

# Variable Physiological Responses to Acute Intermittent Hypoxia in Healthy Participants



NORTHWESTERN UNIVERSITY

Mark A Hoggarth PT DPT PhD<sup>1</sup>; Kendall Fosse SPT<sup>1</sup>; William Lindstrom SPT<sup>1</sup>; Alison Adaniya SPT<sup>1</sup>; Benjamin Carter SPT<sup>1</sup>; Christopher Swen Shaw SPT<sup>1</sup>; Alexander Barry MS<sup>2</sup>; Gregory E.P. Pearcey PhD<sup>1,2</sup>; Jennifer Marie Ryan PT DPT MS CCS<sup>1</sup>; Molly G Bright, DPhil<sup>1,3</sup>

- 1) Department of Physical Therapy and Human Movement Sciences, Northwestern University, Chicago, IL
- 2) Shirley Ryan AbilityLab, Chicago, IL
- 3) McCormick School of Engineering, Northwestern University, Evanston, IL



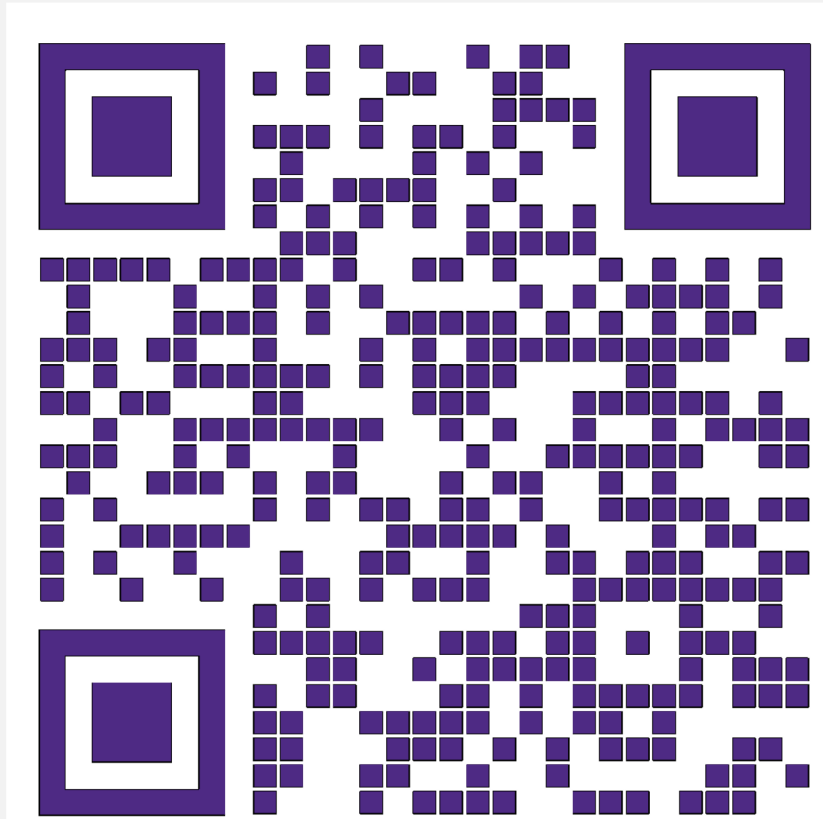
## Introduction

- Individual responses are varied during acute intermittent hypoxia (AIH) interventions
- Current AIH protocols vary greatly between studies
- Little is known about the effects of physiologic and conscious factors when delivering hypoxia

