NEW YORK INSTITUTE OF TECHNOLOGY
College of Osteopathic Medicine

Assessing Physiological Differences After Practice in eSports Players: A Pilot Study

Abstract

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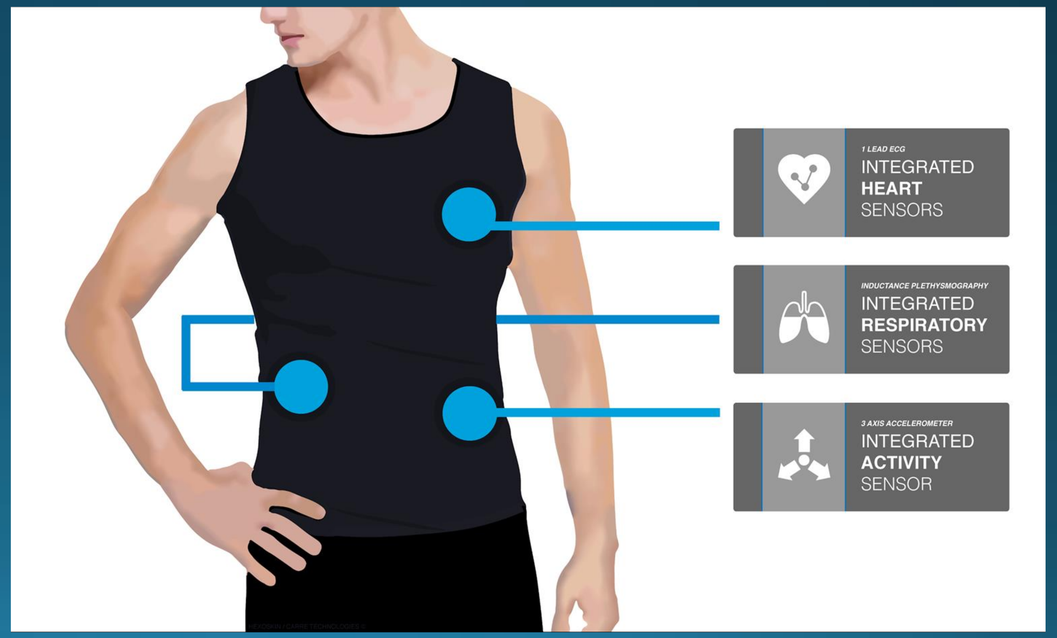

TAP TO GO BACK TO KIOSK MENU

Assessing Physiological Differences After Practice in eSports Players

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ABSTRACT

STATEMENT OF SIGNIFICANCE: Many colleges now have a collegiate eSports team in addition to conventional sports. eSport players, like traditional athletes, often practice for long hours and thus are vulnerable to negative health effects. However, there is a lack of research on the health of these players, such as potential physiological changes during gameplay. These changes can be an indicator of the players' health, and can help coaches and doctors determine when an intervention is necessary. For example, if players experience eye strain after two hours of practice, then they may need a break at that time. Osteopathic medicine recognizes the importance of monitoring these conditions to ensure that they do not affect the players' performance when practicing.

HYPOTHESES:

- Primary hypothesis: There will be a difference in heart rate, respiratory rate, blood pressure, and eye strain before and after one and two hours of gameplay.
- Secondary hypothesis: There will be a difference between heart rate variability, peak heart rate, and respiratory rate variability during practice between players who practiced for one hour and for two hours.

METHODS: A total of 8 male subjects (age 18-22 years) participated. 4 subjects played eSports games for 2 hours and were compared to another group of 4 subjects playing games for 1 hour. Some outcome variables, such as heart rate (HR), blood pressure (BP), respiratory rate (RR), and digital eye strain (DES), were measured pre-gameplay and post-gameplay. For the remaining variables (heart rate variability, respiratory rate variability, and peak heart rate), subjects wore HexoSkin shirts which continuously recorded data throughout gameplay.

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ABSTRACT (cont.)

DATA ANALYSIS: These outcomes were measured as markers of stress. A two-way paired t-test ($p < 0.05$) was conducted to analyze and compare outcomes pre and post gameplay within each group. A two-way independent t-test with equal variance ($p < 0.05$) was used to compare physiological markers during gameplay between both groups.

RESULTS:

- Primary hypothesis: After one hour of practice, there was no significant difference in heart rate ($p = 0.916$), respiratory rate ($p = 0.383$), systolic BP ($p = 0.735$), diastolic BP ($p = 0.878$), and visual acuity ($p = 0.220$). Similarly, after two hours of practice, there was no significant difference in HR ($p = 0.581$), RR ($p = 0.500$), systolic BP ($p = 0.069$), diastolic BP ($p = 0.089$), and visual acuity ($p = 1.000$).

