweating in hands, feet and forehead, among others [2,3]. Thus, the study of stress in young people (ages 18-29) is of vital importance, due to they have a high vulnerability to suffer from stressful situation later in life [4]. As a consequence, a variety of methods have emerged to induce and subsequently study their behaviour, such as: Trier Social Stress Test (TSST) [5], Cold Pressor Test [6], Mannheim Multicomponent Stress Test [7], CO2 challenge [8] and The Cortisol Awakening response [9]. Of these, the TSST has certain advantages, such as: is a highly standardized protocol, allows comparisons between different states (when people are thinking, speaking and developing a mathematical task) and is flexible to be adapted to the needs of the researcher [10].

The study of stress through the TSST is based on the execution of the protocol (speech preparation, speech presentation and development of a mathematical task), sampling and subsequent analysis of them [5]. These samples can be acquired from different biomarkers and in different ways. For example, some biomarkers have been studied through an invasive way[11], such as: the effect of stress on cortisol [12,13], heart rate [14,15], Salivary Alpha-Amylase (sAA) [16] and Salivary Secretory Immunoglobulin A (slgA)

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