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PROJECT SUMMARY: Biometric Feedback and Stress Detection

At one point or another, everyone experiences some form of stress. Routine stress, the most common form, is a product of job-related pressures, family, and a variety of other daily responsibilities. Because the source of routine stress is relatively constant, it is substantially harder to notice at first than stress brought on by a traumatic experience or sudden negative change in one's life. A quicker pulse, rapid breathing, muscle tension, and increased perspiration are all examples of physical manifestations of stress in the human body. In short bursts, these physical reactions often help people deal with stress properly. However, experiencing these symptoms over extensive periods of time can have a harmful impact by suppressing other important bodily functions. As a result, prolonged stress has the potential to not only weaken one's immune system but also has been shown to lead to serious health problems such as heart disease, high blood pressure, diabetes, depression, and many others.[1]

This research proposal argues that a by using a variety of biometric sensors and machine learning classification, suggestions can be made to help a given individual better deal with routine stress inducing activities or even avoid them all-together – reducing the likelihood of chronic stress and its damaging impact on the individual's emotional and physical well-being. The proposed research involves actively monitoring a user's heart activity, perspiration, and muscle tension using an electrocardiography sensor, an electrodermal activity sensor, and an electromyography sensor, respectively, and interpreting the data through machine learning classification. Based on the feedback from the sensors, the system will recognize if the user is "relaxed" or "stressed" and will make suggestions to reduce stress in the event it is detected. The primary question the research will address is: *are there simple activities that an individual can perform, such as going on a run, listening to a favorite song, or playing a game, that will greatly reduce said individual's overall level of stress if performed at the appropriate time?*

Intellectual Merit: In order to maximally reduce the impact of the source of an individual's routine stress, all contributing factors must first be recognized and understood. The proposed research makes two contributions to this effort: (1) improving the amount of time taken to identify a stressful situation by providing nearly instantaneous feedback, (2) suggesting ways to deal with similar, stressful situations in the future by suggesting the given individual take actions the system has classified as "relaxing." The combination of these two contributions may ultimately lead to a deeper understanding of general causes of stress and better ways to treat it.

Broader Impact: The proposed research would allow mental-health professionals make more accurate suggestions to their patients on how to deal with stress. It would also benefit all users of the system by allowing them to better understand what causes them stress and know how they can avoid it – leading to a generally healthier and happier lifestyle.

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[1] http://www.nimh.nih.gov/health/publications/stress/index.shtml