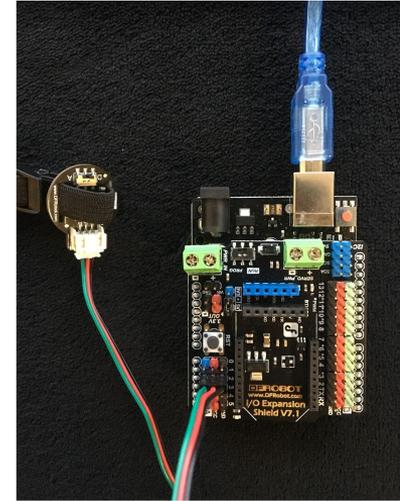
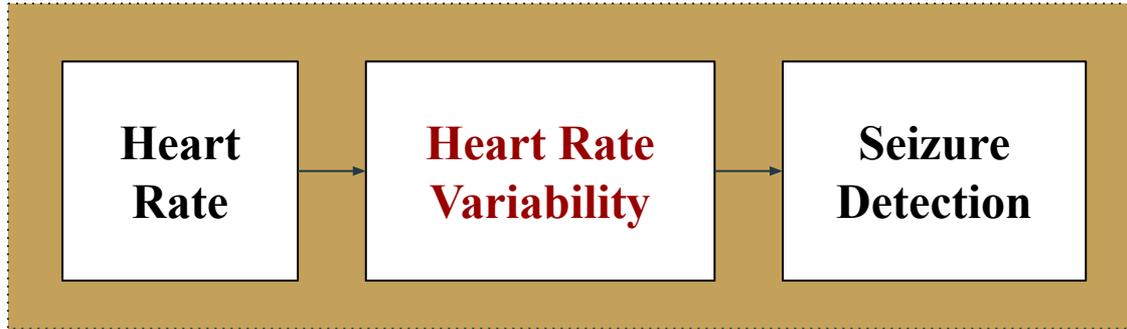
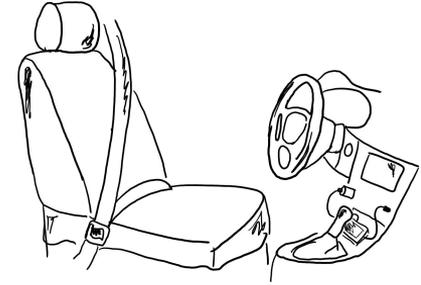


