

# A Study of Effect of Stressors and Heart Rate in an Academic Environment

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## INTRODUCTION

Heart rate (HR) is one of the most basic vital signs and has been extensively correlated to stress as an exacerbating factor. Heart rate is a result of the brain innervating the heart through the autonomic nervous system. The autonomic nervous system is comprised of both the sympathetic and parasympathetic, these divisions determine the HR. The sympathetic and parasympathetic divisions are working in homeostasis with each other and the interaction between the two is expressed in heart rate variability<sup>1</sup>.

Medical students exposed to stressors such as examination experience physiological triggering of the autonomic nervous system which leads to an increase in sympathetic activity subsequently leading to an increase in heart rate<sup>1</sup>.

Stress levels, heart rate and the quantity of tobacco, as well as caffeine and alcohol consumption are believed to be increased due to academic stress.

The comparative observational experiment at the St. James School of Medicine allowed for examination of MD1-MD4 level medical students, to acknowledge the direct effects of pre and post examination periods on HR and the above mentioned contributing factors

## METHODS

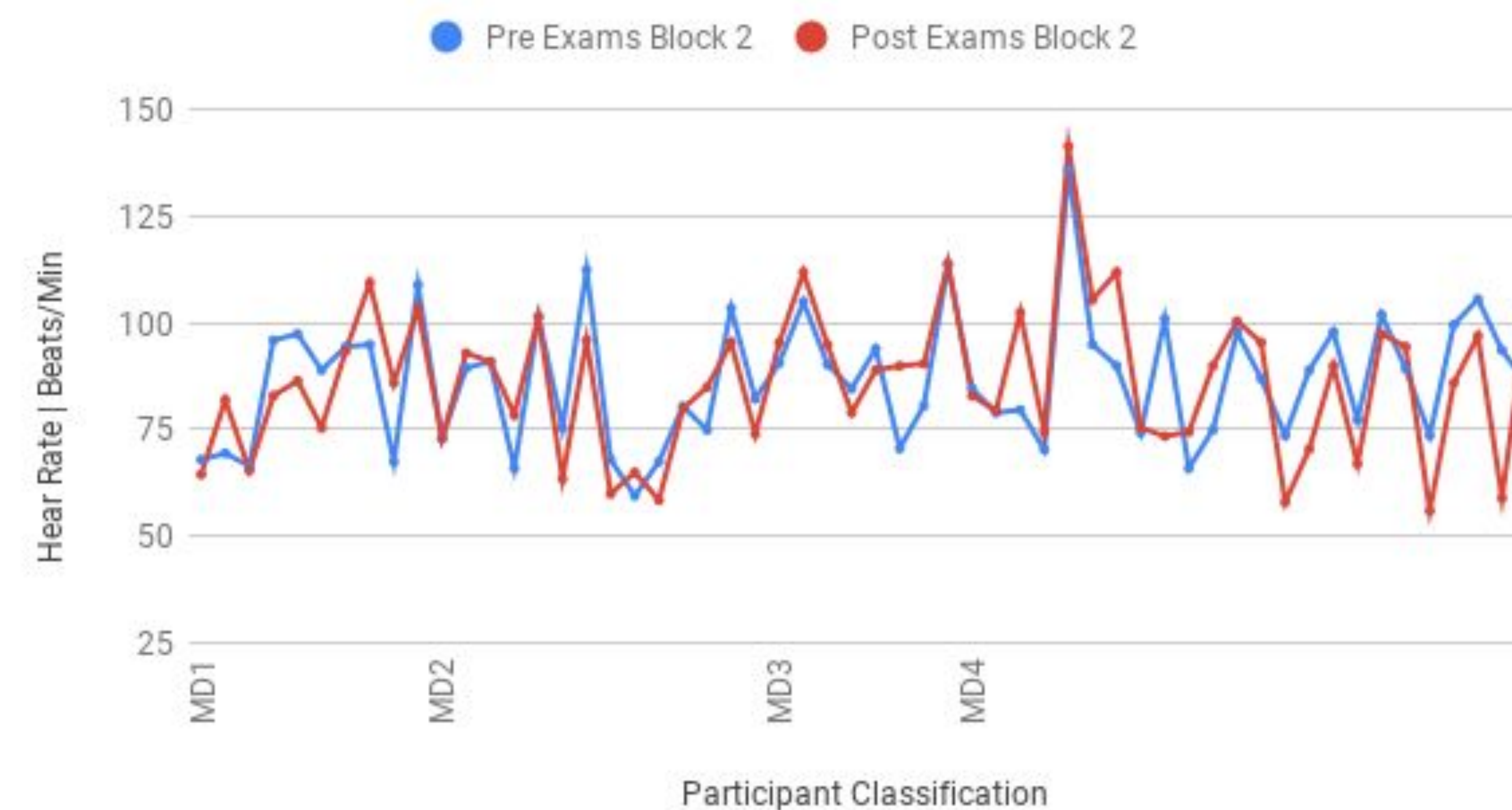
The study consisted of 56 volunteering individuals (27 men and 34 women; age 21-50+). A portion of those that chose to be involved in the study were smokers, the rest were nonsmoking individuals. All of the participants of the study were students of various levels (MD1-MD4) attending the Saint James School of Medicine in Anguilla, British West Indies. Prior to beginning the study, all volunteers signed an informed consent form briefly explaining the purpose and procedure of the study along with confidentiality and data use measures<sup>7</sup>.