- Secondary hypothesis: There was no significant difference between the one-hour and two-hour groups in heart rate variability ($p = 0.300$) and peak heart rate ($p = 0.246$). However, there was a significant difference in respiratory rate variability ($p = 0.033$).

CONCLUSION: The results of this pilot study suggests that even after two hours of practice, there were no changes in the players' vital signs except for respiratory rate variability. In reality, eSports players often practice far longer than two hours, which could result in changes to their physiology and is something that a future experiment can investigate.

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INTRODUCTION

- eSports (electronic sports) is an industry involving competitive video game tournaments in which players compete against each other, similar to traditional sport leagues such as FIFA or the NBA.
- eSports tournaments can involve many different video game genres, including first-person shooters, digital card games, multiplayer online battle arenas (MOBAs) and battle royales.
- Since eSports is relatively new, there is a lack of research on the physical and mental health of these individuals post gameplay.
- The purpose of this pilot study is to assess whether players showed changes in vital signs such as blood pressure and visual acuity, after one and two-hour practice sessions. These physiological changes can be an indicator of the players' health, and can help coaches and doctors determine when an intervention is necessary.

Osteopathic medicine recognizes the importance of monitoring these conditions to ensure that they do not affect the players' performance when practicing. Given that eSports is continuing to grow, it is critical to understand the physical and mental health demands of players, and how to best accommodate them.

STUDY DESIGN

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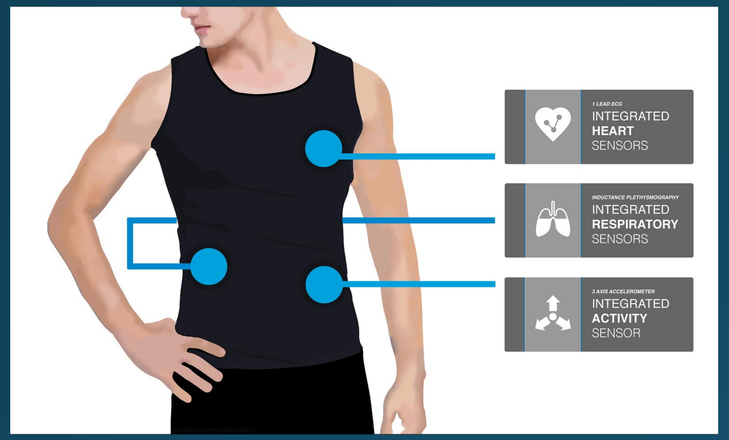
HexoSkin



- **Inclusion:** Individuals 18-23 years old that played games competitively.
- **Exclusion:** Students that did not play video games competitively.

This pilot, prospective observational cohort study (n = 8) was conducted at the NYIT College of Osteopathic Medicine. It was approved by the NYIT Internal Review Board and all subjects signed consent forms to participate. Inclusion criteria included NYIT students that played video games competitively. Exclusion criteria included students that did not play video games competitively.

8 subjects participated in this study. Subjects were recruited from the New York Institute of Technology College of Osteopathic Medicine. Data was collected from April to June 2019.

Hexoskin

- Technologically enhanced shirt that can measure physiological variables using conductive nodes within the shirt.
- Measures heart rate variability, peak heart rate, and respiratory rate variability during gameplay.

Vital Signs

- Manually measured heart rate, respiratory rate, blood pressure, and visual acuity before and after gameplay.

METHODS

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Statistical Methods:

- Primary Hypothesis: two-way paired t-test ($p < 0.05$)
- Secondary hypothesis: two-way, independent t-test with equal variances ($p < 0.05$)

Heart rate: Before and after practice, heart rate was measured manually. During practice, participants wore a Hexoskin suit that calculated the heart rate variability and the peak heart rate.

Blood pressure: A Welsh-Allen sphygmomanometer was used to measure blood pressure prior to and post gameplay.

Respiratory rate: Before and after practice, respiratory rate was measured manually. During practice, the Hexoskin suit measured respiratory rate variability.

Digital eye strain: Participants looked at a pocket Snellen eye chart, which was held 14 inches away, before and after gameplay.

