

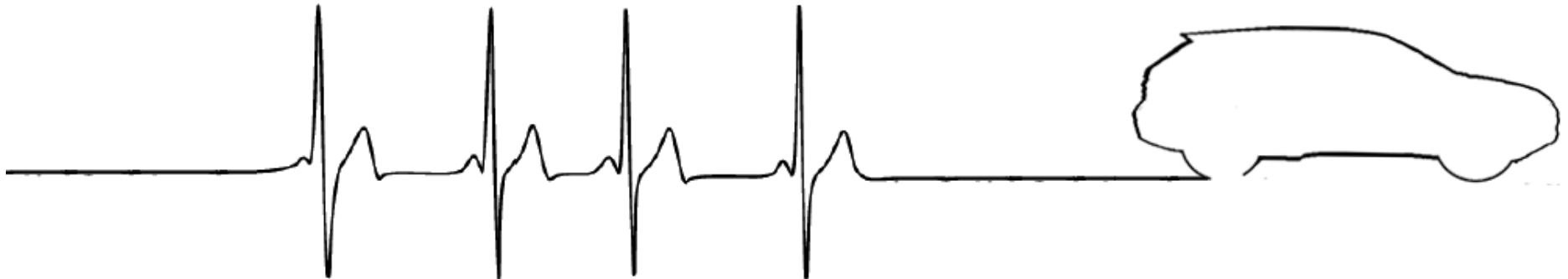


MONASH University
Accident Research Centre

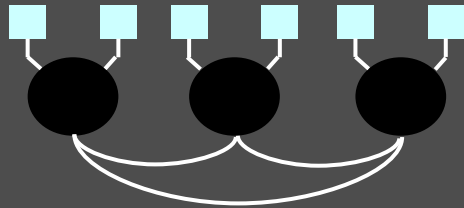
A centre within the Monash University Injury Research Institute

Jonny Kuo, Sjaan Koppel, and Judith Charlton

video-based measure of *driver heart rate* for naturalistic driving data



The power of NDS lies in the capacity to explore *latent variables* retrospectively of data collection



Emotional arousal, task demand, and cognitive distraction do not always produce *observable physical effects*.

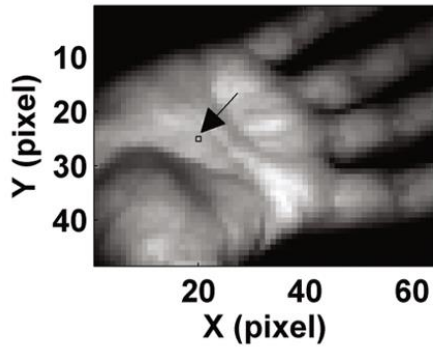
(White & Caird, 2010)



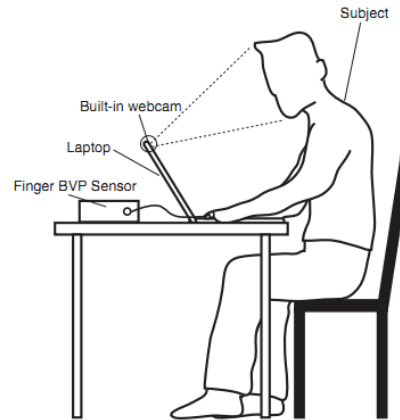
Heart rate correlates with these factors, often *before* changes in physical behaviours can be seen.

(Mehler, Reimer, & Coughlin, 2012)