Students were asked to complete an initial electronic questionnaire on the first day of the study which was utilized to access their overall basic health information. Every survey after this initial questionnaire asked the volunteers about their stress level, sleep quality, weekly caffeine consumption, weekly alcohol consumption, weekly tobacco use, and stimulant use.

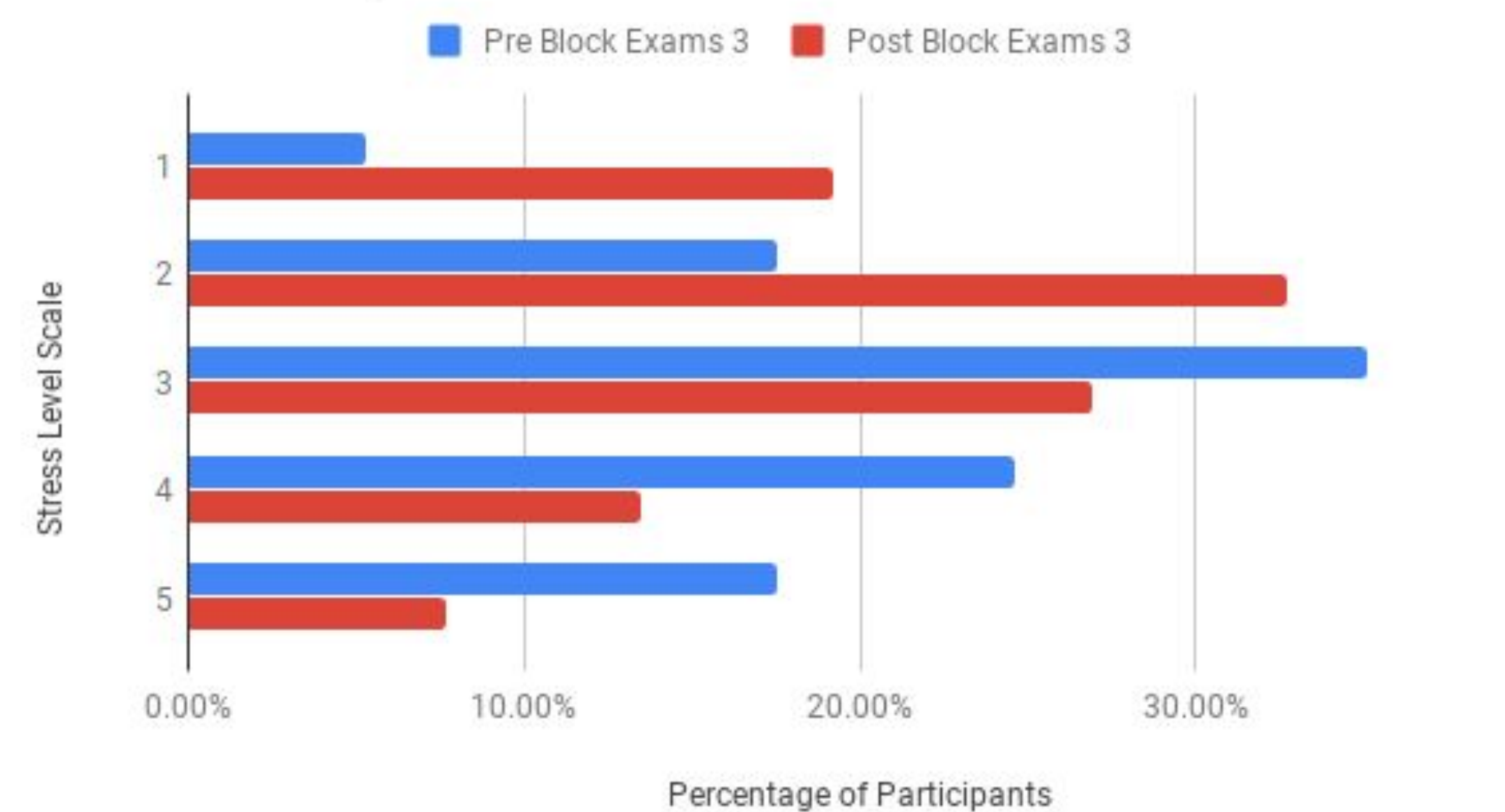
The HR of the participants was measured bi-monthly, once pre-examination and once post-examination using pulse oximeters. There were 2 consecutive data collection sessions, both pre- and post-examinations, for the examination periods of the 2nd and 3rd quarters of the semester<sup>8</sup>. The data collected was then analyzed and statistical tests were performed. The statistical analyses conducted were population standard deviation, population variance, a 2-tailed paired t test, and a Wilcoxon signed rank test<sup>9, 10, 12, 13</sup>.

