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Nasir, S.T., Zulkifli, K.Z., Ghazali, A.S., Jasni, F.

Physiology vs. Perception Paradox: Exploring GSR-Based and Questionnaire Stress Responses
(2024) *Proceedings of the 9th International Conference on Mechatronics Engineering, ICOM 2024*, pp. 310-315.

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Abstract
Stress, a prevalent mental health concern, is a complex phenomenon to quantify. This study explores the impact of stress induction method variations on Galvanic Skin Response (GSR), an electrophysiological measure, in differentiating relaxation and stress states. We employed the Stroop Color Word Test, Digit Span Test, and Mental Arithmetic Test as established stress induction methods, also known as stressors. To explore stress level variations, modified versions of the stressors, incorporating unpleasant visuals and loud audio were also developed. A mixed-methods design with twelve participants utilized GSR alongside questionnaires (subjective measures): the State-Trait Anxiety Inventory and the Psychological Reactance Test to assess subjective stress. Our findings revealed significant differences between relaxation and stressful conditions, confirming the validity of GSR for stress detection using the ANOVA test, $F(6, 60) = 2.563$, $p < 0.05$. Interestingly, a significant discrepancy was revealed between the physiological stress response (measured by GSR) and participants' reported stress levels. The GSR data indicated the highest stress response for the Digit Span Test with the mean of 0.415 (for original) and the mean of 0.411 (for modified), although participants reported finding the modified Mental Arithmetic Test to be more stressful via questionnaire (mean = 2.4417). This highlights the potential limitations of relying solely on subj ective measures. Future research will involve more participants and explore integrating machine learning for a more robust system. This could lead to a comprehensive stress assessment tool with personalized interventions. © 2024 IEEE.

Author Keywords
Galvanic Skin Response (GSR); Mental Stress Analysis; Stressors

Index Keywords
Electrotherapeutics, Physiological models, Subjective testing; Digit spans, Galvanic skin response, Induction method, Mental stress, Mental stress analyze, Stress induction, Stresses analysis, Stresses response, Stressor; Stress analysis

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