## Methodology

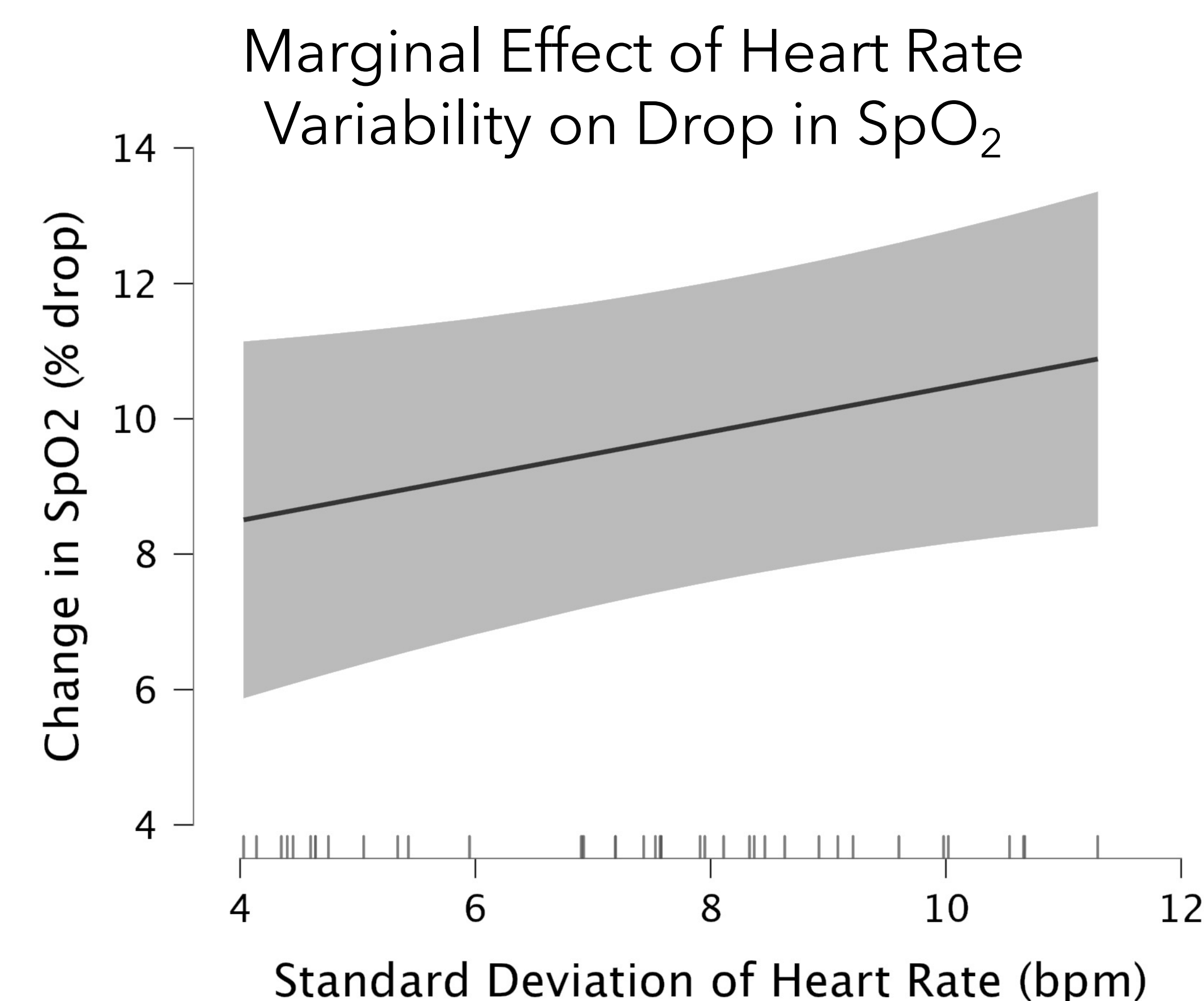
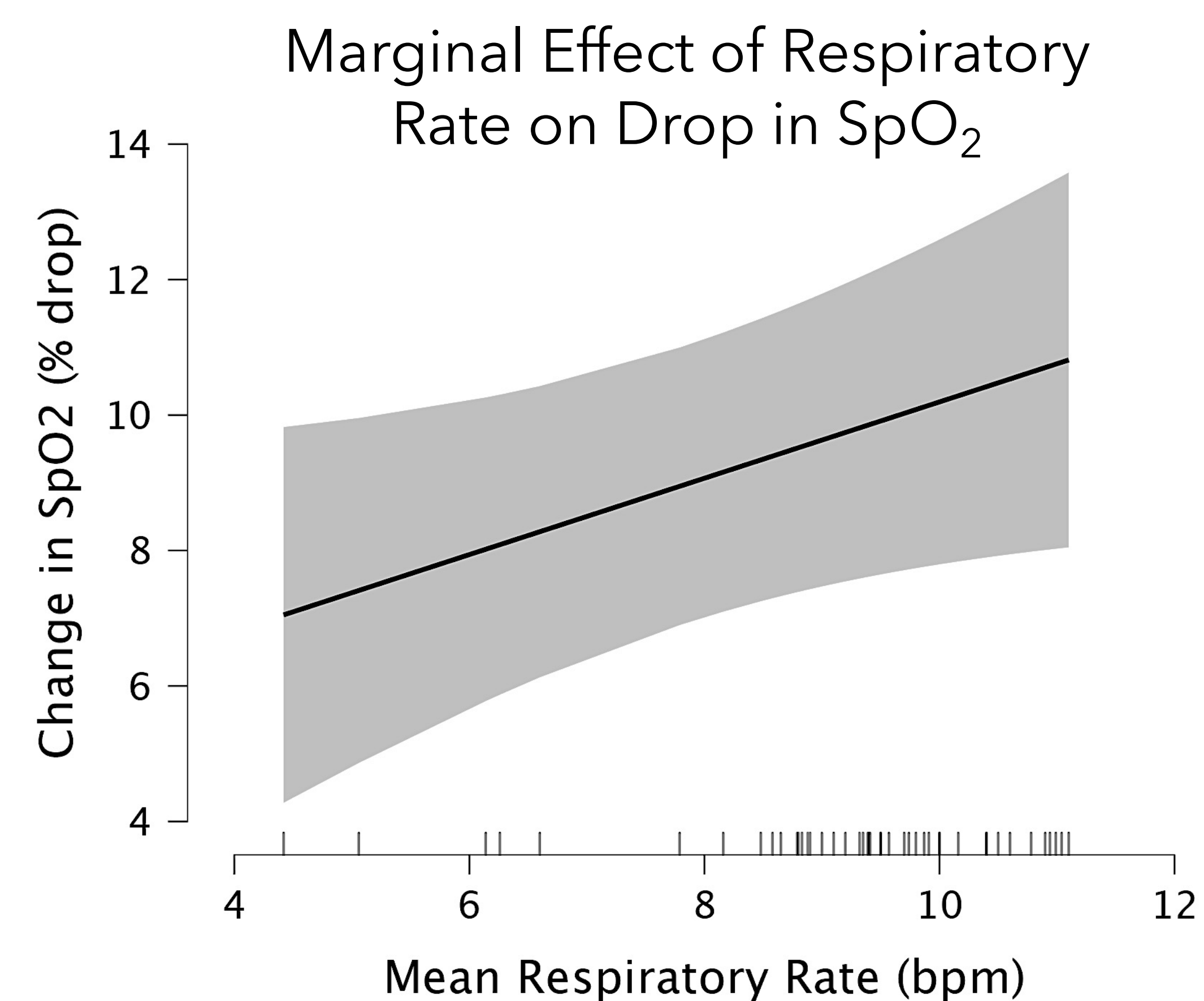
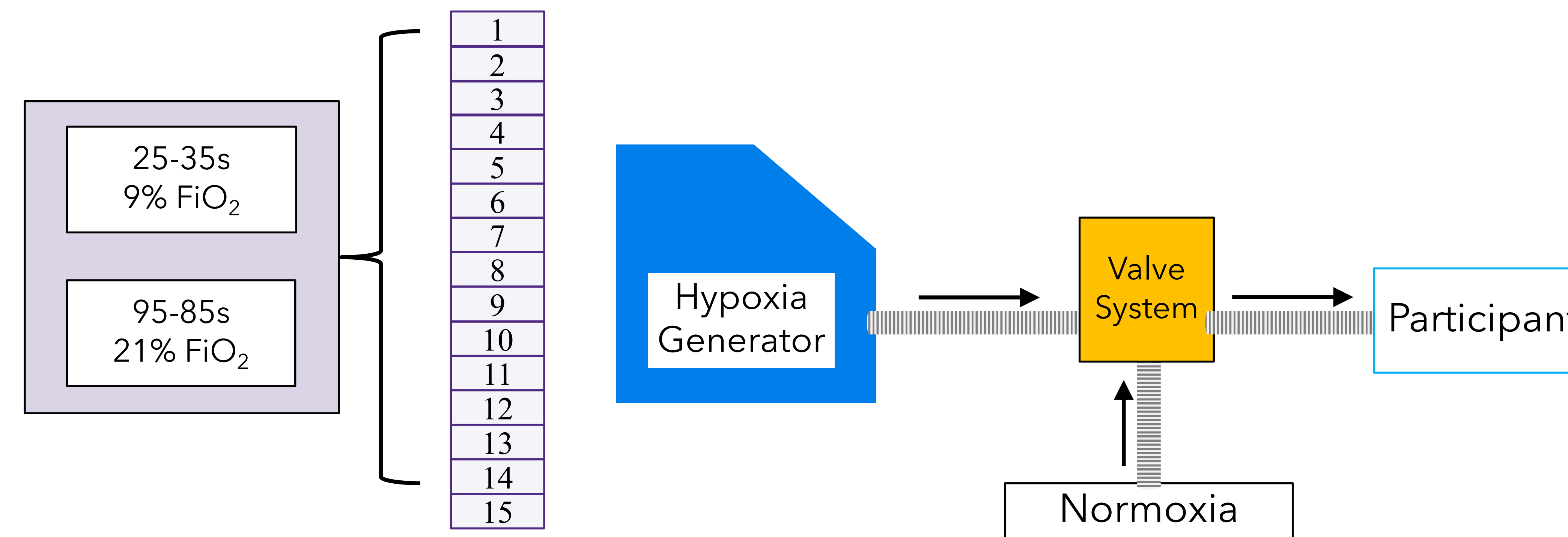
- Healthy participants (N=3) were given a 30 min AIH intervention:
  - 15 alternating bouts of hypoxia and normoxia in 2 min blocks
  - Hypoxia: 25-35 sec at 9.5% O<sub>2</sub>
  - Normoxia: 95-85 sec at 20.9% O<sub>2</sub>
- Physiologic signals measured:
  - SpO<sub>2</sub>
  - Cardiac pressure wave
  - Relative respiratory movement
  - End-tidal partial pressures of oxygen (P<sub>ET</sub>O<sub>2</sub>)
- A linear regression model of change in SpO<sub>2</sub> was created:
  - Participants as factors
  - Physiologic measures as covariates

Want to know more?  
Come check out our lab.



# Respiratory rate and heart rate variability may predict SpO<sub>2</sub> response to Acute Intermittent Hypoxia.

## Experimental Protocol: Acute Intermittent Hypoxia



## Results

- A regression equation was found:
  - $F(7,37) = 2.45$
  - $p = 0.036$
  - $R^2 = 0.317$
- Factors that may influence SpO<sub>2</sub> change:
  - Hypoxia duration
  - Mean respiratory rate
  - Heart rate variability

## Discussion

- Future work is needed to better characterize relationships between:
  - Participant physiology
  - Duration of hypoxia exposure
  - SpO<sub>2</sub> response
- Respiratory rate is a *volitional* factor that could be controlled to improve consistency in SpO<sub>2</sub> response to AIH
- This study does **not** comment on what target SpO<sub>2</sub> values should be for a given therapeutic outcome.
- Continued work is necessary to better understand hypoxia duration in AIH protocols when targeting a therapeutic effect.

## Conclusion

*Continued work is necessary to better understand hypoxia duration in AIH protocols when targeting a therapeutic effect.*