

ASSOCIATION BETWEEN RESTING HEART RATE AND GRADE POINT AVERAGE

Amilliah Kenya, MS, DC¹, John Hart, MHSc. DC², Harry Kenya³

ABSTRACT

Objective: Resting heart rate (RHR) has been used for prognostic and therapeutic purposes when dealing with cardiovascular diseases and in determining the effect of anxiety on academic performance. This study explores the potential relationship between students' RHR and their GPA.

Methods: With no studies done to show an association between resting heart rate and academic achievement, the average resting heart rate of 60 students, enrolled in the doctor of chiropractic degree program, was taken and correlated to their Grade Point Average (GPA).

Results: Resting heart rate and grade point average showed an inverse relationship for students with an RHR of 74 BPM or less. The regression coefficient for RHR was -0.03. This means that for every 1 beat decrease, a 0.03 increase in GPA is predicted, and for every 5 BPM decrease a 0.15 increase in GPA is predicted.

Conclusion: Future research could examine if lowering RHR in those with high RHR who also high GPAs would see their GPA maintained at the higher level. Further study with other groups of students is a reasonable next step. (*J Contemporary Chiropr* 2021;4:79-82)

Key Indexing Terms: Resting Heart Rate; Grade Point Average (GPA); Academic Performance.

INTRODUCTION

Resting heart rate (RHR) is a simple but strong predictor of cardiovascular fitness (1-4) and health in general (5-7) Life span is inversely related to resting heart rate in most organisms. (8). Additionally, RHR derived from simple counting of beats at a palpated artery has good agreement with the standard ECG (9-11). Several studies have been done on the relationship between RHR, anxiety and academic performance (12-15). However, anxiety-related RHR would seem to be a heart rate in the rested state (due to the anxiety).

¹ Sherman College of Chiropractic, Spartanburg, SC

² Private practice of chiropractic, Greenville, SC

³ Student, Clemson University

Purpose of the Study

Our study sought to explore the potential relationship between students' RHR and their GPA. A literature search was performed in Google Scholar and PubMed in November and December of 2019 using keywords such as association between resting heart rate and academic achievement. We found not studies pertaining to this topic.

An inverse relationship should be expected, meaning lower RHR is expected to correlate with higher GPA. Potential benefits of the study might be that RHR could be a useful predictor of GPA, where lower RHR could predict higher GPA.

METHODS

This observational study was approved by the Institutional Review Board at Sherman College of Chiropractic. A convenience sample of 60 students enrolled in a Doctor of Chiropractic degree program was recruited for the study. The students were recruited from various class points in the program (among the 4 years of the program).

RHR was self-measured 20 times by each student on different days. Additionally, a classmate took his or her RHR twice, also on different days. Participants were taught how to measure resting heart rate accurately. Most participants measured their RHR using the count method at the radial artery in the wrist; others measured with a smartphone app. Participants were instructed to rest at least 15 minutes prior to the seated measurement. All

Figure 1. Scatter plot of RHR vs GPA

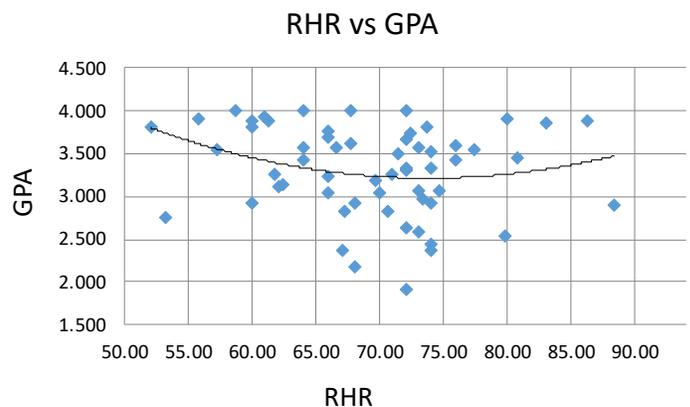
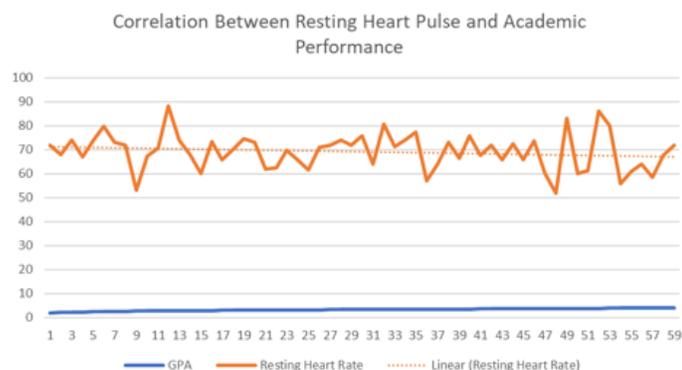


Figure 2. Correlation Between Resting Heart Pulse and Academic Performance trend



22 RHR measurements were averaged, and the data was entered into a spreadsheet along with their age, gender, and cumulative grade point average (GPA). The GPA was obtained from the Registrar. The RHR was obtained approximately 12 weeks prior to obtaining the GPA. All participants signed an informed consent form allowing us to obtain their GPA from the registrar and to for them to participate in the research.

Analysis

RHR and GPA were compared using a scatter plot, Pearson correlation and linear regression in Stata 12.1 (StataCorp, College Station, TX) and Excel 2010 (Microsoft Corp., Redmond, WA). Normal probability graphs were used to assess data normality for the predictor (RHR) and outcome (GPA). Two-tailed p-values less than the conventional alpha level of 0.05 were considered statistically significant. The null hypothesis was that there is no relationship between RHR and GPA while the alternative hypothesis was that there is a relationship.

