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Predicting Compensable versus Uncompensable Heat Stress from Physiological Strain Index

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The Physiological Strain Index (PSI) increases in response to the heat stress as well as other physiological indicators like hydration. While PSI is strongly correlated with physiological state, it is worthwhile to examine how well it might predict excessive strain from independent criteria. **PURPOSE:** To determine if PSI can distinguish between compensable and uncompensable heat stress. Because the border between compensable and uncompensable heat stress is narrow, if PSI can distinguish between them, then there may be good utility for PSI as a real-time alert. **METHODS:** A convenience set of data was used. The study trials were designed to find the transition point between compensable and uncompensable heat stress as it relates to environment, clothing and work demands. The individual trials began with a low level of heat stress that allowed a physiological steady-state to be established, and then the environmental contribution was increased in small steps every five minutes. The upper limit of compensable heat stress was identified as the critical level of heat stress, and the physiological state (rectal and skin temperatures and heart rate) were noted. The physiological states at 15 minutes prior to and after the critical level were also noted. The pre-critical and critical levels were compensable heat stress and the post-critical level was uncompensated heat stress. The data set included 1461 observations over gender, 10 clothing ensembles, and three levels of metabolic rate. Logistical regression was used to predict the level of heat stress from the PSI along with potential effect modi. ers of gender, clothing, and metabolic demands. **RESULTS:** PSI was a significant predictor. The predictive ability was increased by the following separately and in combination: skin temperature, gender and level of metabolic rate. Importantly, ensemble played no significant role. **CONCLUSION:** PSI can estimate the probability that someone is in a compensable versus uncompensable heat stress. A similar analysis can be used to distinguish between independently assessed acceptable and unacceptable strain. Supported by CDC/NIOSH R01 OH03983.