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RESULTS

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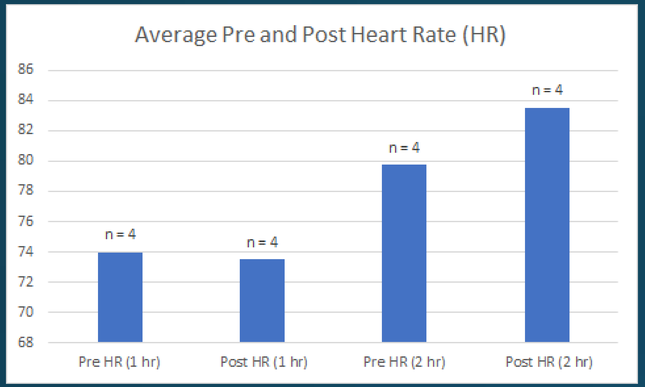

Figure 1. Comparison of heart rate (click image to enlarge)

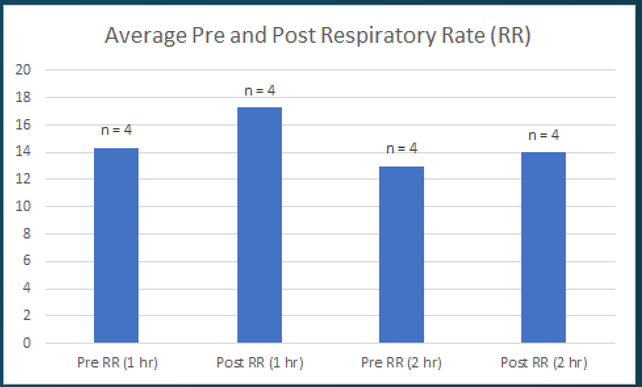

Figure 2: Comparison of respiratory rate (click image to enlarge)

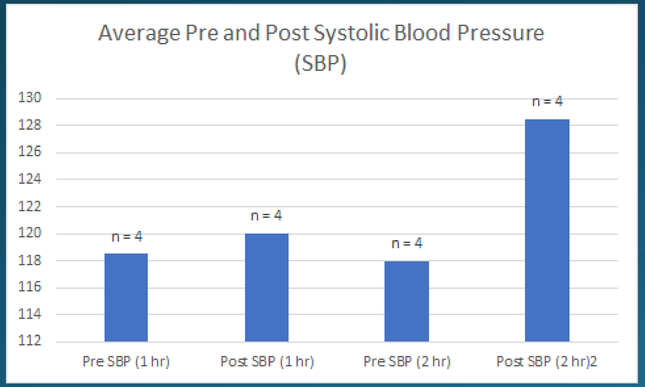

Figure 3: Comparison of systolic blood pressure (click image to enlarge)

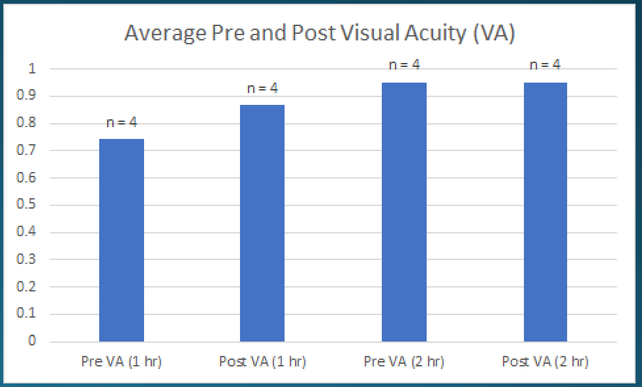

Figure 4: Comparison of visual acuity (click image to enlarge)

CONCLUSIONS FOR PRIMARY HYPOTHESIS

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- For players who practiced for one hour, there was no significant difference before and after practice in heart rate (p = 0.916, 73.75 bpm +/- 6.798), respiratory rate (p = 0.383, 15 breaths per minute +/- 1.265), systolic blood pressure (p = 0.735, 119.25 mmHg +/- 7.479), diastolic blood pressure (p = 0.878, 73.25 mmHg +/- 4.132), and visual acuity (p = 0.220, 0.803 +/- 0.189).

- For players practicing for two hours, there was also no significant difference pre- and post-practice in heart rate (p = 0.581, 81.625 bpm +/- 6.368), respiratory rate (p = 0.500, 13.5 breaths per minute +/- 1), systolic blood pressure (p = 0.069, 123.5 mmHg +/- 8.812), diastolic blood pressure (p = 0.089, 83.125 mmHg +/- 7.019), and visual acuity (p = 1.00, 0.950 +/- 0.093).

- Using descriptive statistics, players who practiced for two hours tended to have a higher heart rate, blood pressure, and visual acuity score than those who practiced for one hour. The average post-practice respiratory rate was lower in the two hour practice group.

