

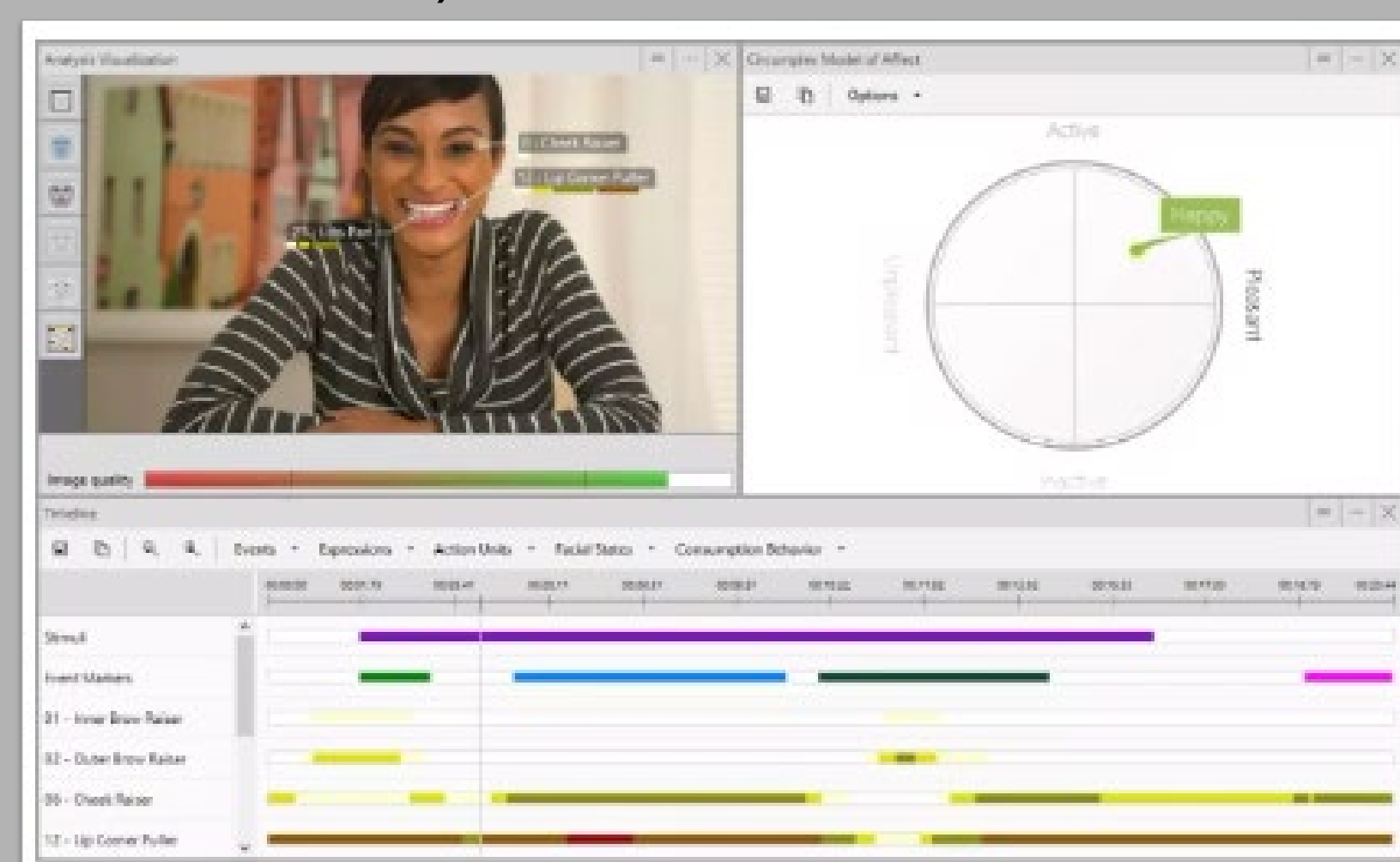
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### INTRODUCTION

