



Analyzing Impacts on Physiological Aspects of Rickshaw Pullers due to Heat Exposure

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Background & Motivation

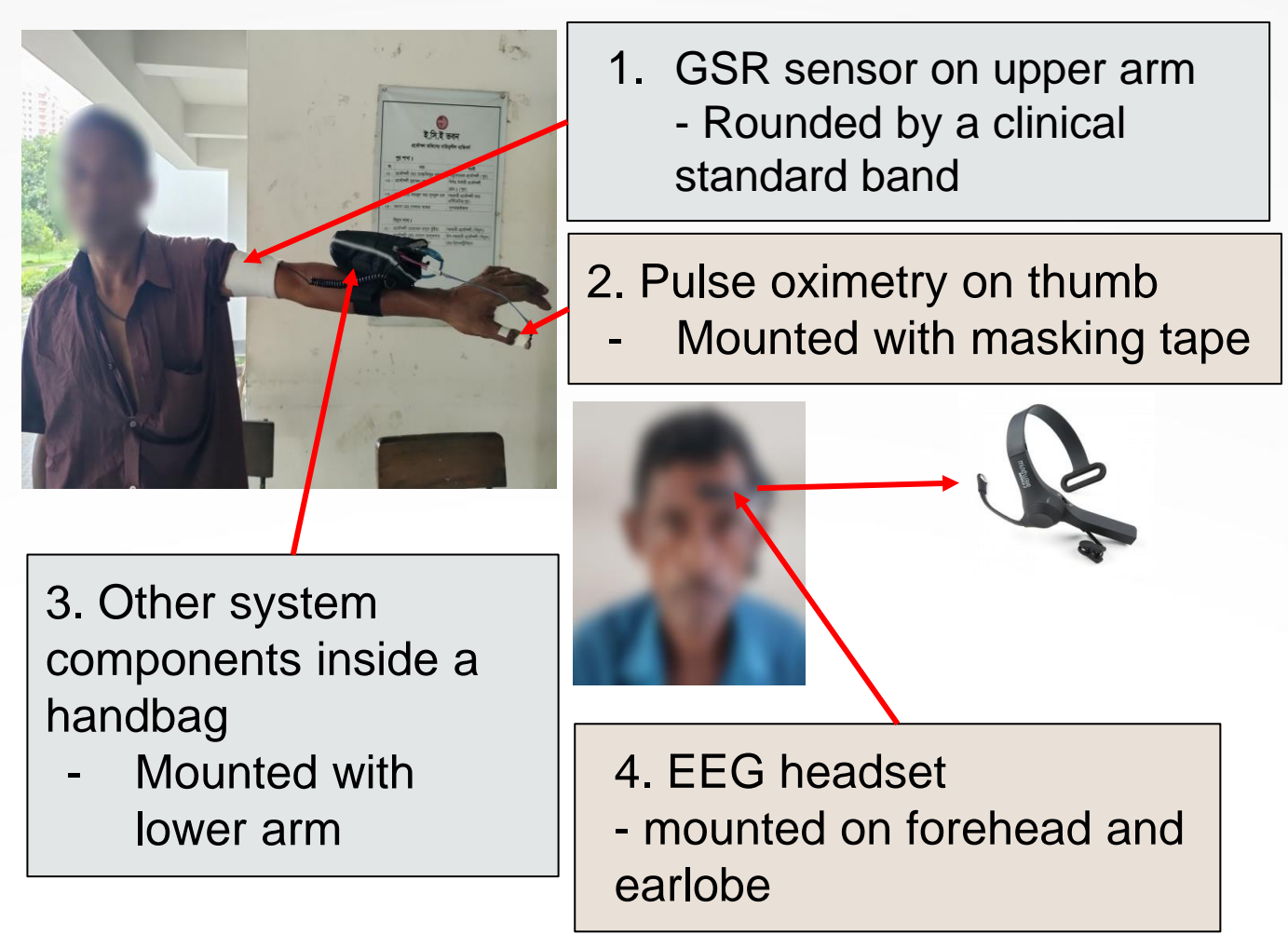
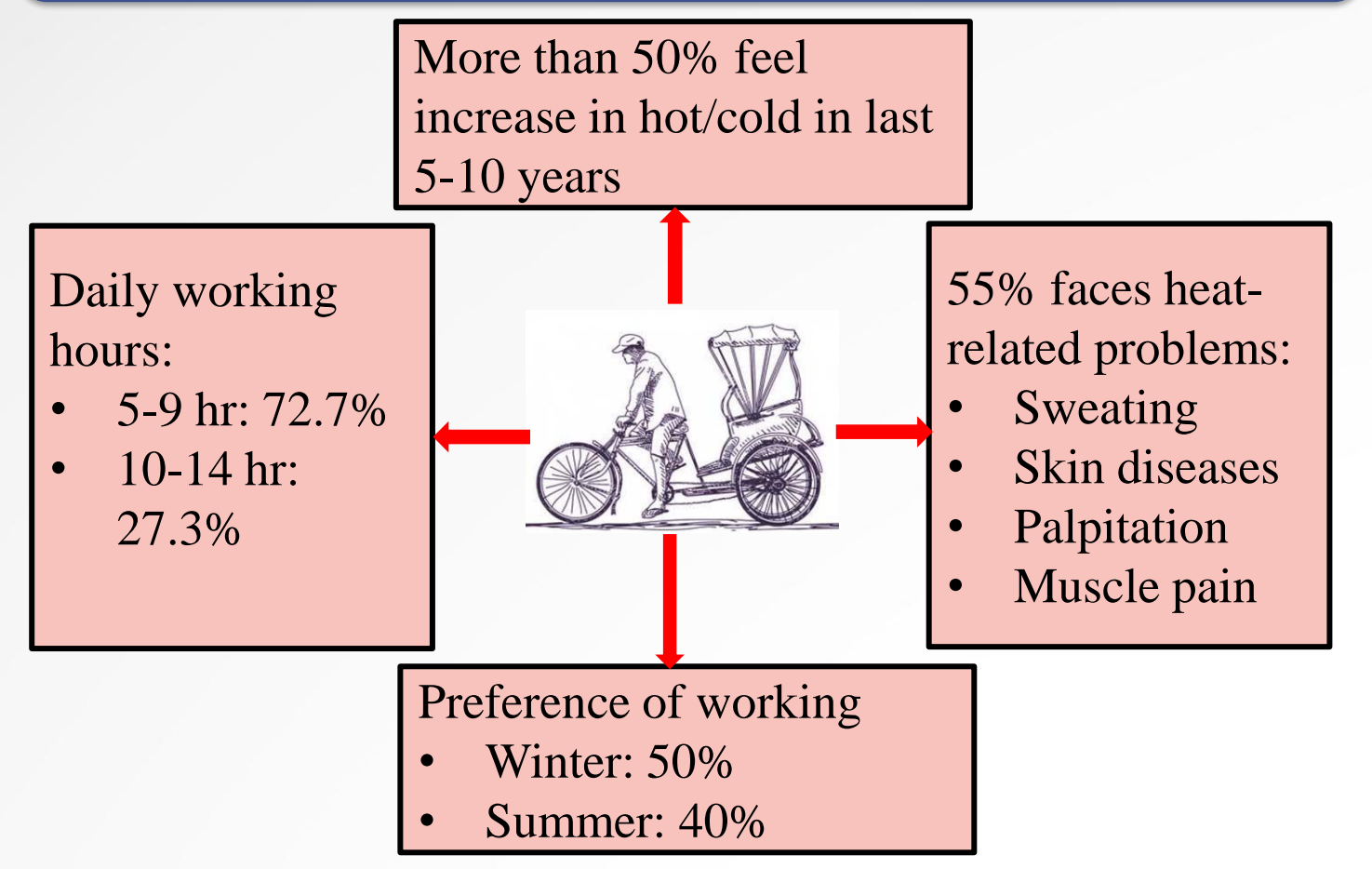


