

Skin Temperature Biofeedback as an Adjunct Intervention in Psychotherapy

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Abstract

Anxiety disorders are globally prevalent and disabling mental illnesses characterized by persistent autonomic nervous system dysregulation. This dysfunction contributes to not only core emotional anxiety symptoms but also measurable physiological changes, including peripheral vasomotor anomalies and impaired autonomic modulation. Such physiological aberrations sustain anxious states and drive behavioral avoidance, serving as a key physiological foundation for persistent anxiety symptoms. Systematic desensitization, a mainstream exposure-based technique in cognitive behavioral therapy, operates based on reciprocal inhibition theory, with its efficacy largely dependent on patients' stable relaxation states. However, most anxious patients present a dissociation between subjective relaxation experience and objective autonomic responses. This discrepancy hinders accurate baseline relaxation assessment, undermining the precision and reproducibility of traditional systematic desensitization interventions. Skin temperature biofeedback can convert real-time peripheral temperature fluctuations into perceivable, quantifiable signals, enabling objective evaluation of autonomic tone and relaxation levels. This study systematically reviews the physiological mechanisms and empirical evidence of thermoregulatory abnormalities in anxiety disorders, demonstrating the validity of skin temperature as a reliable anxiety-related physiological biomarker. It also summarizes the technical principles, operational procedures and clinical progress of skin temperature biofeedback. Targeting the limitations of subjective assessment in conventional desensitization, this paper constructs an integrated intervention model combining skin temperature biofeedback pre-training with graded systematic desensitization, and clarifies its implementation procedures and underlying mechanisms. Based on interoception theories, it further explains how biofeedback narrows the gap between subjective bodily awareness and objective physiological states. This study proposes that skin temperature biofeedback acts as a preparatory strategy rather than a replacement for desensitization, enhancing patients' interoceptive ability, relaxation level and autonomic regulation to optimize subsequent exposure therapy outcomes. This integrated framework provides a novel theoretical reference for physiological-oriented anxiety interventions and offers testable hypotheses for future clinical trials.

Keywords

Anxiety Disorders, Biofeedback, Skin Temperature, Cognitive Behavioral Therapy, Psychotherapy