Physical inactivity has been linked to increased risk of numerous clinical pathologies, including cardiovascular disease, diabetes mellitus, and certain cancers. Previous research on incentives for physical activity of patients has been focused on extrinsic factors, such as weight loss, chronic symptom reduction, and increased fertility. Newer research on incentivized exercise is focusing on intrinsic motivators such as the enjoyment of the patient's prescribed regimen. Facial analysis to determine emotional response during physical exercise is a novel concept, and has been tested minimally. Previous research using facial analysis utilized programs that require the researchers to insert emotional values for facial expressions, which is not a viable option for health care providers to use in their practice. The goal of this project was to test FaceReader software that has preset emotional values for facial analysis as a way to determine an overall positive or negative experience during incremental physical activity to determine it as a plausible option for prescribing exercise.

### METHODS

- Participants: 39 adults, divided into age groups 18-24, 25-34, 35-44, 45-54, 55-64, and 65+ years old.
- The exercise protocol involved participants performing an incremental exercise test on an indoor cycle ergometer with heart rate recorded every 2 minutes.
- Perceived exertion was rated by participants using the RPE scoring scale.
- Participants' emotional response to the exercise test was analyzed using FaceReader. Faces were continuously analyzed in real time during performance of the exercise using a camera mounted on the ergometer screen.
- All procedures in this study received approval from the OSU-CHS IRB to ensure compliance with ethical guidelines (2023024-OSU-CHS).