Figure 4: Deployment of health sensing module

Analysis & Findings

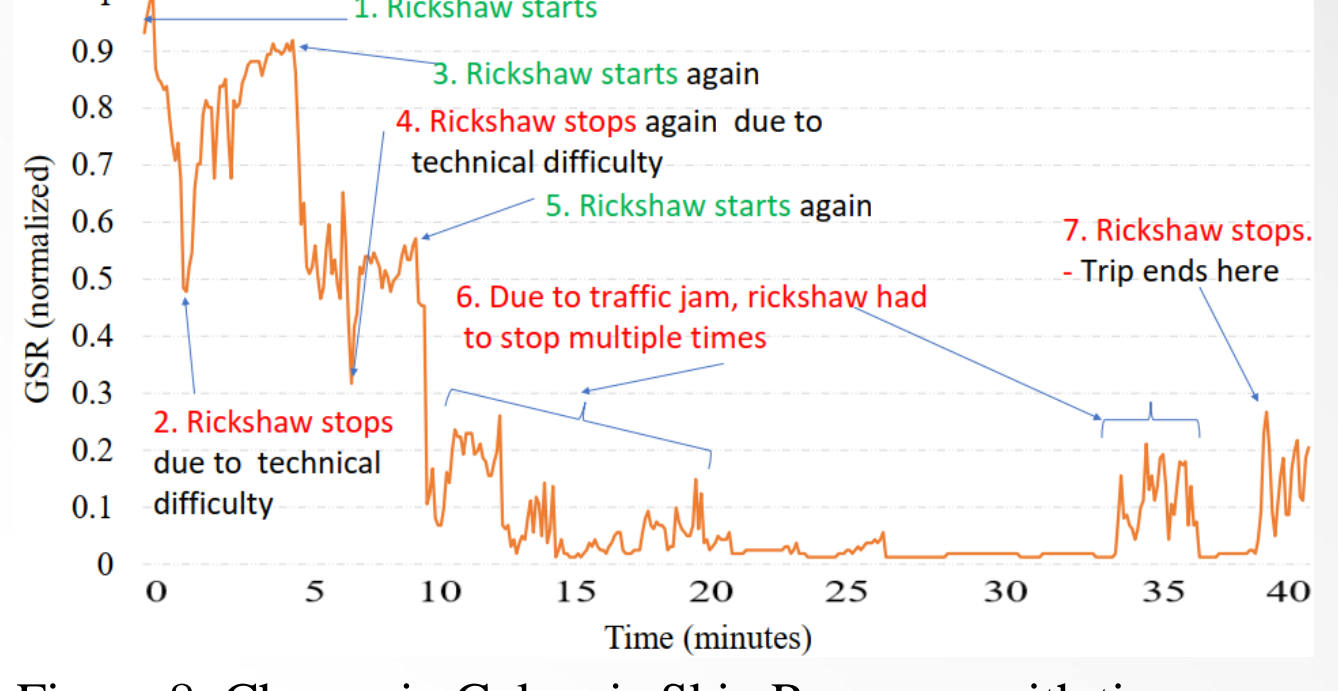


Figure 8: Change in Galvanic Skin Response with time

Galvanic Skin Response (GSR) is an indication of resistance of the body due to perspiration which is influenced by

- Temperature and Humidity
- Physical movement

Research Question

- Environmental parameter
 - a. Temperature and Humidity
 - b. CO₂, CO, NO_x, O₃, SO₂, etc.
 - Health parameters of rickshaw pullers
 - a. Body temperature
 - b. Heart rate (BPM)
 - c. Galvanic Skin Response (GSR)
1. How are health parameters of rickshaw pullers influenced by the environmental parameters?
 2. Which are the possible health risks of rickshaw pullers?

Data Collection



Figure 5: Integration of both sensing modules at the beginning of trip

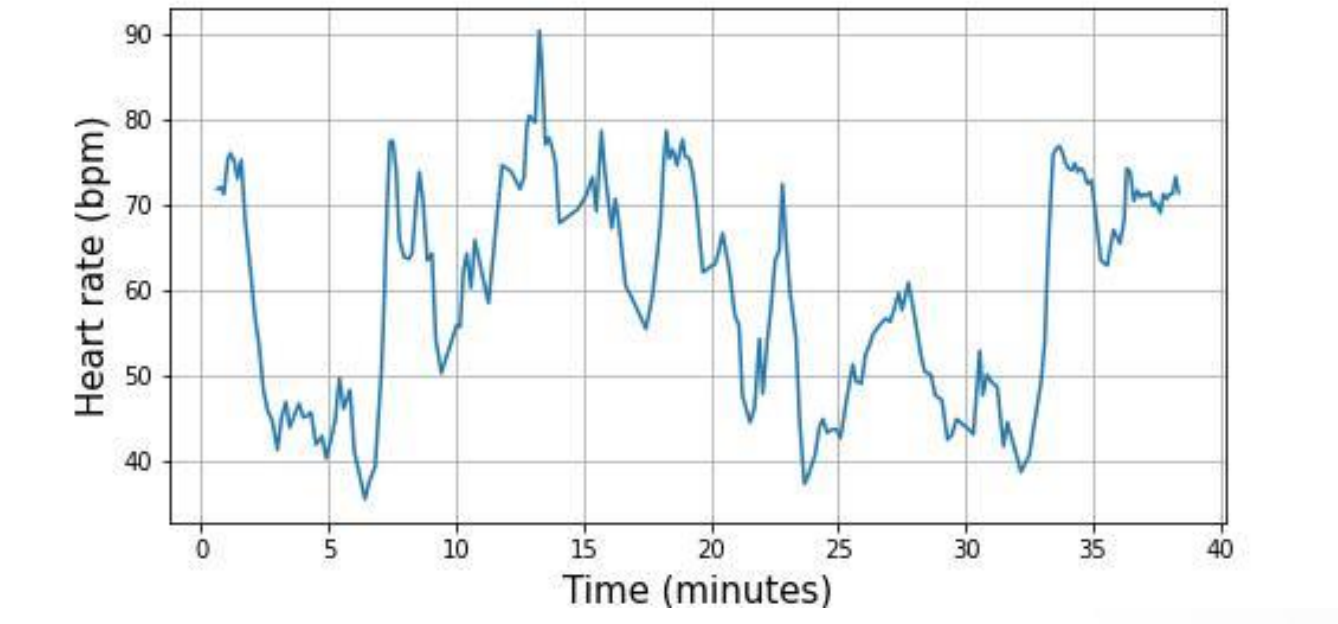


Figure 9: Change in Heart rate with time

Heart rate fluctuates frequently and in many cases below 50 bpm.

