“Saturday Night Fever”: Reliability and validity of single-use temperature stickers for the detection of hyperthermia for implementation at music festivals

Daniel T Winter[1,2,3], Jessica R Chow[1,2,4], Tsz Yan Chow[1,4], Benjamin C Riordan[1,5], Paul S Haber[1,2,4,6], Andrew Dawson[1,4,7,8], Jacques Raubenheimer[1,7,8,9]

[1]Edith Collins Centre (Translational Research in Alcohol, Drugs and Toxicology), Sydney Local Health District, Sydney, Australia, [2]Specialty of Addiction Medicine, Central Clinical School, Faculty of Medicine and Health, The University of Sydney, Sydney, Australia, [3]Drug and Alcohol Services, Northern Sydney Local Health District, Sydney, Australia, [4]Drug Health Services, Sydney Local Health District, Sydney, Australia, [5]Centre for Alcohol Policy Research (CAPR), School of Psychology and Public Health, La Trobe University, Melbourne, Australia, [6]NSW Drug and Alcohol Clinical Research and Improvement Network (DACRIN), Sydney, Australia, [7]Discipline of Pharmacology, School of Medical Sciences, Faculty of Medicine and Health, The University of Sydney, Sydney, Australia, [8]NSW Poisons Information Centre, The Sydney Children’s Hospitals Network, Sydney, Australia, [9]Discipline of Biomedical Informatics and Digital Health, School of Medical Sciences, Faculty of Medicine and Health, The University of Sydney, Sydney, Australia.

Presenter’s email: daniel.winter@sydney.edu.au

Introduction: Drug-related harm and fatalities among music festival attendees necessitates novel harm reductions strategies to address this issue. Hyperthermia, often a result of stimulant overdose, is a significant health concern at festivals due to the presence of other risk-factors (e.g., alcohol consumption, dehydration, high-temperature environments). Wearable temperature stickers may offer a potential solution to detect hyperthermia among music festival attendees. We conducted a pilot study to examine the reliability and validity of wearable temperature stickers, compared to tympanic temperature, with participants undertaking physical activity in a controlled environment.

Methods: Study comparing three commercial temperature stickers across four body locations (forehead, upper chest, forearm, wrist) against tympanic temperature with high-intensity fitness class participants. Celsius temperatures were measured at four timepoints (pre-class, twice during, and post-class). A generalised linear model tested differences between sticker and tympanic (as reference) temperatures across sticker brand, location, and timepoint.

Results: Participants (N=204) wore one of three sticker brands (Brand 1: N=70; Brand 2: N=67; Brand 3: N=67) across four body locations simultaneously. Most tympanic temperatures (99.4% of 816 readings) were recorded across the timepoints. Given that stickers fell off participants, only 65.1% of 3,264 sticker temperature readings were valid by the post-class timepoint.
We calculated, for each available measurement, the variation of sticker temperature from tympanic temperature. The model showed significant differences between both sticker location and type, and tympanic temperature. Timepoints showed a significant temperature deviation of stickers from tympanic; pre-exercise showed the smallest deviation, while the second during-exercise and post-class measurements were greatest. Interactions between patch location and brand, and timepoint were also significant.

Discussions and Conclusions: The model showed all body location temperature readings underestimated tympanic temperature, although forehead less so than other locations. All sticker brands underestimated tympanic measurements; while one brand outperformed others, it still significantly underestimated tympanic temperature measurements.

Manufacturer corrections to ensure temperature stickers are valid and reliable may be necessary prior to implementation in music festivals.

Implications for Practice or Policy: Use of thermometers stickers among music festival attendees may serve to help indicate hyperthermia, but should not replace other harm reduction and health initiatives in such settings.

Disclosure of Interest Statement: *This study was funded by a Seed Funding Grant (ID: NCR3SF11) from the National Centre for Clinical Research on Emerging Drugs (NCCRED). Manufacturers of the single-use temperature stickers were not involved and did not contribute to this study, financially or otherwise.*

Acknowledgements: *We would like to acknowledge the NSW Drug and Alcohol Clinical Research and Improvement Network (DACRIN) for providing technical equipment for the study. We also thank Dr Abdul Cader Mohamed Fahim, Emma Pygall, Lucy Peck, and Brennan Geiger for assisting with data collection.*