Biometric devices help pinpoint factory workers' emotions and productivity

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A time series of subjects' emotional status. Green indicates happiness, red indicates anger, and yellow indicates relaxation. The blue bar below shows the amount of time series conversation of the subject. The horizontal axis represents time series, and the vertical axis represents emotion and conversation volume in that time zone. The gray portions indicate neutral emotion or time periods where measurement could not be performed well due to poor contact with the device. Credit: Hiroshima University

Happiness, as measured by a wearable biometric device, was closely related to productivity among a group of factory workers in Laos, reveals a recent study.

The team of researchers from the School of Economics at Hiroshima University conducted a study to examine relationships between toy painters' productivity and on-the-job emotional states.

While employee productivity has already been linked to job conditions, mental health, and other demographic factors, this study adds to a deeper understanding of how emotional states affect productivity.

Professor Yoshihiko Kadoya, the lead researcher on the paper, said the findings have implications for both operational and human resources strategies.

"Organizations need to consider employees' emotionality when producing workflow designs that could help ensure a pleasant working environment," he said.

In the study, 15 workers answered a questionnaire and wore a device on their wrist with built-in sensors to detect movement, pulse waves, environmental ultraviolet light, body temperature, and sound through which it continuously recorded physical activity, beat-to-beat pulse intervals, skin temperature, and sleep. The device, Silmee W20, is produced by the TDK Corporation Tokyo, Japan.

Employees' emotional states were measured for three working days through a complex process of beat-to-beat pulse intervals via custom software developed by NEC Corporation Tokyo, Japan. The researchers followed a common model in the field—Russel's circumplex model—to measure employees' emotion in four states: happy, angry, relaxed, and sad.

Using a random effect panel regression model, they found people's happy emotional state was positively related to their productivity. Meanwhile, no other emotional states were found to be related to productivity.

"The use of wearable biometric devices, which can track employees' emotional states provides an opportunity to examine more objective

components of the emotion-productivity link," Kadoya adds.

The study's limitations included the possibility of device errors, the number of observations throughout the day, and the gender distribution (14 out of 15 workers in this study identified as female), therefore the results should not be over-generalized. In the future, however, researchers hope to apply similar methods to explore the links between emotional states and different types of work.

More information: Yoshihiko Kadoya et al, Emotional Status and Productivity: Evidence from the Special Economic Zone in Laos, *Sustainability* (2020). DOI: 10.3390/su12041544

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