CONCLUSIONS FOR SECONDARY HYPOTHESIS

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- There was no significant difference between the one-hour group and two-hour group in heart rate variability ($p = 0.300$, 70.265 bpm +/- 30.863) and peak heart rate ($p = 0.246$, 130.375 bpm +/- 27.333).
- However, there was a significant difference in respiratory rate variability ($p = 0.033$, 47.375 +/- 18.431 breaths per minute).
- Using descriptive statistics, players practicing for two hours had a greater heart rate variability and higher peak heart rate, but a lower respiratory rate variability, compared to those who practiced for one hour.

CONCLUSIONS (cont.), FUTURE DIRECTIONS

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Even though eSports players remain sedentary when playing video games, it is possible that they experience changes in their physiology. The results of this pilot study suggests that even after two hours of practice, there were no changes in the players' vital signs except for respiratory rate variability. One of the reasons for the large range in respiration is that some players talked frequently to teammates when practice (especially for multiplayer games), whereas others talked less or not at all.

In reality, eSports players often practice far longer than two hours, which could result in changes to their physiology and is something that a future experiment can investigate. In addition, players in this study practiced playing games without a lot of pressure. If they were to play video games in a tournament, though, then they may experience significant amounts of stress and pressure. This environment could also cause changes in their physiology, and is another area for investigation.