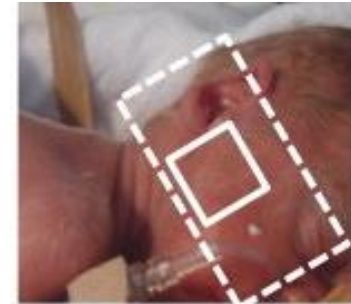




Sun et al., 2011



Poh, McDuff, & Picard, 2010



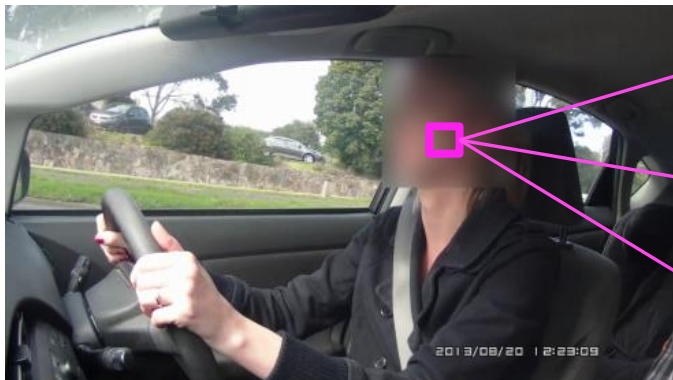
Aarts et al., 2013

IPPG

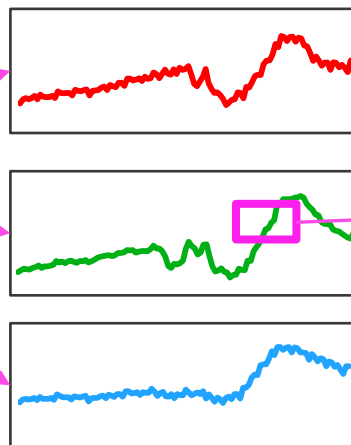
Estimates pulse rate from subtle changes in skin colour

Previously explored in physiology experiments,
telemedicine and neonatal ICU

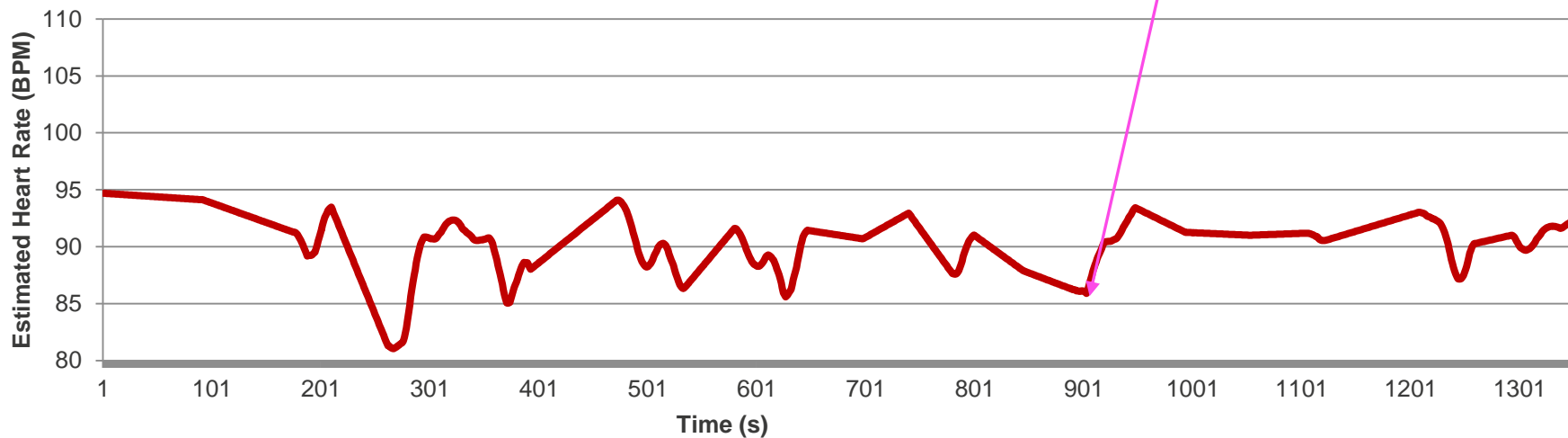
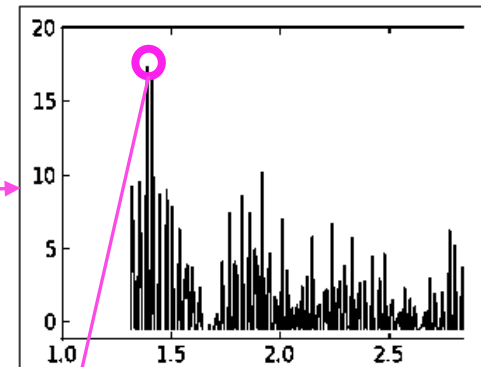
Participant video