### RESULTS

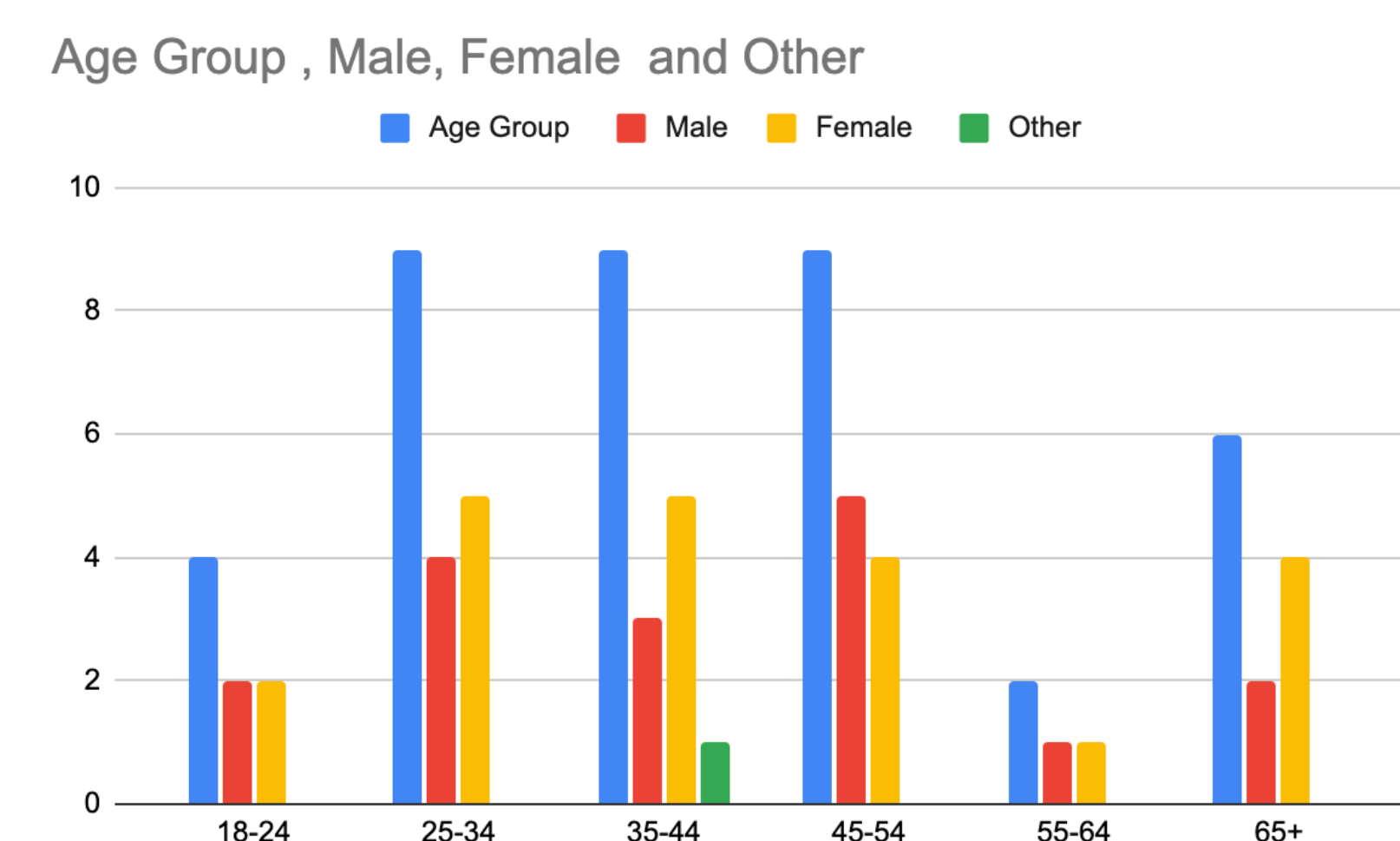


Figure 1: Number of participants per age group.