Future Directions

- Increase sample size
- Increase gameplay time
- Stratify by game type

REFERENCES

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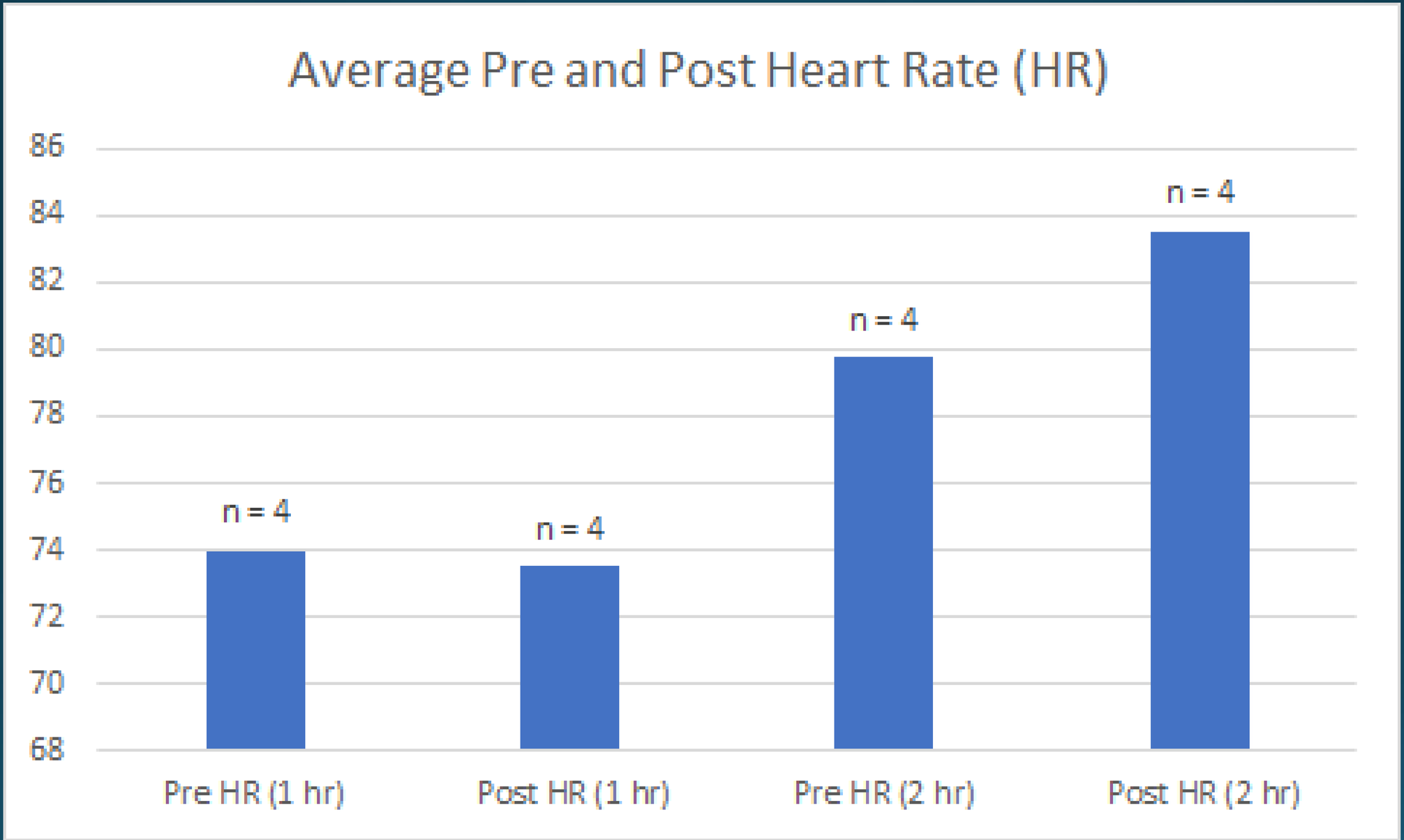
