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Identifying physiological response to calls experienced during 24-hour shifts among Thunder Bay Fire Rescue firefighters.

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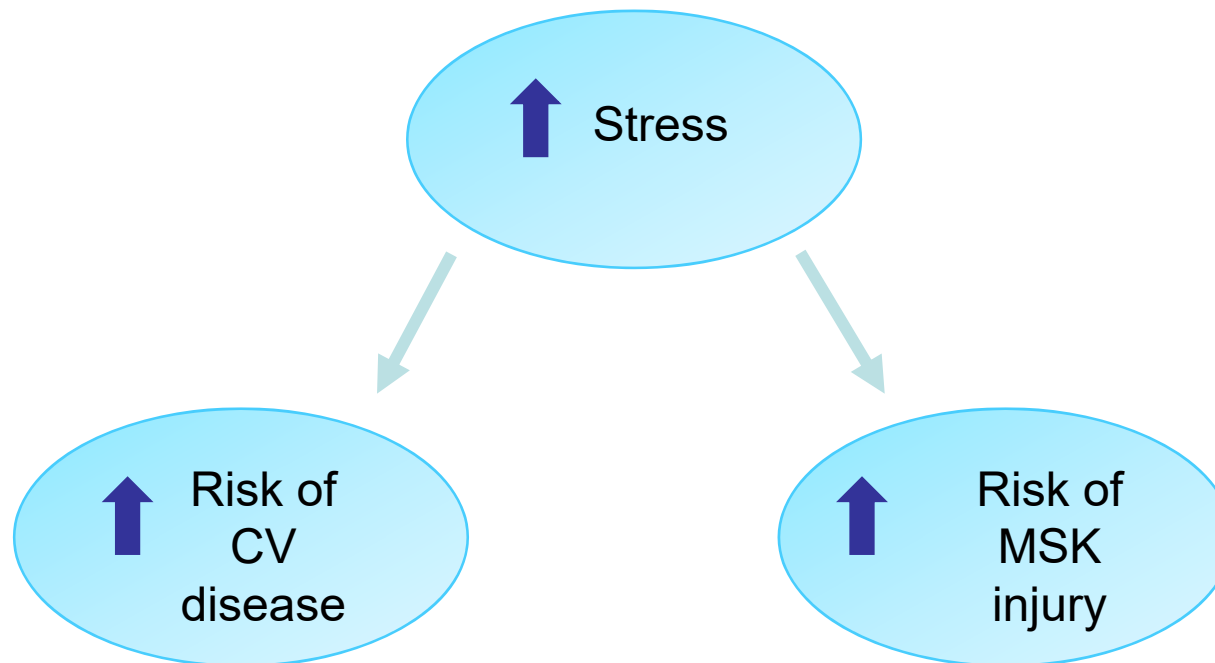


Firefighting Occupational Demands

- 24-hour shift work rotations [1]
- High degree of psychological and physiological stress [2,3]
- Chronic and acute stressors include: [4]
 - irregular physical exertion, dietary habits, smoke exposure, noise, heat, dehydration, and occupational stress



Implications of Stressors





Disturbed Sleep

- Shift work results in disturbed sleep
- Can cause increased hypothalamic pituitary adrenal (HPA) activity [5]
 - Results in chronic cortisol release
- Can result in performance deficits [6]



Physiological Variables

- Heart Rate Variability (HRV)
- Heart Rate (HR)
- Breathing Rate (BR)