System Design

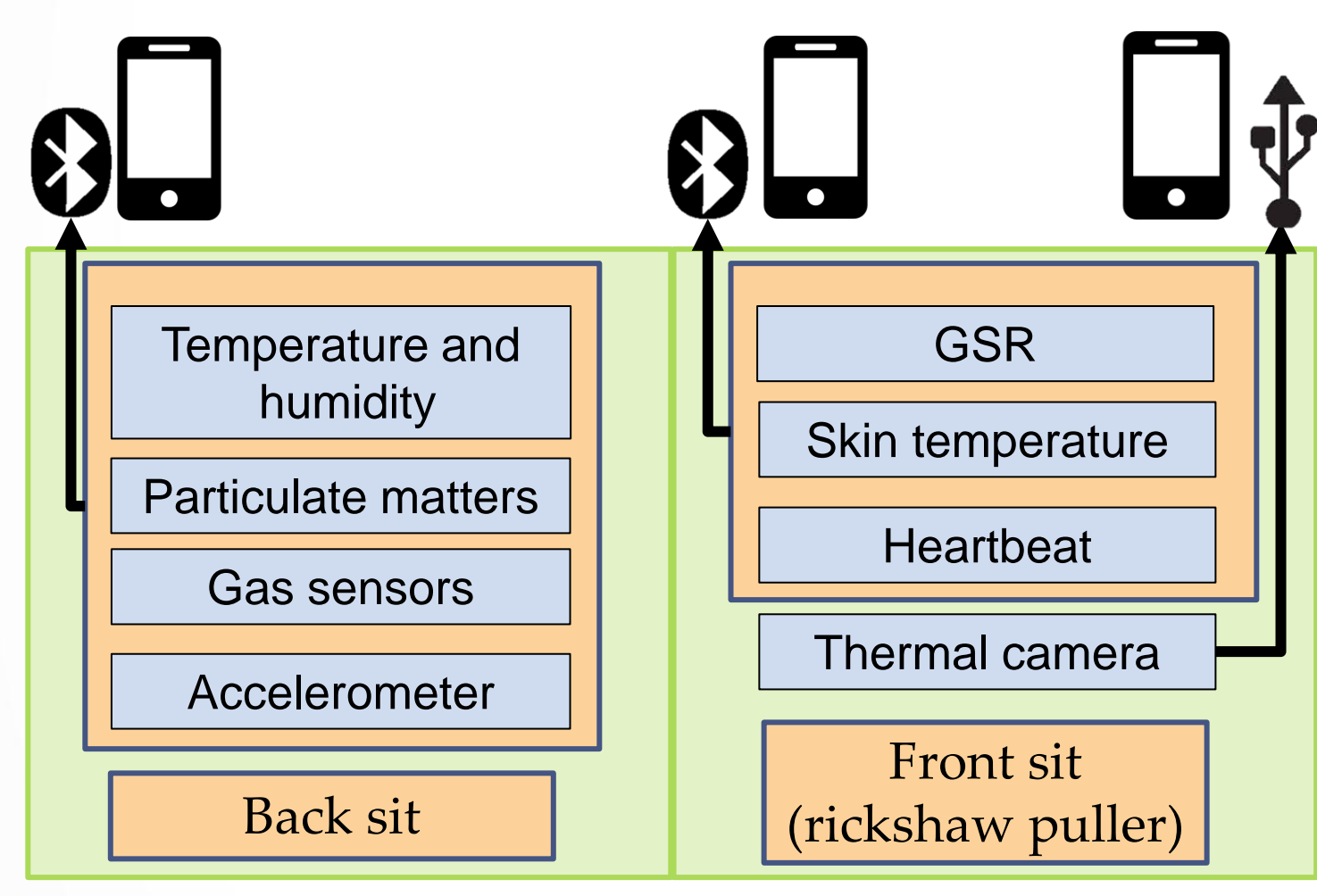


Figure 1: Proposed architecture of the system deployed on a rickshaw

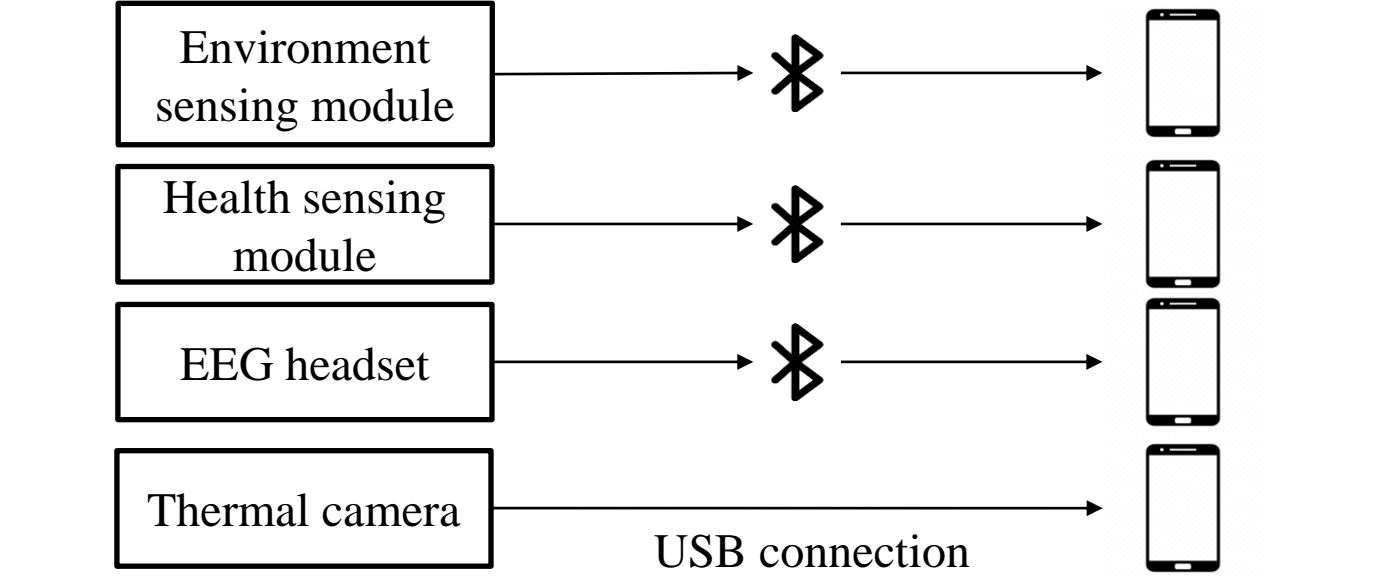


Figure 6: Data acquisition