Epiic Technologies

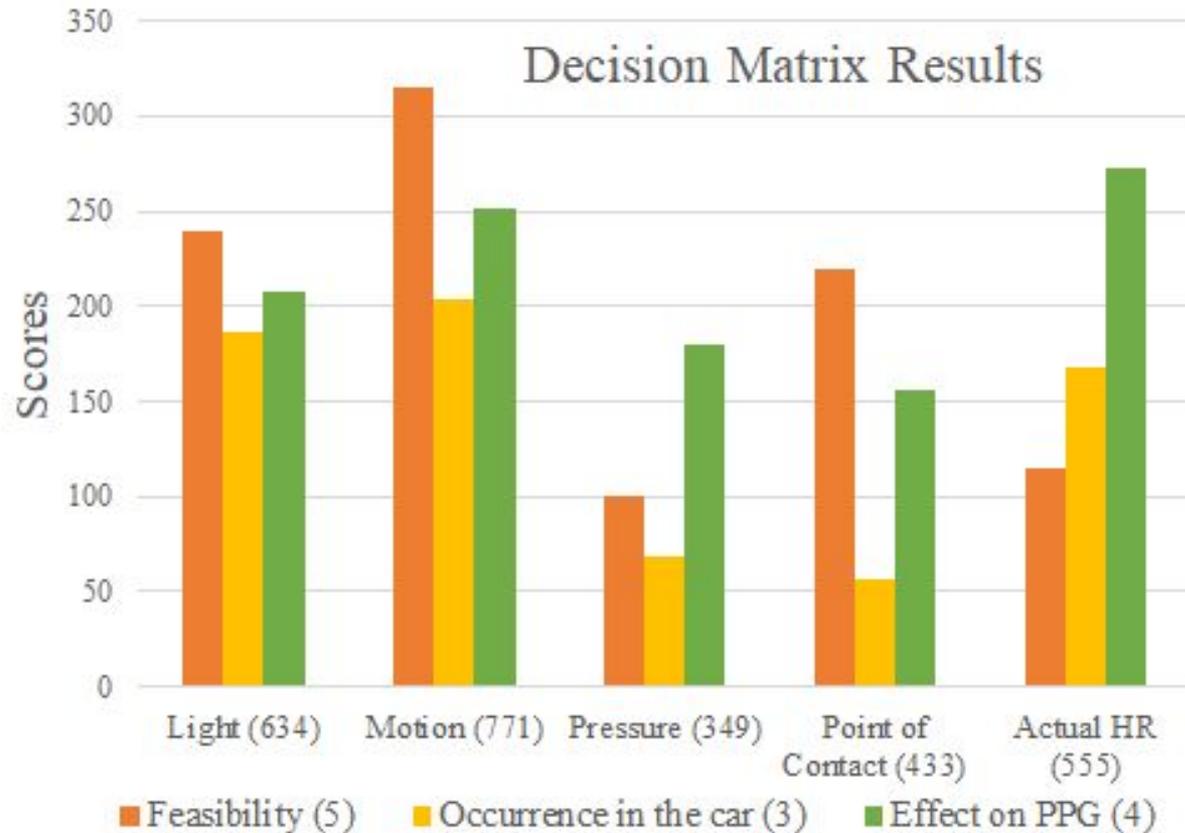
Phase IV



Motivating Statement

Determine the *environmental* and *physiological* factors under which the PPG error will be *greater than* control error with $\alpha=0.05$.

Informed Decision Making Process



Experimental Model

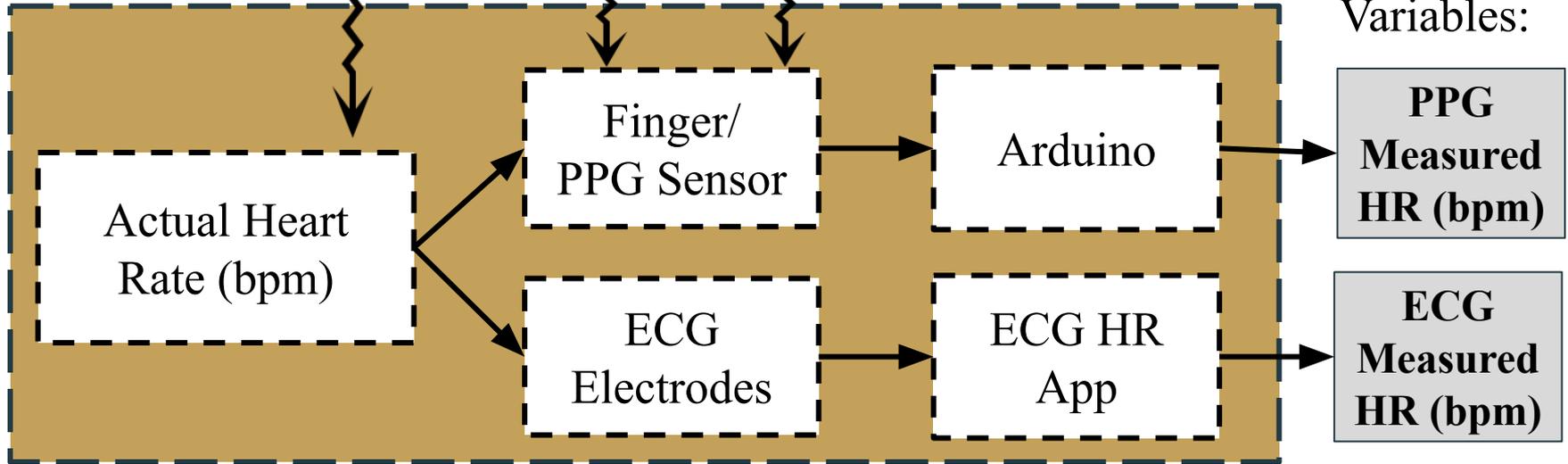
Independent Variables:

External Stressors

Motion

Light

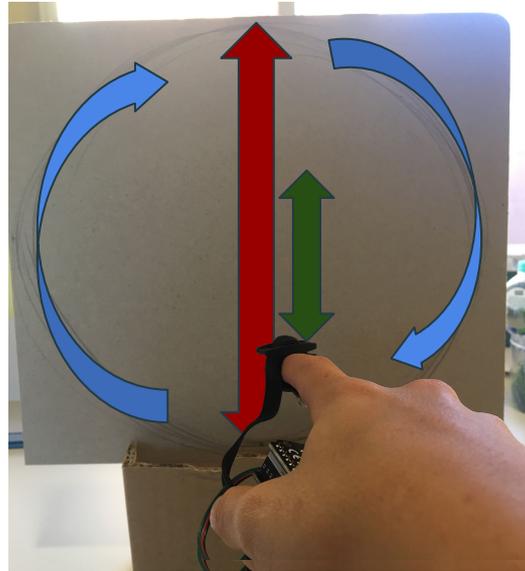
Dependent Variables:



Experimental Design: Independent Variables



Light Exposure



Path of Motion



External Stressors

Assumptions

- Discrete HR
- Light Extremes
- Factors Tested

Limitations

- Sample Population
- Pressure
- Movement
- Sweat

Experimental Analysis

Means

μ_0 : control

μ_1 : non-control

Hypotheses

Null:

$\mu_0 = \mu_1$

Alternative:

$\mu_0 < \mu_1$

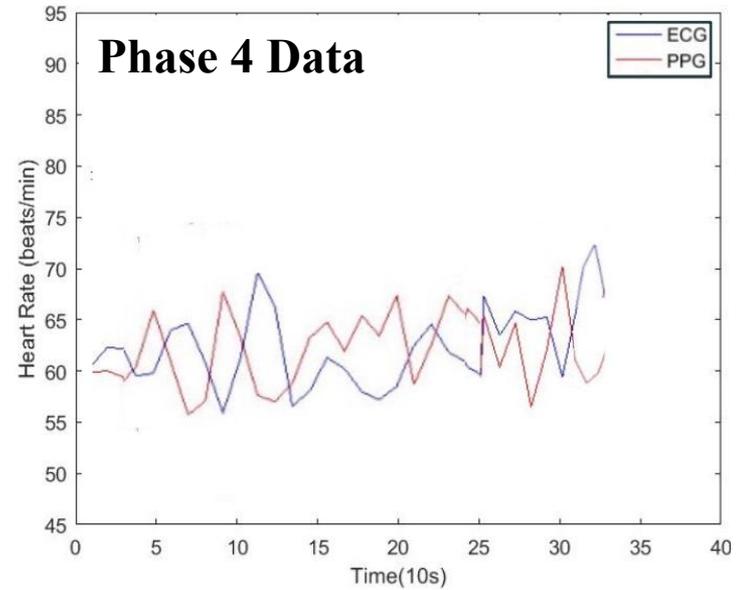
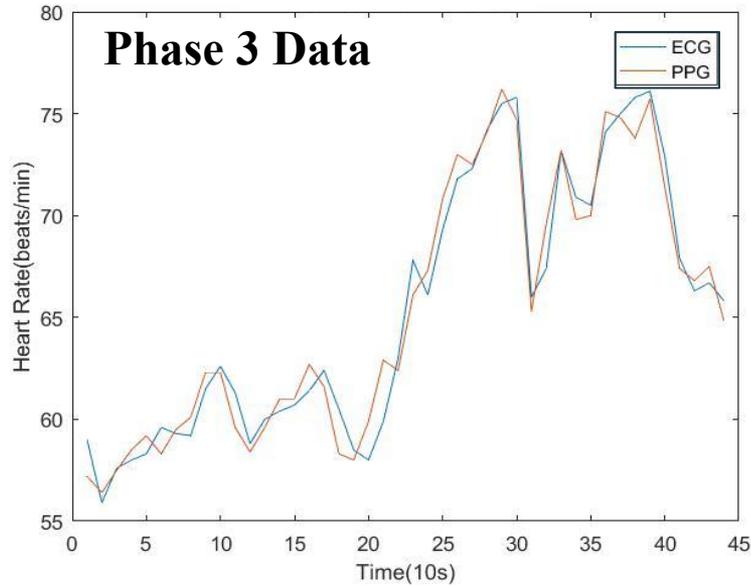
Condition	R ² (ECG vs. PPG)	Mean Absolute Error (bpm)	P-value
Control	0.95	2.85	N/A
External Stressor	0.91	1.08	1.00
Circular Arm Motion	0.84	3.82	0.035
Vertical Arm Motion	0.87	2.39	0.846
Vertical Finger Motion	0.82	2.79	0.550
Light	0.46	2.25	0.907
No Light	0.84	1.56	0.997