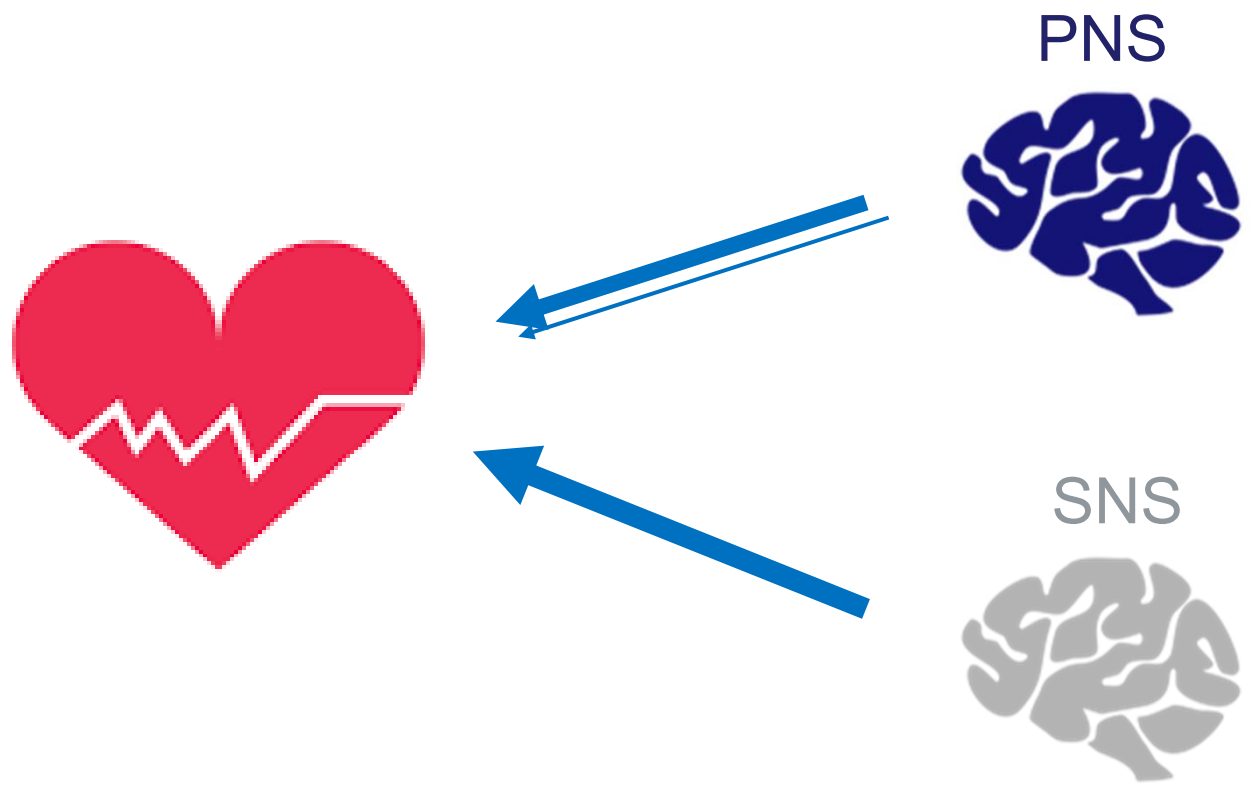


Heart Rate Variability

- the variation of the time period between consecutive heartbeats [7]
- Good measure of autonomic sympathetic control over the heart [7,8]



