New approaches to teachers' experience of stress: Do heart rate measurements with fitness trackers provide an efficient, inexpensive, and robust measurement method?

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Abstract

One or two sentences providing a **basic introduction** to the field, comprehensible to a scientist in any discipline.

Two to three sentences of **more detailed background**, comprehensible to scientists in related disciplines.

One sentence clearly stating the **general problem** being addressed by this particular study.

One sentence summarizing the main result (with the words "**here we show**" or their equivalent).

Two or three sentences explaining what the **main result** reveals in direct comparison to what was thought to be the case previously, or how the main result adds to previous knowledge.

One or two sentences to put the results into a more **general context**.

Two or three sentences to provide a **broader perspective**, readily comprehensible to a scientist in any discipline.

XXX In this proof-of-concept study, we aimed to advance the field of teacher stress by collecting heart rate data with wrist-worn devices and testing a methodology that has the potential to provide more insights on the non-invasive assessment of teacher stress. XXX

Keywords: heart rate, photoplethysmography, wearable electronic device, teaching

Table 1:

Interval	M HR	SD HR	Min	Max
Overall Course of 2h	90.09/-0.04	15.76/0.99	51/-4.03	164/4.56
Pre-teaching interval	77.95/-1.07	11.14/0.57	50/-2.68	120/2.96
Teaching interval	82.32/-0.72	11.85/0.74	51/-2.51	132/4.39
Post-teaching interval	93.61/0.27	14.01/0.76	60/-2.17	150/3.06
Interview interval	96.28/0.48	14.11/0.88	56/-3.56	139/3.24
End Interval	100.8/0.85	16.23/0.77	63/-2.18	164/4.37

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1. Present investigation

The aim was to investigate whether HR measures assessed by a Fitbit Charge 4 are a suitable and effective method to **(1)** map teachers course of arousal over the course of a five phase lab study, including a micro teaching unit, and **(2)** examine whether HR measures can be predicted by self-reported data on cognitive appraisal.

Within the time frame of approximately two hours, we investigated five intervals with a duration of 10-minutes each: In the (1) pre-teaching phase, the subjects were prepared for the following micro teaching unit teaching lesson and familiarized with the setting. During the (2) teaching phase, the participants taught a 15-minute self-prepared lesson to a "class" of three actors that simulated nine classroom disruptions . In the following (3) post-teaching phase, the subjects answered a questionnaires, followed by and in the (4) interview phase, in which they subjects watched thea pre-recorded video of their 15-minute lesson to assess the self-report data of how disrupted subjects felt and how confident they felt in dealing with disruptions. In the (5) end phase, the subject answered another second questionnaire.

According to previous findings that fitness trackers can be used as a low-cost, non-invasive method of measuring HR (**?**Fuller et al., 2020) and that different HRs of teachers can be measured in different teaching phases (**??**), we formulate the hypotheses as follows:

Hypothesis 1. In a first step, we wanted to display exploratively the course of HR during the entire study. Additionally, we presumed the highest mean HR in the (2) teaching phase and lower mean values in all other phases (**Hypothesis 1a**). Moreover, we expected an increase in HR in the (1) pre-teaching phase as the first phase and a decrease in the following phases (**Hypothesis 1b**). **Hypothesis 2**. We statistically predicted the subjects' standardized mean HR for the (2) teaching, the (3) post-teaching, the (4) interview and the (5) end phase with teaching experience and self-repoted data on .... With respect to teaching experience, Wwe expected a lower HR in teachers with more teaching experience for the four phases (**Hypothesis 2a**). According to the relationship between physiological arousal and cognitive appraisal, we controlled for shared variance with the self-reported data. Concerning the ..., Wwe expected higher HR values for for the four phases that teachers who reported that they felt more disrupted by disruptions would have higher standardized mean HR (**Hypotheses 2b**). In contrast, individuals with high confidence in dealing with disruptions would have a lower standardized mean HR in the four phases (**Hypothesis 2c**). When considering the three predictors in concert and controlling for their common variance, we expected teaching experience and self-reported data to remain substantial predictors (**Hypothesis 2d**).

References

Daniel Fuller, Emily Colwell, Jonathan Low, Kassia Orychock, Melissa Ann Tobin, Bo Simango, Richard Buote, Desiree Van Heerden, Hui Luan, Kimberley Cullen, et al. Reliability and validity of commercially available wearable devices for measuring steps, energy expenditure, and heart rate: systematic review. *JMIR mHealth and uHealth*, 8(9):e18694, 2020.