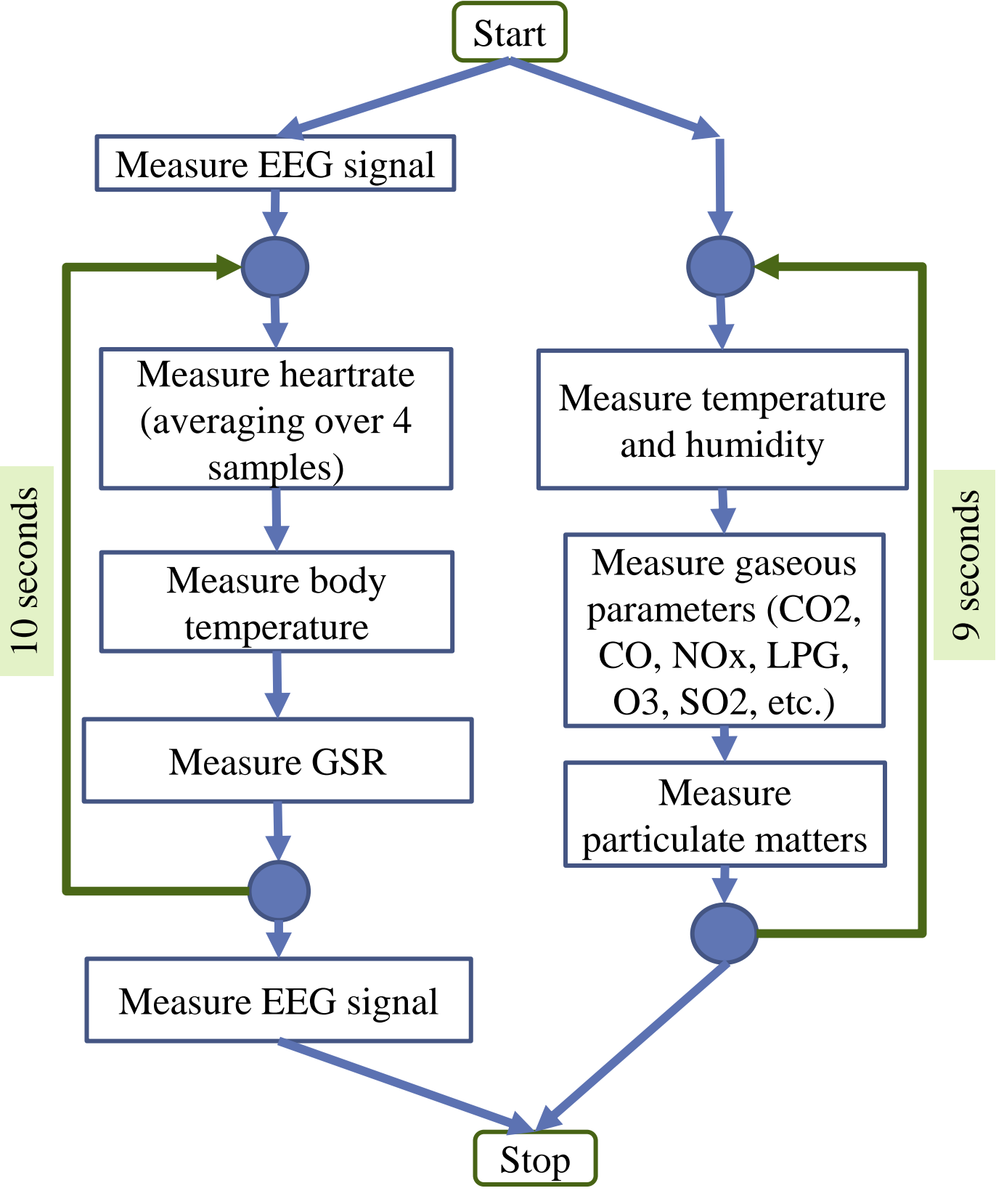


Figure 7: Flowchart of data collection methodology

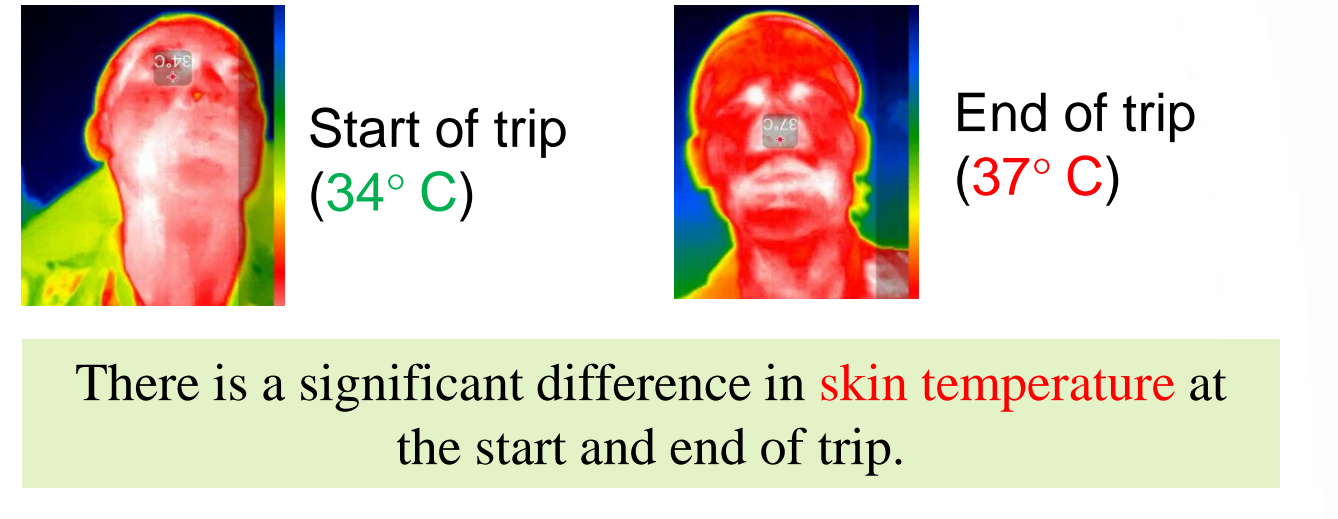


Figure 10: Scatter plot of body temperature and humidity vs environmental temperature

There is a significant difference in skin temperature at the start and end of trip.

Body temperature is correlated with

- Environment temperature (Pearson $r = 0.9$)
- Humidity (Pearson $r = -0.73$)