Heart Rate Variability



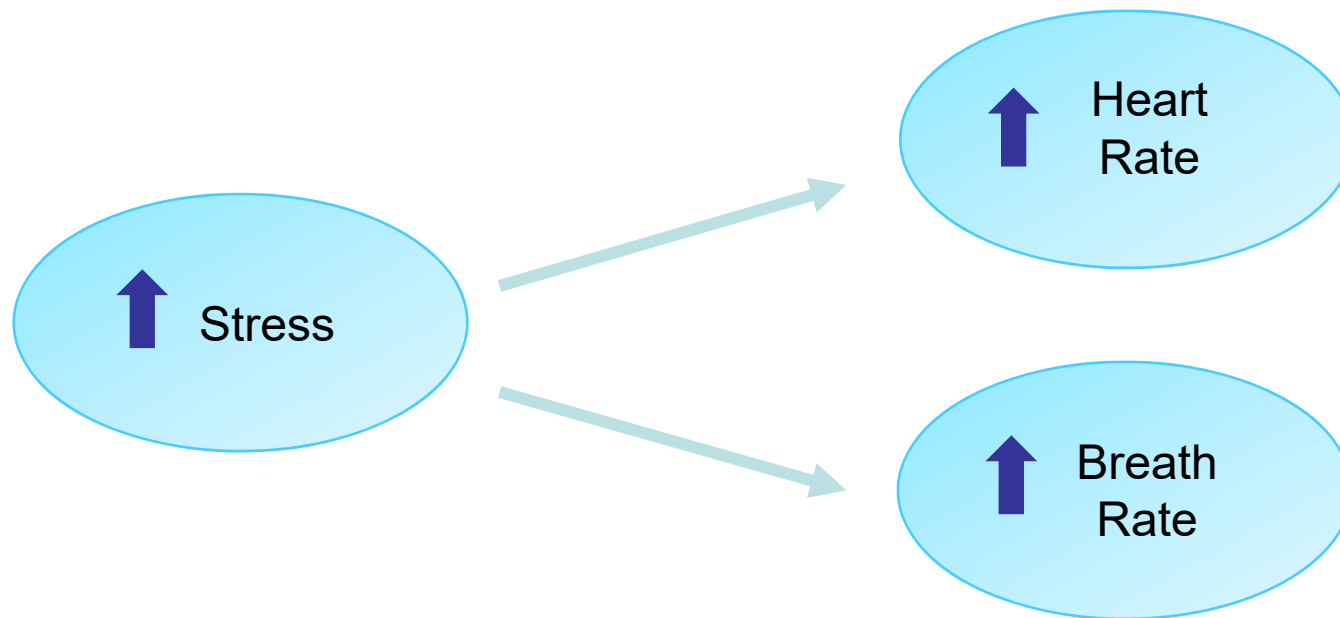


Heart Rate Variability

- Ultimately
 - High HRV is a positive health indicator [8,9]
 - Thus it is associated with a decreased risk of cardiovascular disease
 - Low HRV is associated with a physiological stress response [8]



Heart Rate and Breath Rate





Gaps in the Literature

- Longer duration
- While on shift
- Lack of HRV data
 - HRV is an important indicator of health in this population!



Purpose

- The purpose of this pilot study is to identify physiological responses to calls experienced during 24-hour shifts among Thunder Bay Fire Rescue firefighters.



Hypothesis

- Disturbed sleep results in increased stress [5,10]
- Stress is associated with decreased HRV [7,8]
- Therefore, after awakening in response to a call, firefighter HRV will decrease



Methods

- Study design
 - Pilot study
- Sampling and Recruitment
 - Convenience Sample
 - $n=5$
- Data Collection
 - Zephyr Bioharness
 - Activity Diaries/Call Logs



Methods

- Data Processing
 - Primary response area call (PRAC)
 - Secondary response area call (SRAC)
- Statistical Analysis
 - Data was analyzed pre and post-call
 - Descriptive statistics were obtained



