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LETTER

The caveats of wearable stress monitoring technology – in response to MacQuarrie et al., 2023

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Dear Editor,

We read with interest, the article by MacQuarrie et al. on wearable physiologic monitoring in healthcare simulation [1]. The phenomenon of psychological stress has intrigued researchers for generations. In recent years, the advent of wearable technology has afforded the research community the ability to track stress through a variety of metrics. However, there are number of device-related caveats that may not be immediately apparent to researchers when designing a study. We wish to highlight two potential areas of interference in relation to tattooing. With a typical prevalence of 10–20% in USA, Europe or Australia [2], having a tattoo on the skin in contact with any physiological sensor is an important consideration for the manufacturers of such devices.

Take, for example, galvanic skin response (GSR), otherwise known as electrodermal activity. Whilst GSR supposedly offers an insight to the human stress response by analysing the electrical conductivity of the skin, researchers may not consider that tattooed participants can cause an issue. Whilst the field is not large, research has shown that the process of tattooing can damage eccrine sweat glands, thus generating less sweat [3]. In this instance, wrist-worn GSR monitors may be at risk of obtaining data that is not reflective of the stress response, due to the lack of moisture lowering the electrical conductivity of the skin.

The wrist-worn heart rate (HR) monitor is another piece of technology that can be susceptible to tattooed skin. Whilst research in this area is understandably sparse, two leading manufacturers of this technology, Apple and Garmin, have stated that tattoo ink directly impacts the ability of wrist-worn photoplethysmography HR monitors to obtain accurate values [4,5], as the ink can increase light absorption and skew data. Considering the above, it may be prudent of researchers to use a device availing of finger electrodes when evaluating GSR, as the distal region of the fingers may be less prone to tattooing than the wrist. Whereas, it may be of benefit to use a chest-worn HR monitor, that employs electrocardiography as opposed to photoplethysmography, if a participant is extensively tattooed on the distal region of the forearms.

The excellent recent article by MacQuarrie et al. [1] places forth both the Astro and Hexoskin as emergent alternatives to the current array of stress monitoring devices. Can the authors comment on any issues that may potentially impact the validity of data concerning the aforementioned biometric shirts?

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Competing interests

None declared.

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