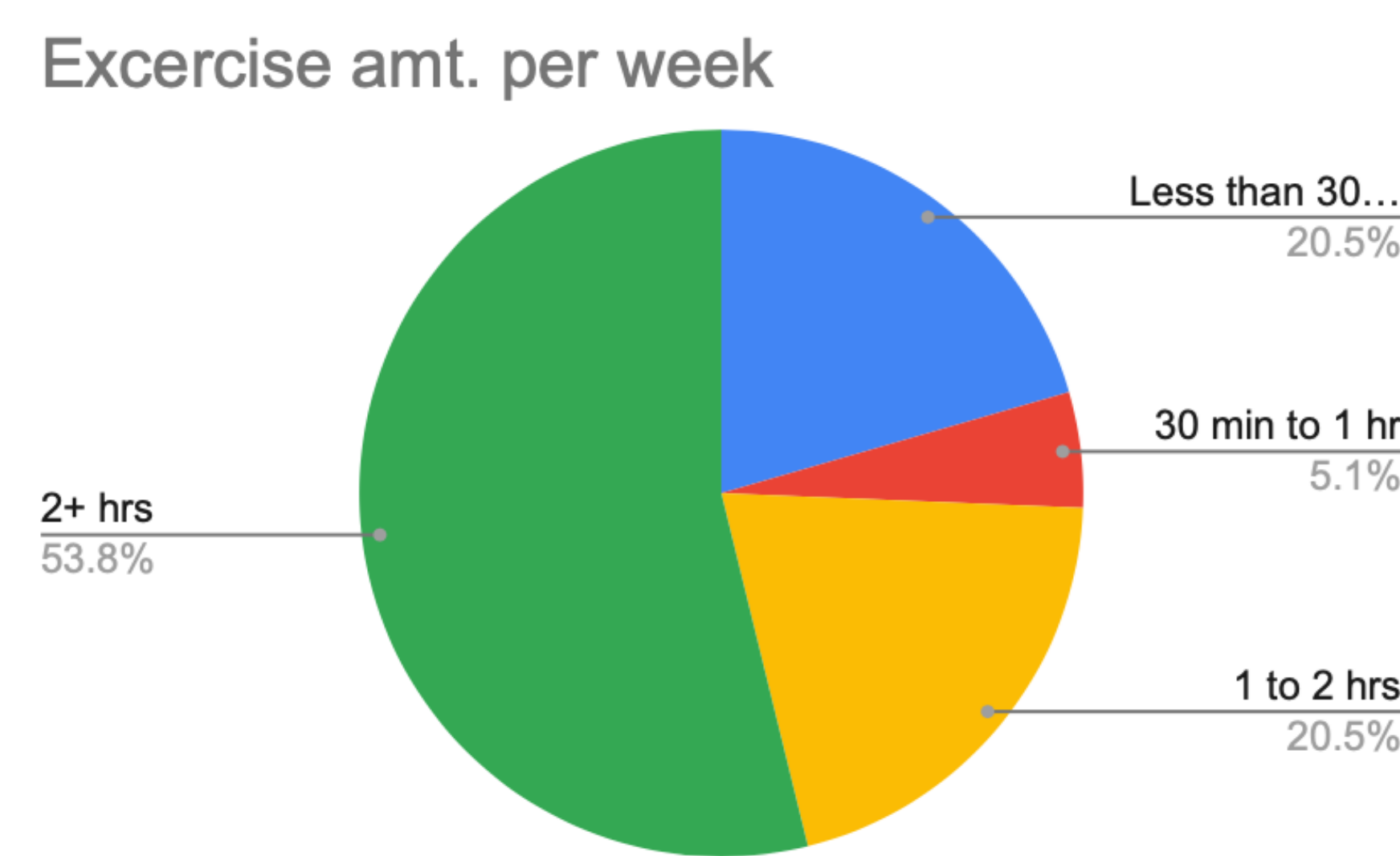


Figure 2: Participants were asked how much they exercised on average per week.