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Results



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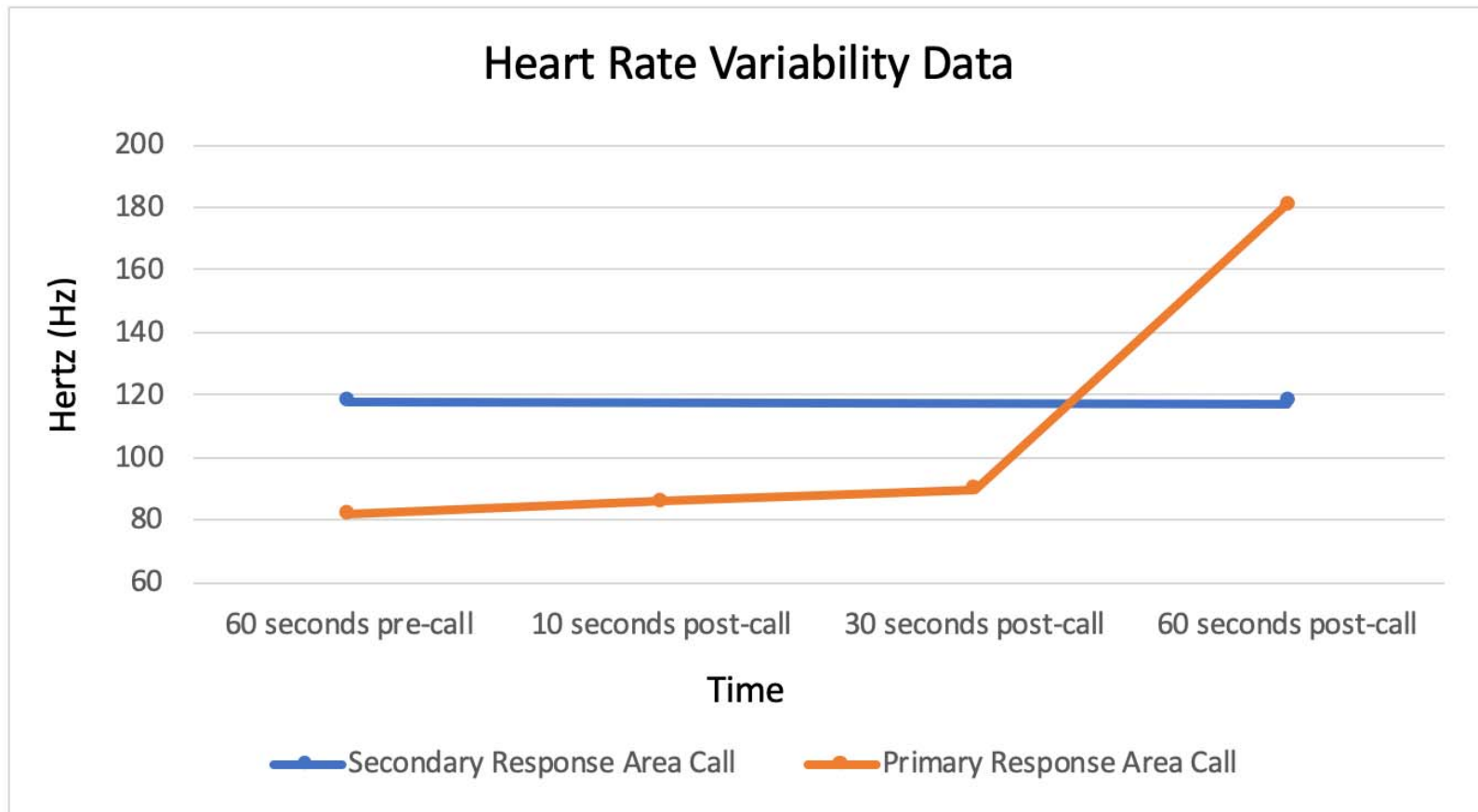