## RESULTS

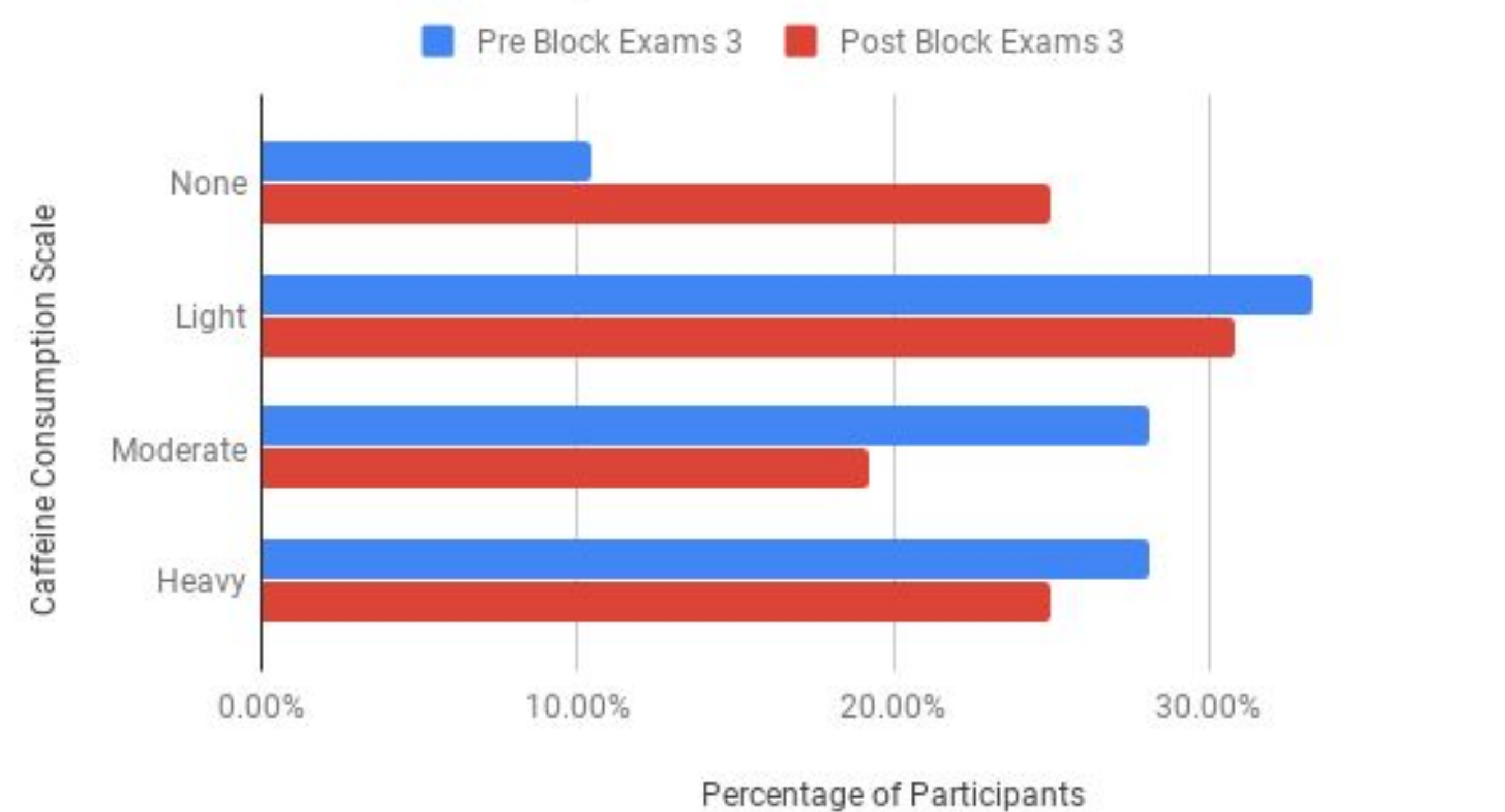
Heart Rate | Pre and Post Exams Block 2



Stress Levels | Pre and Post Block Exams 3



Caffeine Consumption | Pre and Post Block Exams 3



Each of the following variables were measured pre and post- examination periods of testing periods 2 and 3. Other graphs are present in the research paper. **Heart Rate (HR) Data:** Each point on the graph is representative of one participant. The table regarding HR shows the changes of HR in the pre-examination period compared to the post-examination period of Block examination 2. The paired T Test results for block examinations 2 was 6.70E-01. The p-value was 0.6695. The result is not significant at  $p < .05$ . The null hypothesis of the paired T Test was that there is no significant difference in the pre- examination heart rates when compared to the post-examination heart rates. After calculating the p-value we have determined that we can not reject the null hypothesis based on the heart rate data collected. **Stress Levels:** Block examination 3 results displayed a 29.1% decrease in reported high stress levels post-examinations compared to pre-examinations. **Caffeine Consumption:** Block examination 3 results displayed a 12% decrease in moderate to heavy caffeine consumption from pre to post- block examinations.

## CONCLUSION AND FUTURE RESEARCH

The HR of the pre-examination compared to the post- examination period did not provide significant data to support the original research hypothesis. Utilizing the self reporting method of the surveys, it was observed that the consumption of caffeine and self-reported stress levels were higher in the pre examination period as compared to post examination. The other variables measured in the self reporting survey did not provide significant data pertinent to the experiment.

With all research there are some limitations that could potentially affect the outcomes of the experiment. The limitations include self reporting, differences in measurement tools, absent participants, time to record and compute data, and incompleteness of the heart rate readings. There were many external factors that could affect the HR. These factors include quizzes, students exercising, consuming caffeine, or usage of medications for pre-existing health problems.

Future research suggestions include using four instead of two examination periods, having clear assigned roles for each researcher, and having a protocol in place to minimize the impact of external variables that can potentially skew the results.

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