Power Analysis

```
V Horror T3P.txt - Notepad
File Edit Format View Help
2017-11-21 15:18:08 101 178862
2017-11-21 15:18:09 BPM Time
2017-11-21 15:18:10 Wait for valid data !
2017-11-21 15:18:11 Wait for valid data !
2017-11-21 15:18:12 Wait for valid data !
2017-11-21 15:18:13 Wait for valid data !
2017-11-21 15:18:14 Wait for valid data !
2017-11-21 15:18:15 Wait for valid data !
2017-11-21 15:18:16 Wait for valid data !
2017-11-21 15:18:17 Wait for valid data !
2017-11-21 15:18:18 Wait for valid data !
2017-11-21 15:18:19 Wait for valid data !
2017-11-21 15:18:20 Wait for valid data !
2017-11-21 15:18:21 Wait for valid data !
2017-11-21 15:18:22 Wait for valid data !
2017-11-21 15:18:23 Wait for valid data !
2017-11-21 15:18:24 Wait for valid data !
2017-11-21 15:18:25 Wait for valid data !
2017-11-21 15:18:26 Wait for valid data !
2017-11-21 15:18:27 Wait for valid data !
2017-11-21 15:18:28 63 18626
2017-11-21 15:18:29 63 19432
```

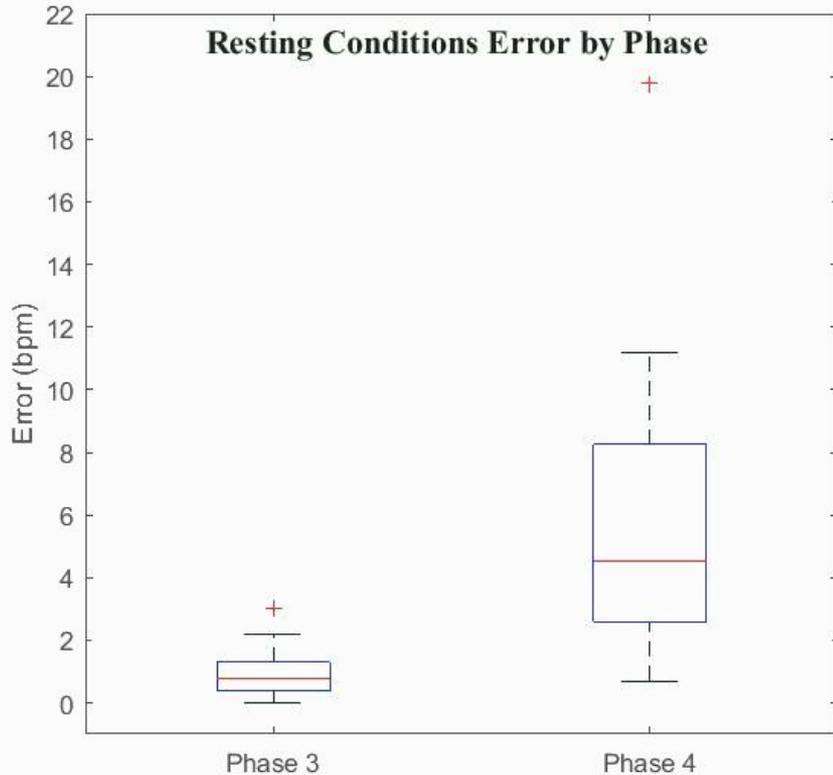
Variable	Power (%)	Invalid Data (%)
External Stressor	99.86	22
Circle Arm Motion	57.46	30
Vertical Arm Motion	26.87	17
Vertical Finger Motion	6.45	32
Light	37.87	7
No Light	88.72	20

PPG and ECG Control Data



	Mean of Error	SD of Error	R ² Correlation
Phase 3	0.6758	0.9341	0.9831
Phase 4	5.622	4.0685	0.9059

Reliability of Control Data



	Mean Error	bpm
Phase 3	μ_0	0.94
Phase 4	μ_1	5.62

$\mu_0 < \mu_1$ (Alternative)

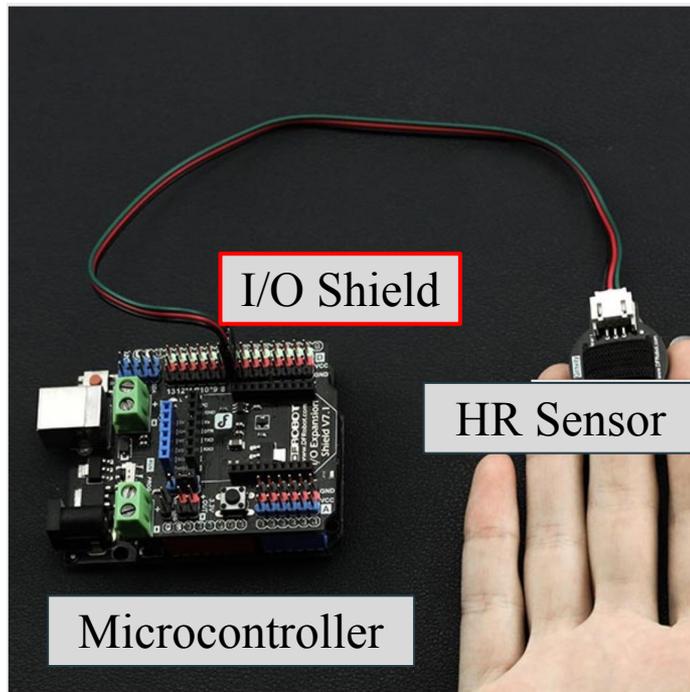
P-Value = $2.55 \cdot 10^{-8}$

Conclusions

- Extraneous variables
- Data not reliable
- Hardware malfunction?
- P-values invalid

Future Work:

- Hardware
- Larger population
- Other factors



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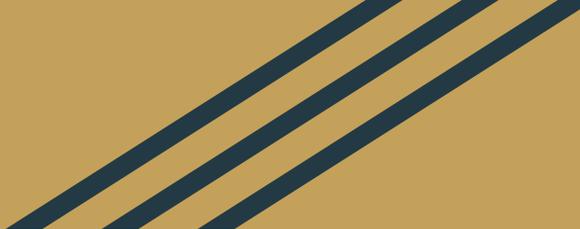
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Questions?