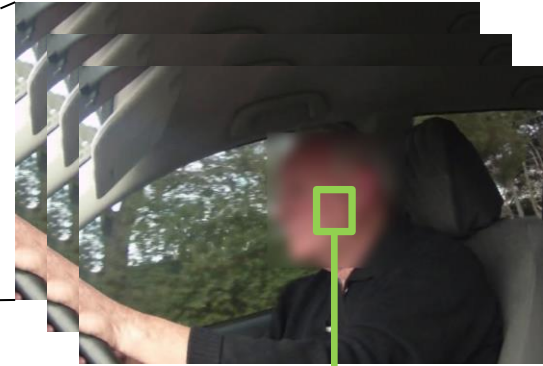


RGB values

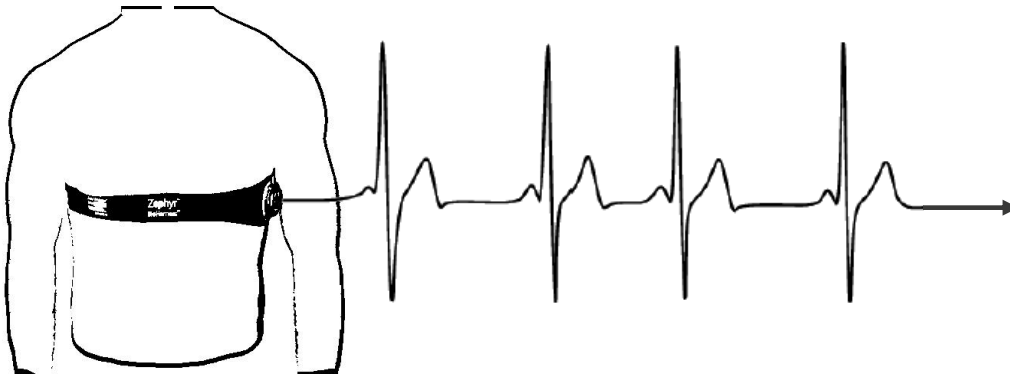


Fourier analysis





Full methods in [Koppel et al. \(2014\)](#). *Examining physiological responses across different driving maneuvers...*