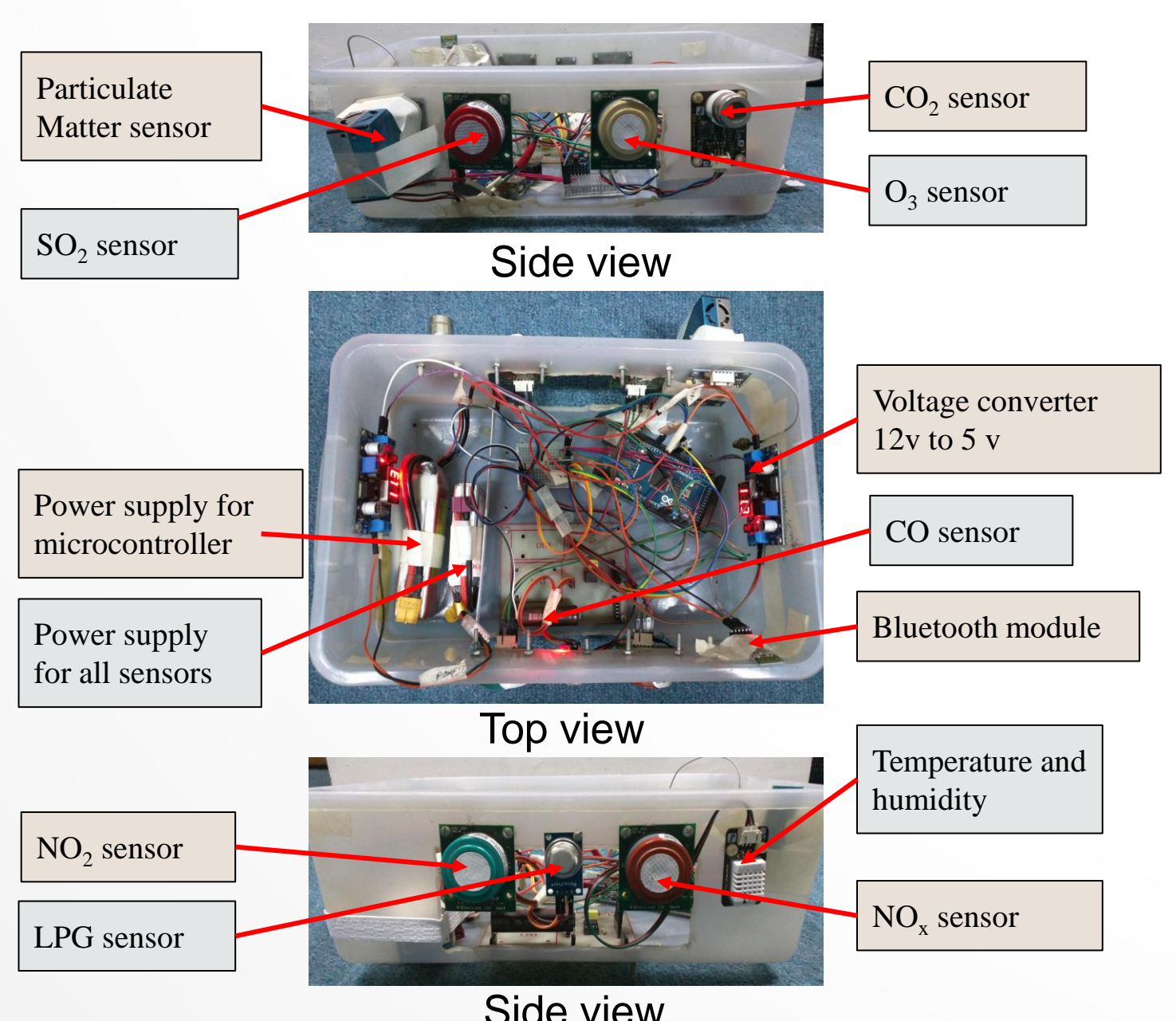


Figure 2: Environmental sensing module

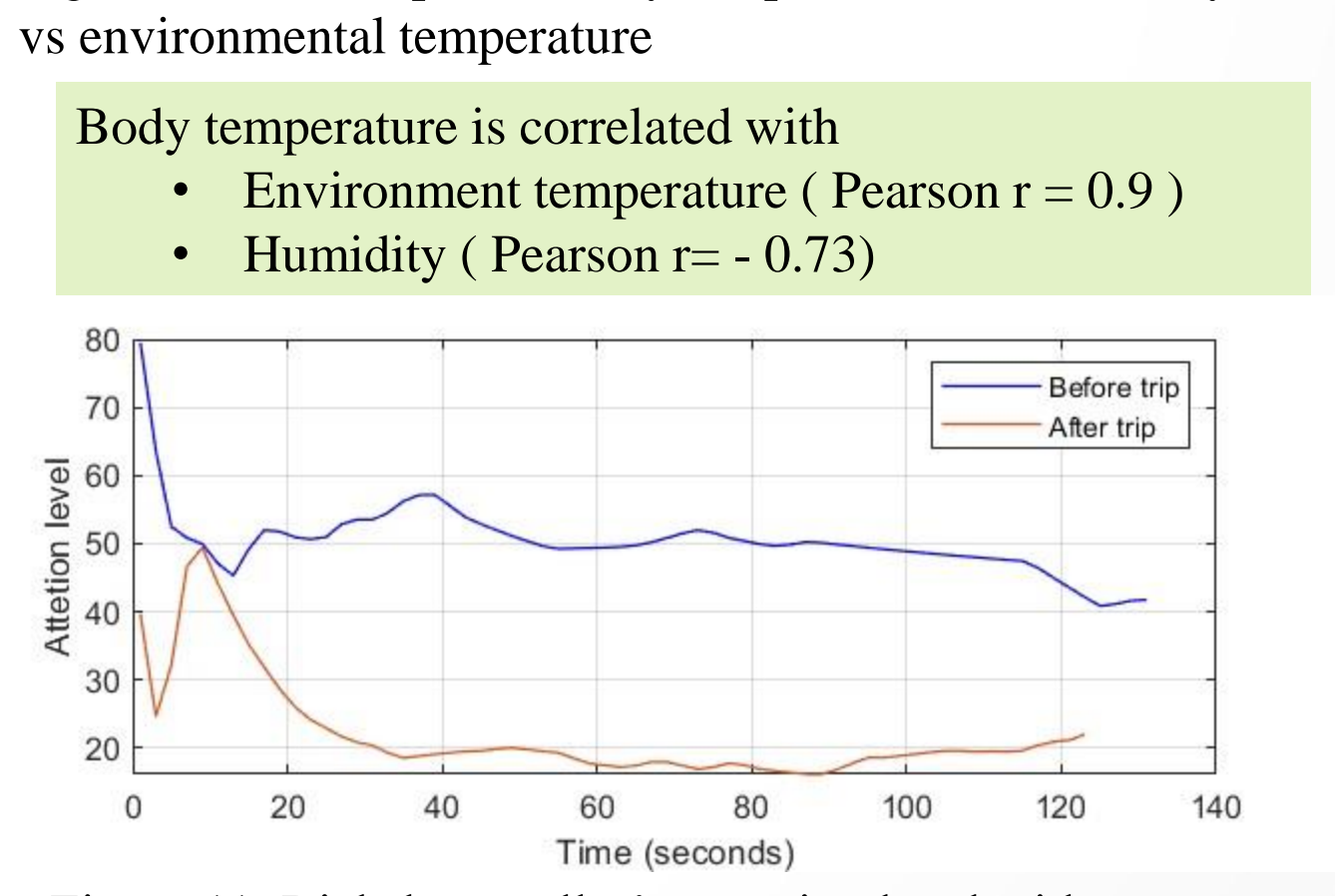


Figure 11: Rickshaw puller's attention level with respect to time for before trip and after trip

Attention level falls drastically after the trip may be due to physical stress while cycling rickshaw.