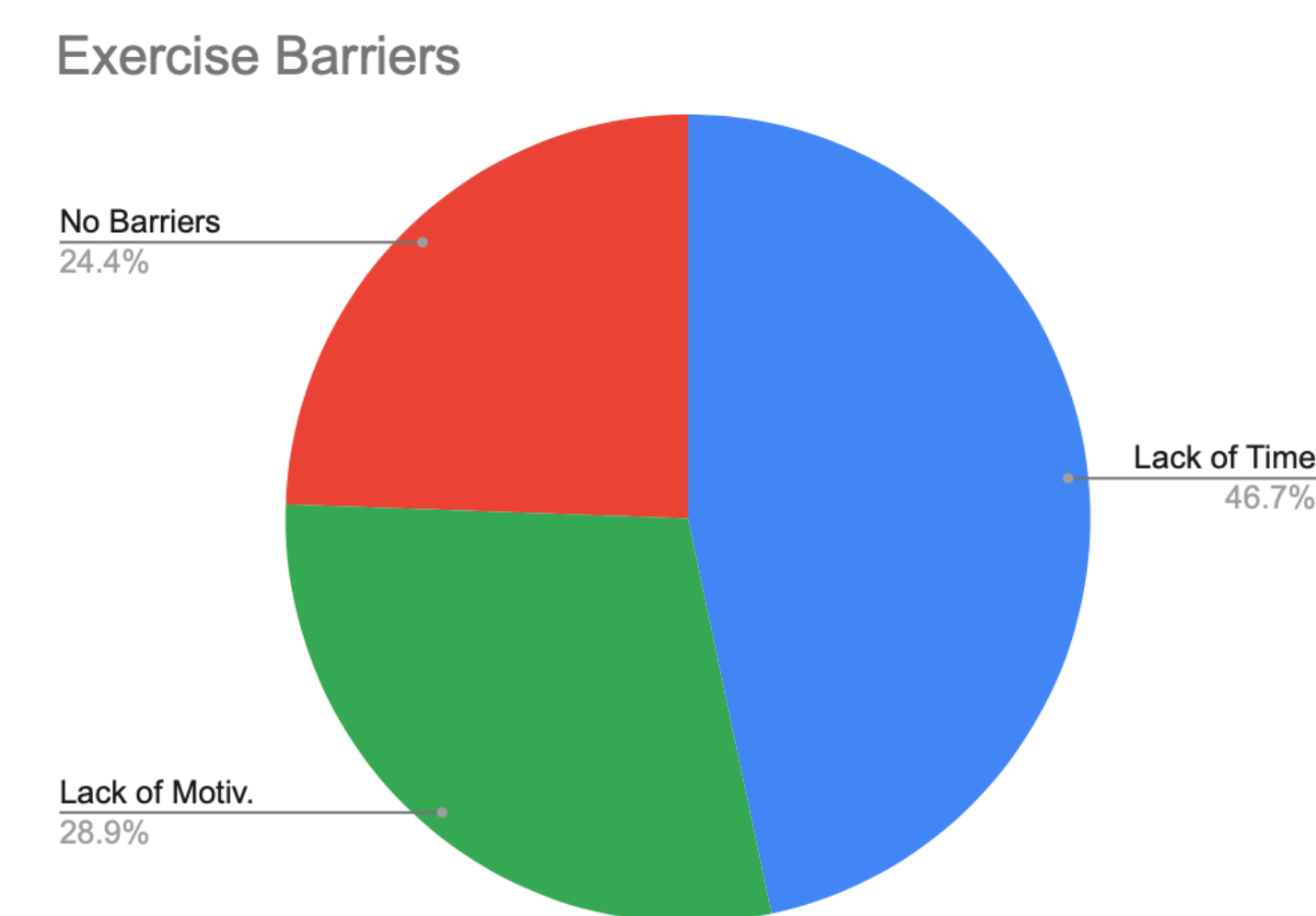


Figure 3: Participants were asked what barriers they face towards exercise.

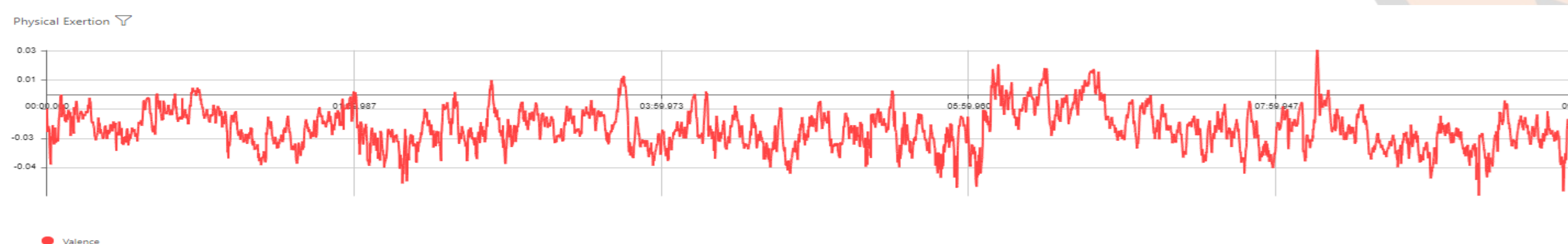


Figure 6: Valence measurement based on 20 Action Units of the Facial Action Coding System during physical activity of the Cherokee Nation cohort. Valence measurement indicates an overall positive or negative emotional value by subtracting the negative perceived emotions ('sad', 'angry', 'scared', 'disgusted') from the one perceived positive emotion ('happy').