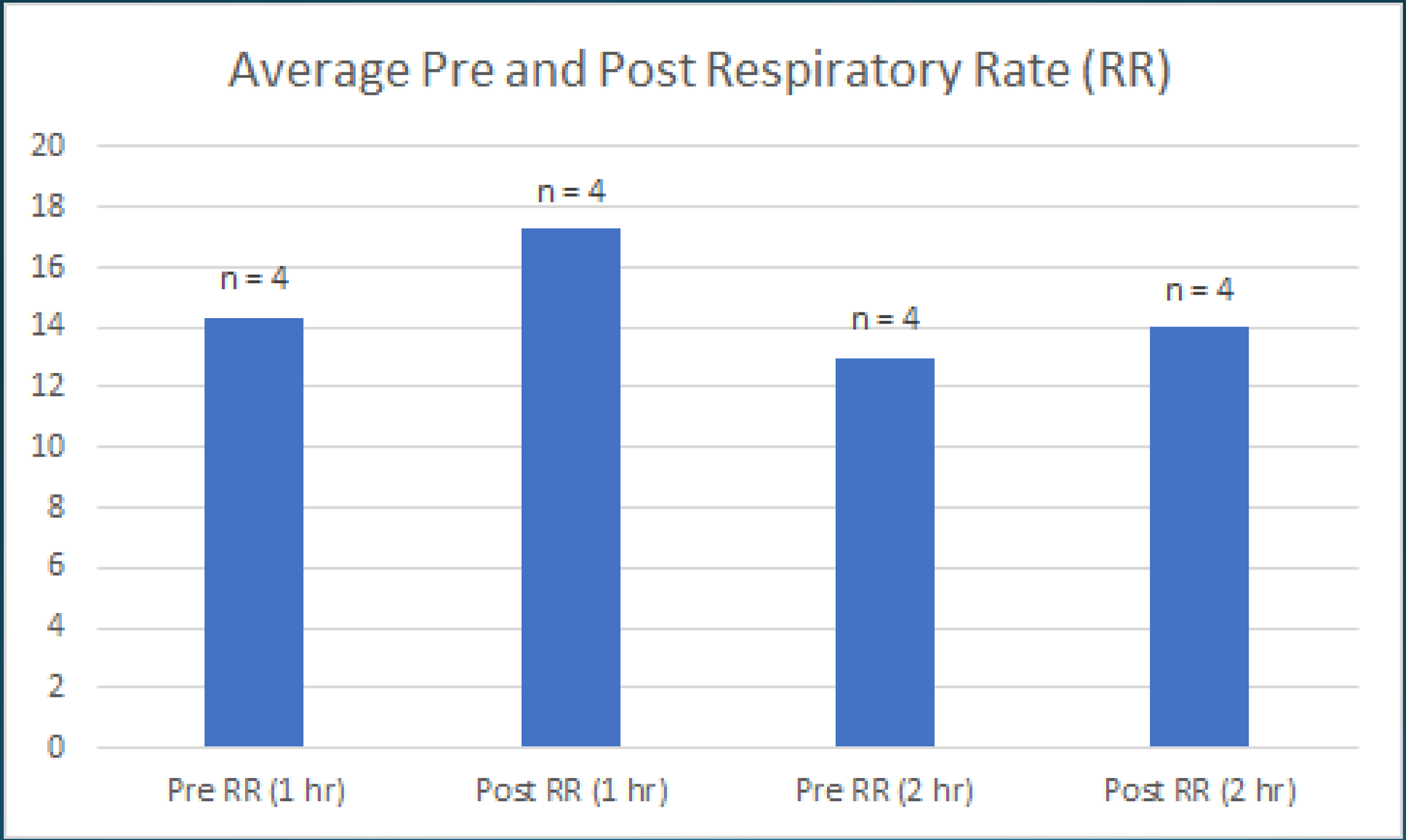
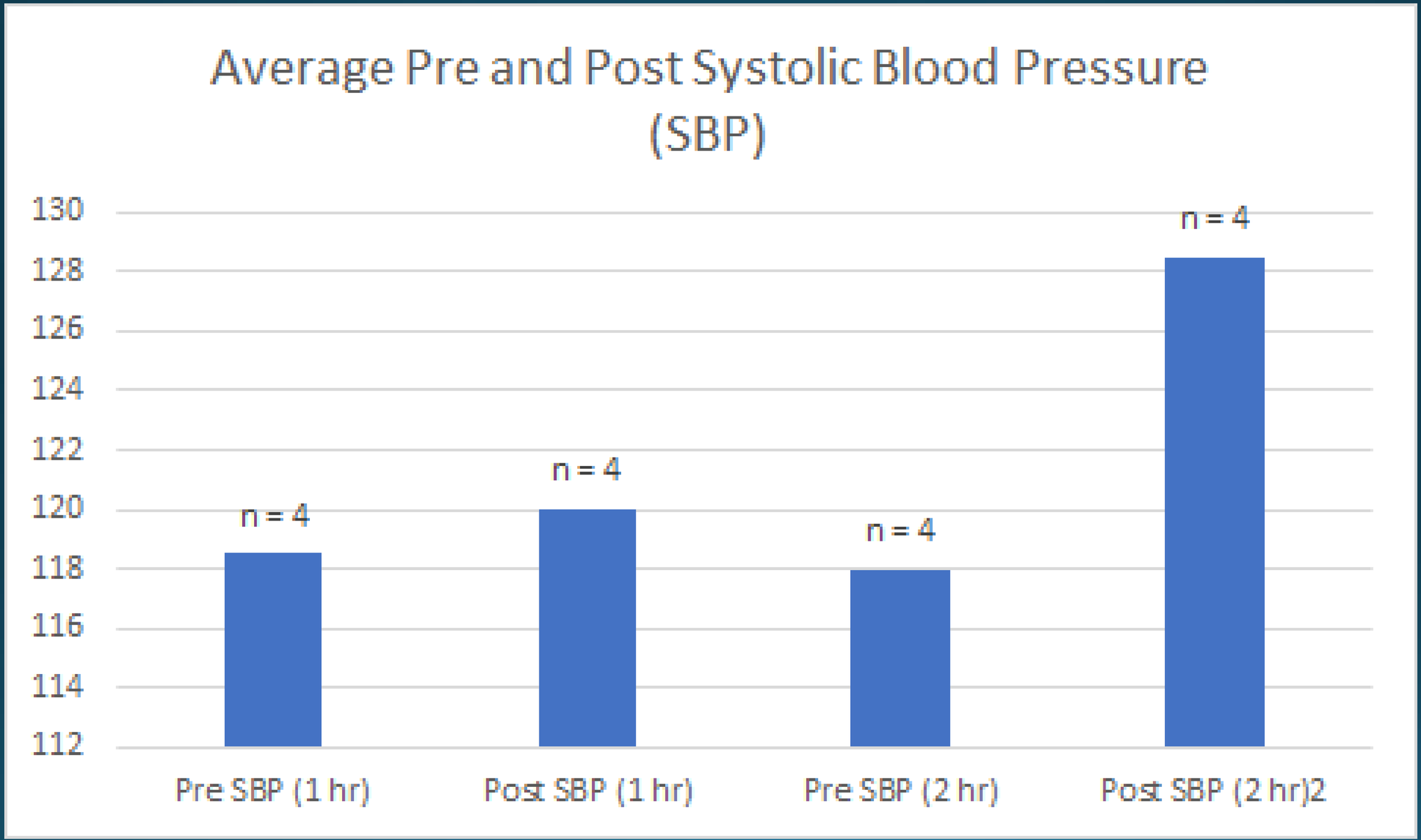
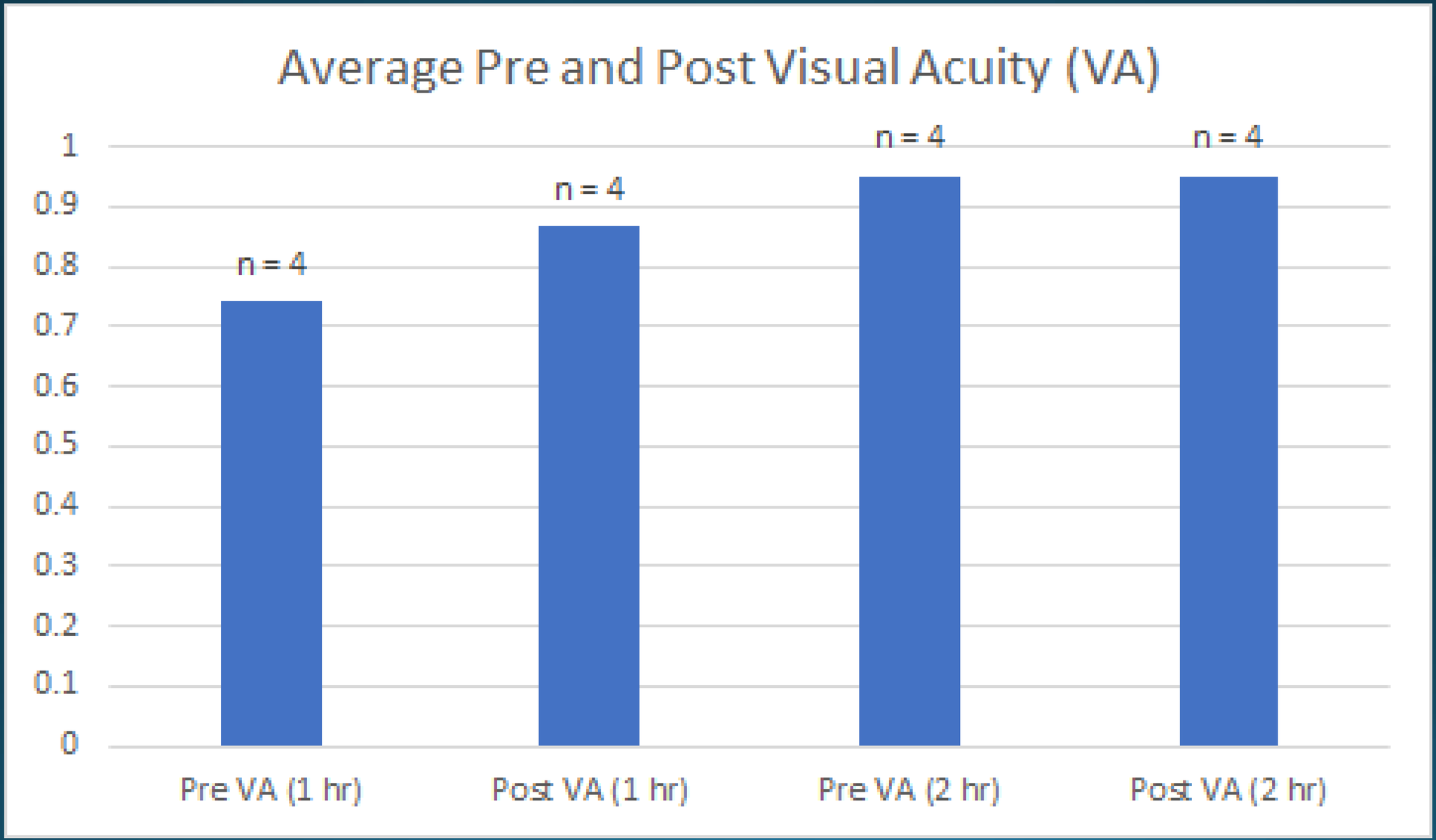
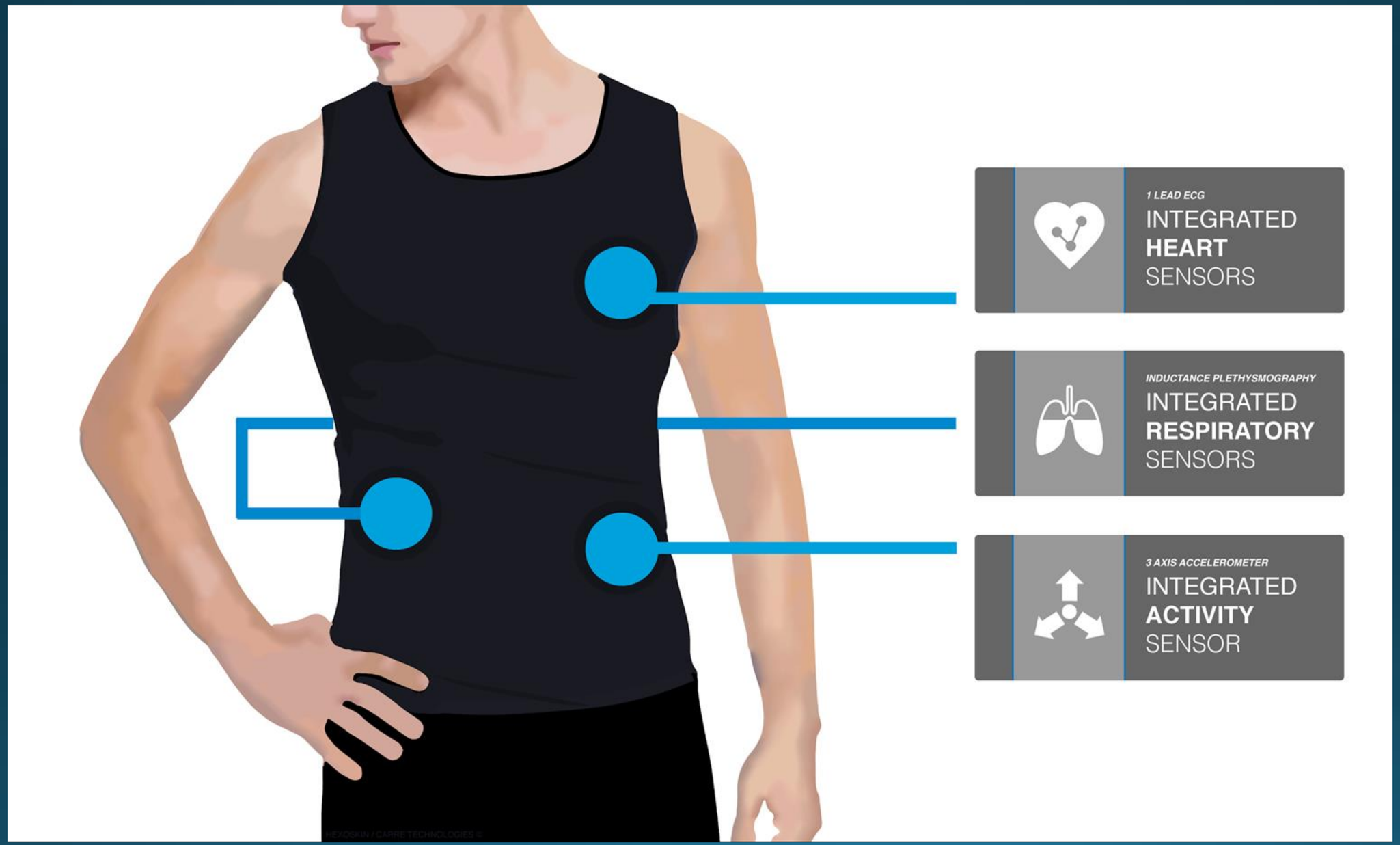
Smith MJ, Birch PD, Bright D. Identifying Stressors and Coping Strategies of Elite Esports Competitors. International Journal of Gaming and Computer-Mediated Simulations (IJGCMS). 1;11(2):22-39. Published April 2019.