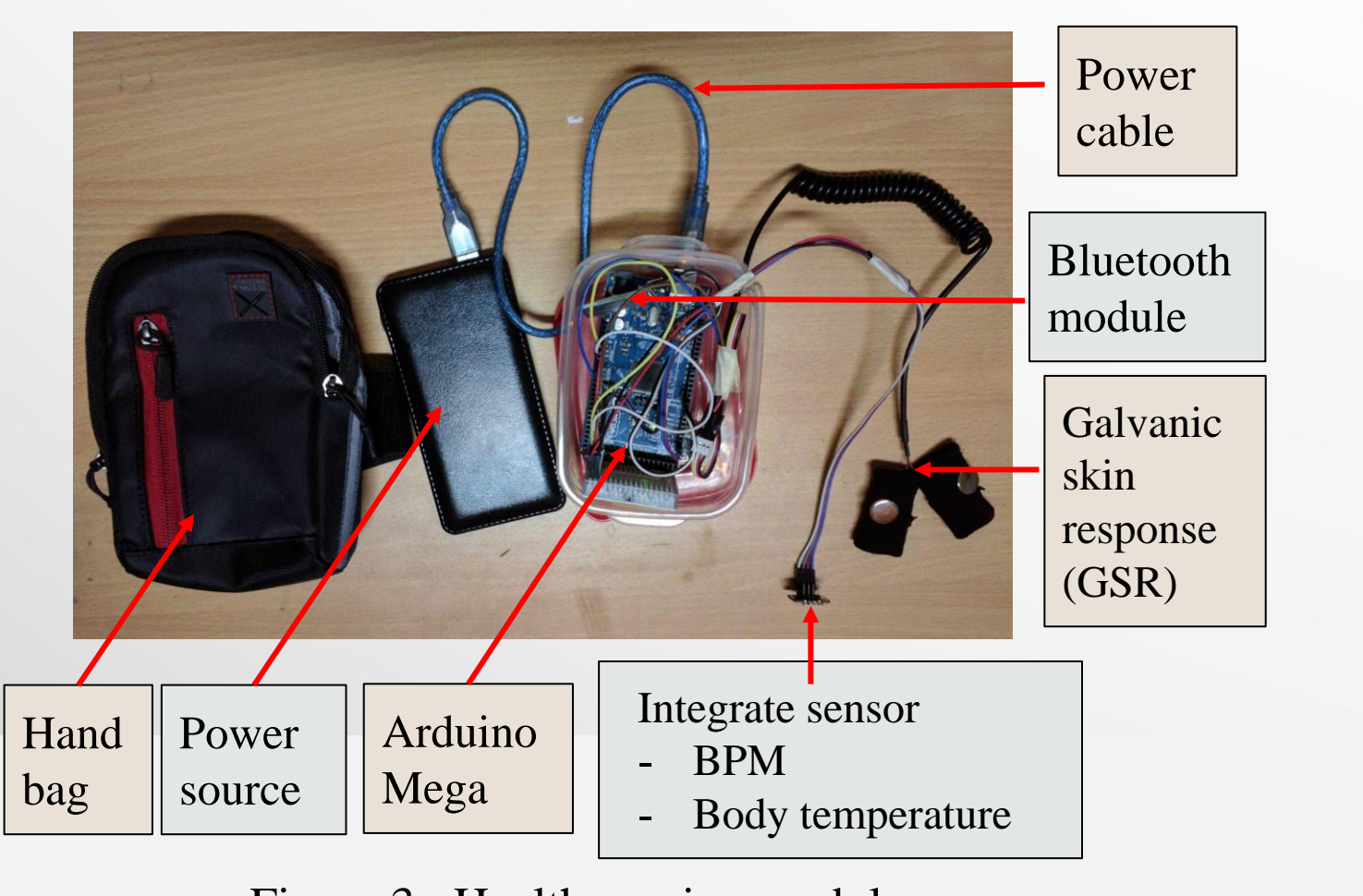


Figure 3: Health sensing module

Table 1: Demographics of three rickshaw pullers

	Rickshaw puller 1	Rickshaw puller 2	Rickshaw puller 3
Age	62	49	50
Height	5'3"	5'5"	5'7"
Weight	44 kg	51 kg	59 kg
BMI [1]	17.2 (underweight)	19 (Normal)	20.7 (Normal)
Intake	3 meals/day	3 meals/day	3 meals/day

Conclusions

In this study,

- We assess the physiological conditions of rickshaw pullers considering the environmental parameters.
- We find perspiration, frequent change in heart rate, increasing body temperature, and decline in attention level as the most concerning physiological changes of rickshaw pullers when cycling the rickshaw.

In future,

- We will extend our analysis to more rickshaw pullers having diverse weather conditions

References

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2. Hugo F Posada-Quintero, Natasa Reljin, Craig Mills, Ian Mills, John P Florian, Jaci L VanHeest, and Ki H Chon. 2018. Time-varying analysis of electrodermal activity during exercise. PLoS One 13, 6 (June 2018), e0198328.
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