Figure 1: HRV averaged data across SRACs and PRACs



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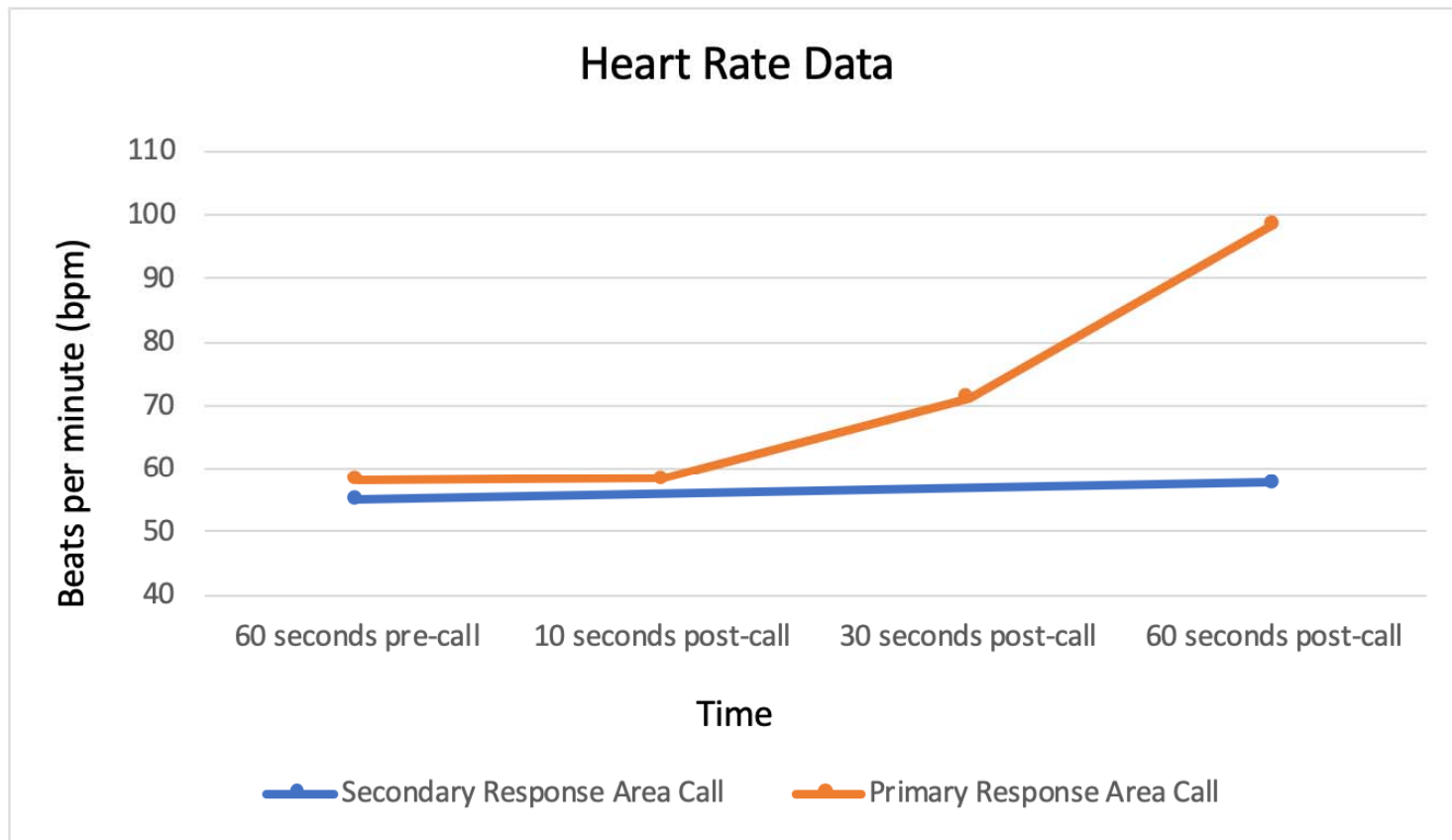


