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Thermal Imaging of Facial Muscle Activation and Temperature Patterns During Emotional Contagion in Highly Emotionally Intelligent Individuals

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Abstract

Emotional intelligence (EI) influences how individuals perceive, regulate, and respond to emotions in social interactions [1]. Emotional contagion, the unconscious mirroring of others' emotions [2], is moderated by EI [3]. Individuals with higher EI are better at regulating their own emotions and interpreting others' emotions, which helps them maintain balance in social interactions and reduce susceptibility to negative emotional contagion [3]. While earlier studies have explored behavioral aspects of emotional contagion and EI [3,4], their physiological correlates—specifically facial thermal responses—remain underexplored. This study uses thermal imaging to examine how EI affects emotional contagion and related facial thermal responses.

Thirty-five healthy participants were initially recruited, eight were excluded due to inconsistencies, and twenty-seven participants with high EI were shortlisted for future analysis .EI was measured using the Brief Emotional Intelligence Scale [5], and emotional contagion was assessed using the Emotional Contagion Scale [6]. Participants viewed video stimuli eliciting happiness and fear, while thermal imaging recorded facial blood flow across fifteen predefined facial regions of interest (ROIs) linked to emotion-related muscle activity [7]. A one-way between-group ANOVA [8], followed by Tukey's HSD post hoc test, revealed that during happiness, Marginal orbicularis oris, left and right buccinator showed significantly higher temperature changes, while fear elicited more change in Depressor Supercilii, Corrugator Supercilii, Buccinator, and Platysma ($p < 0.05$). Frontalis region shows high thermal response in both emotion. Although thermal changes were observed across facial muscle-related ROIs, the differences between happy and fear ROIs were not statistically significant. Therefore, the hypothesis that distinct emotional states would produce significantly different thermal patterns

was not supported. This work offers a non-invasive framework for understanding emotional processing and supports applications in emotion-aware systems and mental health.

Keywords: Emotional Expression; Emotion Regulation;Facial Muscles; Noninvasive Measurement; Thermal Response