Average Pre and Post Heart Rate (HR)
86
84
82
80
78
76
74
72
70
68
n = 4
n = 4
n = 4
n = 4
Pre HR (1 hr)
Post HR (1 hr)
Pre HR (2 hr)
Post HR (2 hr)


Average Pre and Post Respiratory Rate (RR)
20
18
16
14
12
10
8
6
4
2
0
n = 4
n = 4
n = 4
n = 4
Pre RR (1 hr)
Post RR (1 hr)
Pre RR (2 hr)
Post RR (2 hr)


Average Pre and Post Systolic Blood Pressure (SBP)
130
128
126
124
122
120
118
116
114
112
n = 4
n = 4
n = 4
n = 4
Pre SBP (1 hr)
Post SBP (1 hr)
Pre SBP (2 hr)
Post SBP (2 hr)2


Average Pre and Post Visual Acuity (VA)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
n = 4
n = 4
n = 4
n = 4
Pre VA (1 hr)
Post VA (1 hr)
Pre VA (2 hr)
Post VA (2 hr)


1 LEAD ECG
INTEGRATED
HEART
SENSORS
INDUCTANCE PLETHYSMOGRAPHY
INTEGRATED
RESPIRATORY
SENSORS
3 AXIS ACCELEROMETER
INTEGRATED
ACTIVITY
SENSOR


EAST COAST CONFERENCE
2019
LEAGUE OF LEGENDS
CHAMPIONS
lenovo


ROSENBAUM POCKET VISION SCREENER
95
874
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638
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3 7 4 2 5 8
9 3 7 8 2 6
distance equivalent
Point
Jaeger
26 16
14 10
10 7
8 5
6 3
5 2
4 1
3 1+
20/800
20/400
20/200
20/100
20/70
20/50
20/40
20/30
20/25
20/20
Card is held in good light 14 inches from eye. Record vision for each eye separately with and without glasses. Presbyopic patients should read thru bifocal segment. Check myopes with glasses only.
DESIGN COURTESY J.G. ROSENBAUM, M.D.
PUPIL GAUGE (mm.)
2 3 4 5 6 7 8 9