RESULTS

The software-generated order-2 polynomial trend line in the scatter plot indicated a U-shaped relationship between RHR and GPA (Figure 1). This means that higher GPA was observed at RHR extremes (at the low end and high end). Correlation between the nonlinear variables was inverse but negligible in strength and statistically non-significant ($r = -0.161, p = 0.2$).

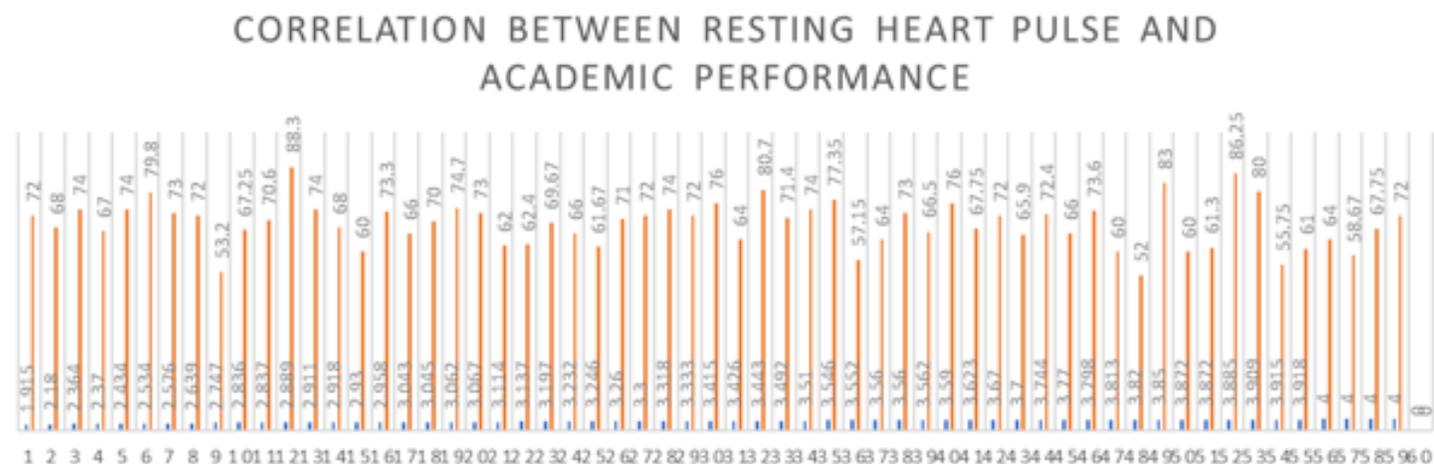
The trend line in the figure stops its downward angle around RHR of 75 BPM. This means that for participants with 75 BPM or less, there is an inverse correlation between RHR and GPA. This means that as RHR increases, GPA decreases, again, for those with 75 BPM or less. Correlation for these participants was low-to-moderate in strength ($r = -0.342$) and statistically significant ($p = 0.02$). (Figure 2)

In linear regression for this same sub-group (< 75 BPM) there was a weak but statistically significant model ($R = 0.117, p = 0.02$). The regression coefficient for RHR was -0.03. This means that for every 1 beat decrease, a 0.03 increase in GPA is predicted; and for every 5 BPM decrease a 0.15 increase in GPA is predicted, and so on (Figure 3, Table 1).

DISCUSSION

A normal resting heart rate has been documented to fall between 60 and 100 beats per minute. (15,16) A resting heart rate below 60 is an indicator of better physical fitness and a good functioning heart. (17) Elevated heart rate is directly associated with cardiovascular diseases like high blood pressure, diabetes.(18-20) When resting heart rate goes beyond 100 beats per minute, this may indicate an increased intake of stimulants such as coffee, stress or the presence of physiological illness. (21) Conversely, low resting heart rate is also not healthy. A resting heart

Figure 3. Bar—Correlation Between Resting Heart Pulse and Academic Performance



BPM Increase	GPA Change
1	-0.03
5	-0.15
10	-0.3
15	-0.45

Table 1. Regression results

rate lower than 50 beats has been associated with faulty electrical works within the heart systems. (22,23)

As can be seen, the research on RHR is rather clear that it is healthier in general (e.g., longevity-wise) to have a lower RHR compared to higher RHR.

From the time we started collecting data for this research project, we had strong inclinations in predicting low RHR to correlate with higher GPA because of the overwhelming evidence of the advantages of low RHR. Nonetheless, the results are not only surprising but also interesting.

What does it mean for top performing students to have a high RHR and to see the same repeated pattern for students with a low GPA and low RHR? Not only is this intriguing but it creates a desire to dig deeper into this research with more versatile cohort groups to understand this better while finding out what other factors could contribute to such results.

It is unknown why there is a U-shaped relationship between RHR and GPA, where higher GPA is related to RHR at the very low and very high extremes. One cannot help but think there may be a side benefit of having an unhealthy (high) RHR in the form of higher GPA. However, the downside of the high RHR would seem to outweigh such an upside. Further research could investigate the possible effect of lowering RHR in those with high RHR who also have high GPAs to see if their GPA is at least maintained at the higher level. Subsets of such research could investigate the possibility of increasing RHR through normal and steady physical activities for those with low RHR while observing its effect on GPA over a period.

Since this research was carried out in one institution of higher learning, future studies could incorporate students from community colleges and different universities in varied subject majors to yield more revealing and diagnostic results.

LIMITATIONS

More revealing results could have been seen had it not been for a small and convenient sample of participants

and restricting the research to one institution. Moreover, most students attending chiropractic school take similar courses for the entire program. Versatility of courses and programs of study could have yielded more meaningful and revealing results.

CONCLUSION

In this study, resting heart rate and grade point average showed an inverse relationship for students with an RHR of 74 BPM or less. Further study with other groups of students is a reasonable next step.

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