t-test
Bland-Altman analysis

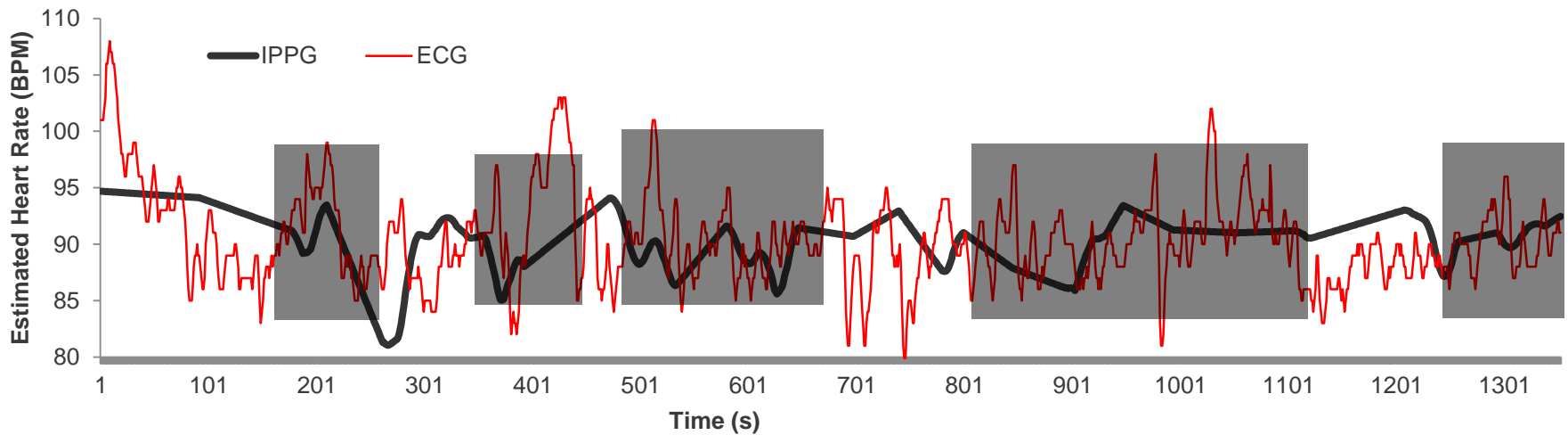
Results

$$t(2) = 0.35$$

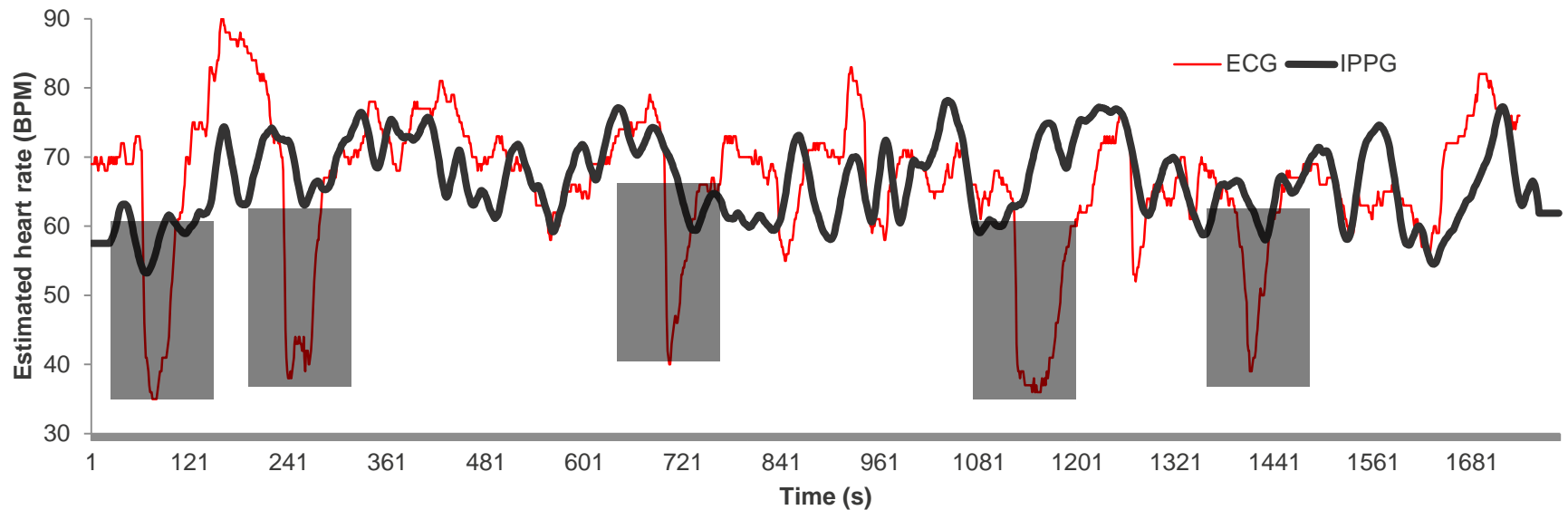
$$d = -0.58 \text{ BPM}$$

$$95\% \text{ CI} = 16.93$$

Participant No. 8



Participant No. 2



Key outcomes

In-vehicle IPPG *proof of concept*

Unobtrusive measure of mean HR

Potential application in *Child Safety Project*

Further research

Increased precision

- In-depth analysis of movement artefacts
- More robust tracking algorithms
- Advanced time-frequency analyses

Heart rate variability

- Beat-to-beat comparisons

Further validation

- Larger and more diverse sample

Existing applications



- Scalability
- Specificity
- Insourcing

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