Emotions Experienced throughout Exercise

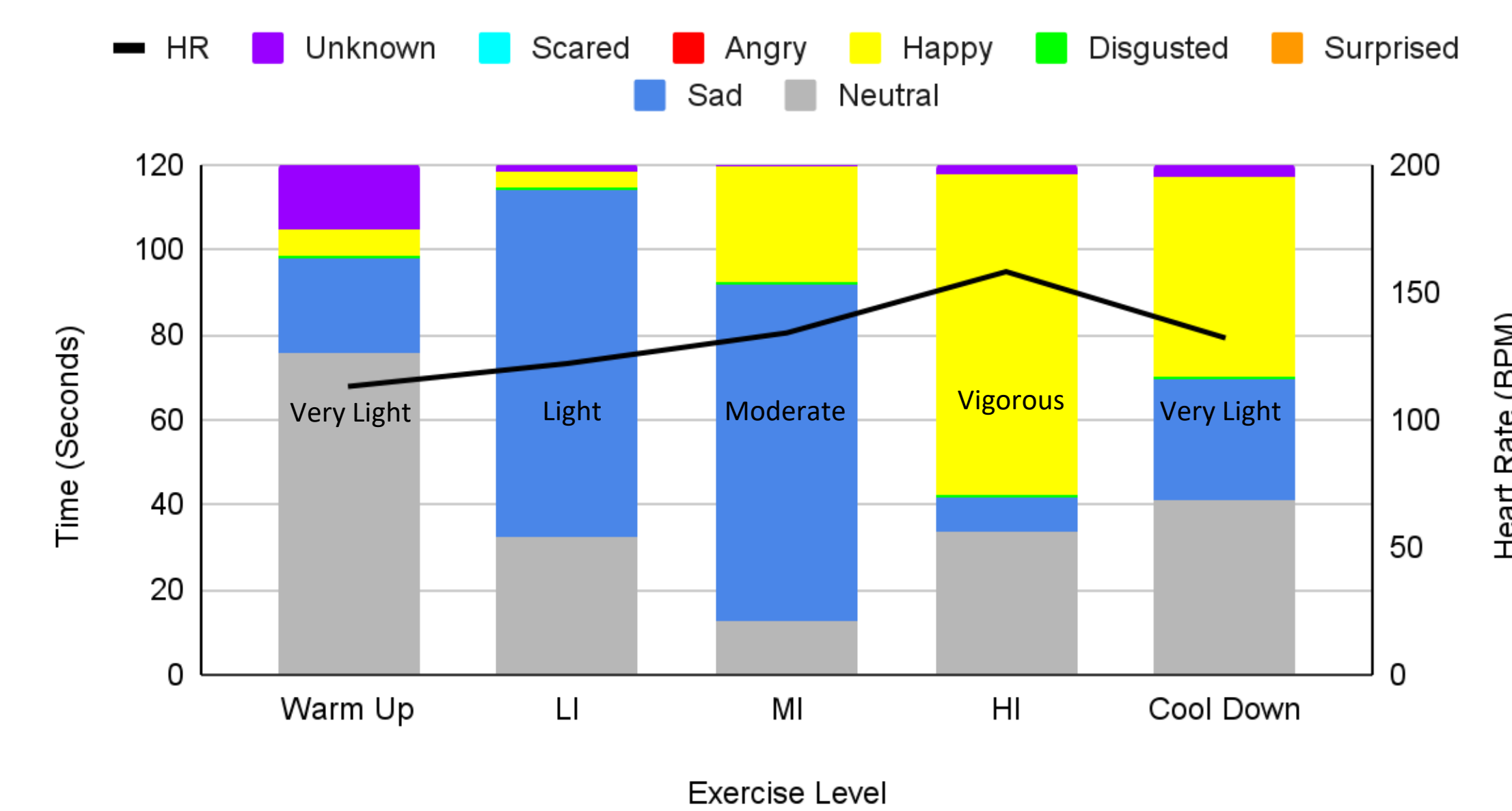


Figure 4: Emotional response, heart rate, and perceived exertion during incrementally increasing physical exercise in an experimental female participant in the 25-34 age group who regularly exercises and prefers indoor exercise.