Figure 2: HR averaged data in SRACs and PRACs



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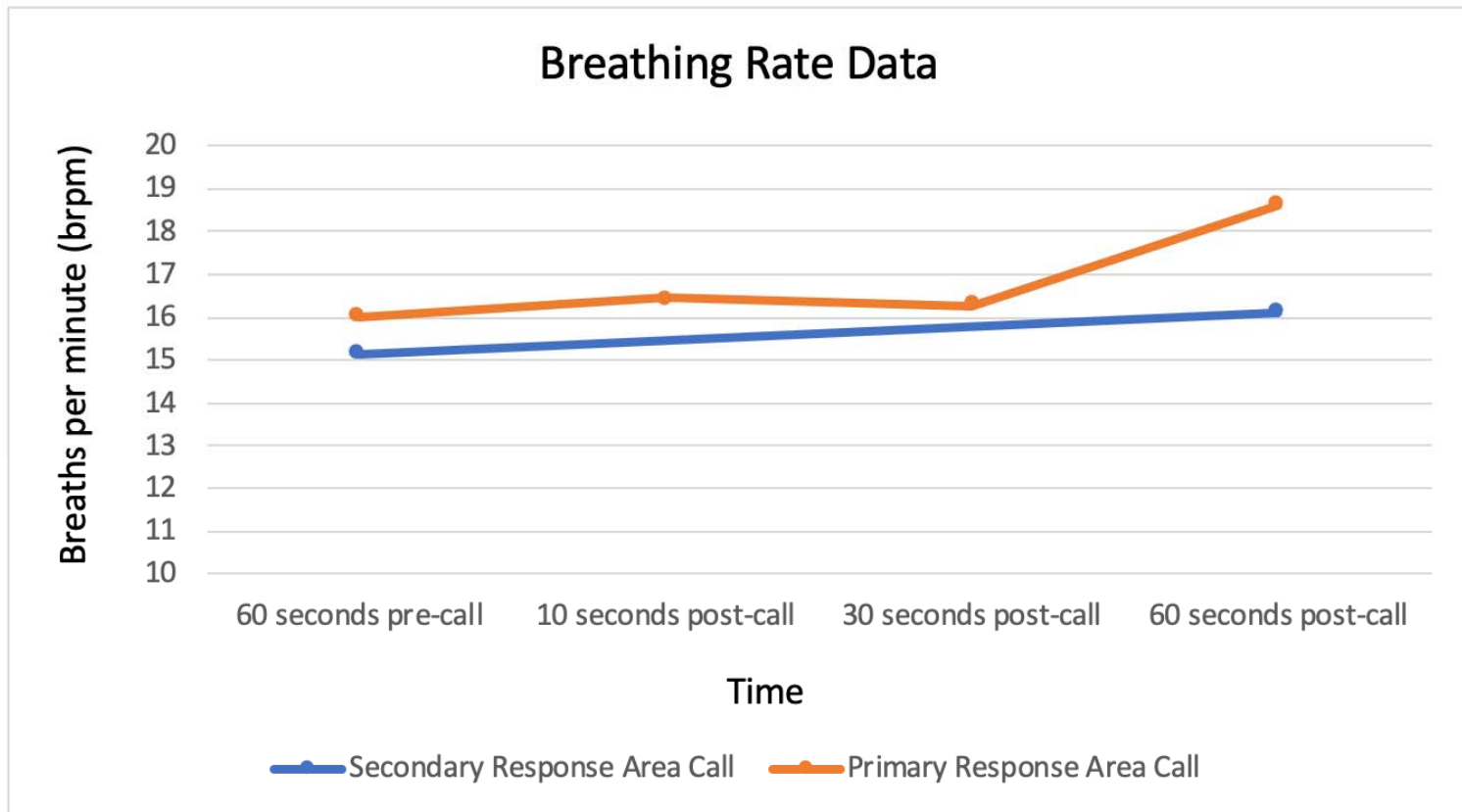


Figure 3: BR averaged data in SRACs and PRACs



Discussion

- HRV
 - It was expected that HRV should decrease with stress and disturbed sleep [11]
 - HRV increased with calls requiring response
 - In SRACs, there was a variability in HRV response
- HR
- BR



Clinical Implications

- HRV is an important clinical indicator [3,4]
- Physiotherapy role
 - Education
 - Injury prevention
 - Exercise programs



Conclusion

- SRACs
 - Impact on policy for creating hall-specific alarms
- PRACs
 - Firefighters may have a well-trained ability to react to emergency situations



Limitations

- Small sample size
 - Unable to run comparative statistics
- Based only in Thunder Bay



Future Directions

- Sex differences
- Stratifications across age, fitness levels and years of firefighting experience
- Impact of region-wide alarms and disrupted sleep
- Impact in other professions involving 24-hour



Acknowledgements

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References

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