Emotions Experienced throughout Exercise

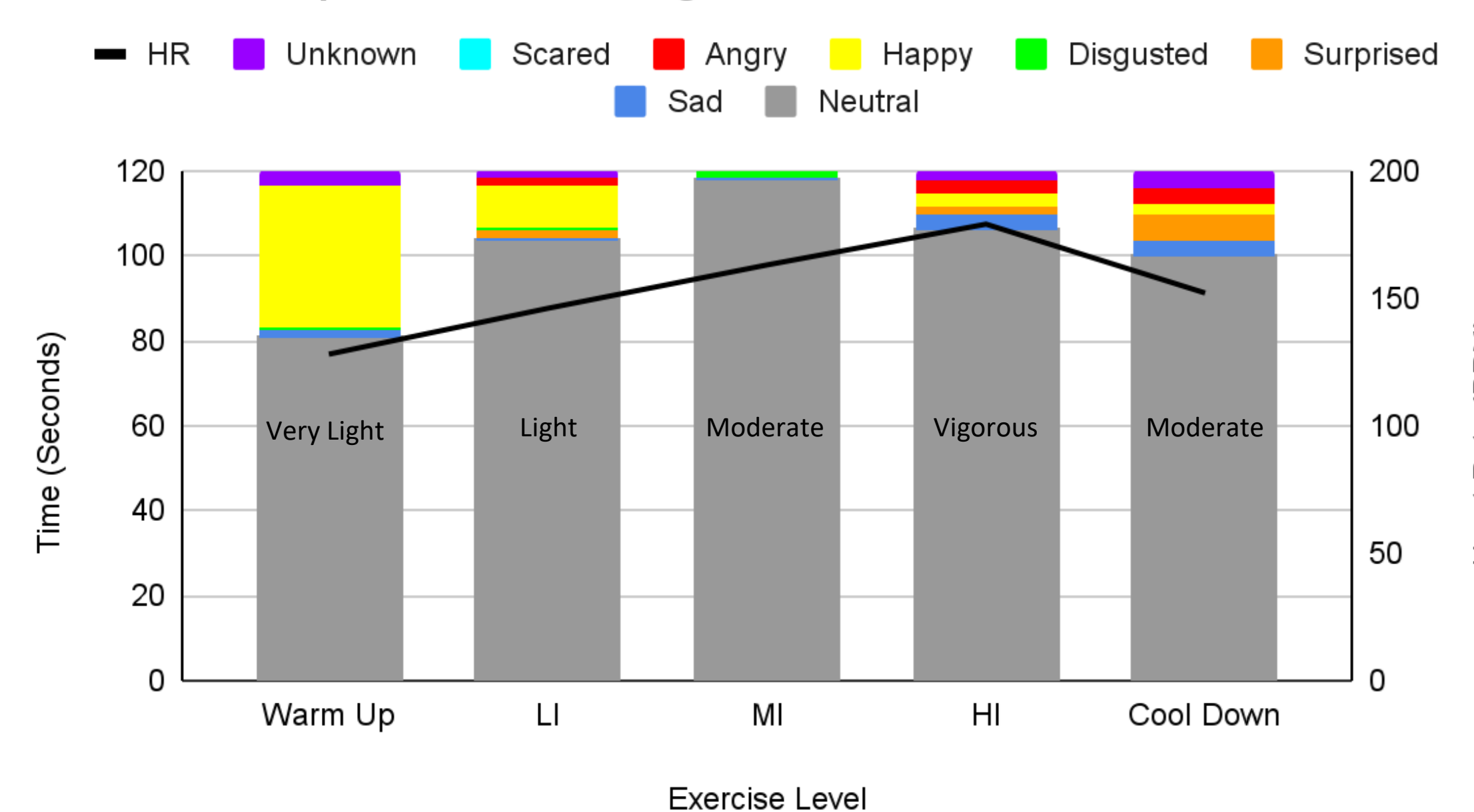


Figure 5: Emotional response, heart rate, and perceived exertion during incrementally increasing physical exercise in an experimental female participant in the 25-34 age group whom does not exercise regularly and prefers outdoor exercise.

### DISCUSSION

Throughout current participants' exercises and prior research regarding exercise prescription, exercise appears to be a highly individualized experience. For instance, high intensity indoor exercise would be a reasonable recommendation for Figure 4's participant, meanwhile low intensity outdoor exercise could be recommended for the participant illustrated in Figure 5 based on preferences and positive emotion expression. Utilizing facial analysis could aid physicians prescribing patients exercises to optimize their intrinsic and extrinsic motivators and encourage regimens that are more sustainable, longer-termed, and more beneficial over time.

### FUTURE DIRECTIONS

Future studies could pertain to correlating other factors to their perceived emotions, such as blood pressure, continuous heart rate, and respiratory rate. Comparing various modes of exercise should also be considered. The inevitable goal is a longitudinal study where individuals can be assessed using facial analysis and physiological measures to see how their enjoyment and physical ability changes over time, as well as their opinions on exercising.

### REFERENCES

- Ekkekakis, Panteleimon, and Ralf Brand. "Affective Responses to and Automatic Affective Valuations of Physical Activity: Fifty Years of Progress on the Seminal Question in Exercise Psychology." *Psychology of Sport and Exercise*, 28 Dec. 2018, www.sciencedirect.com/science/article/pii/S1469029218305363.
- Rodgers, Anthony, and Patrick Vaughan. "World Health Report 2002: Reducing Risks, Promoting Healthy Life." *World Health Organization*.