Comparing Maximum Heart Rate of University Students and Professional Cyclists

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Introduction

- The heart is used to pump blood through the body. Blood carries oxygen to muscles and is directed to the skin's surface to dissipate excess heat. When exercising muscles use more oxygen and create heat, this forces the heart to pump faster in order to get more oxygen to the muscles and to pass more blood through the capillaries near the skin's surface[1].
- Athletes have low heart rates because they have trained their heart to pump more blood with each beat[2]. We looked at the maximum heart beats per minute (bpm) of male and female university students compared to that of professional cyclists.
- We hypothesize that professional cyclist will have a lower heart rate than university students because they have trained their heart to be more efficient.

Objectives

1) To find the average maximum heart rate of university students
2) Compare maximum heart rates of males and females
3) Compare maximum heart rates of university students and professional cyclists

Methods

- The maximum heart rate of university students was collected by having volunteers ride a stationary bike (Precor Precision Series PVS15-DT) the resistance started on level at 6 on the bike and increased by 1 level every minute until the test was over. The test finished when students could no longer pedal or reached the 10 minute limit. We measured heart rate using the heart rate monitors on the bike. Heart rate was recorded every 30 seconds.
- The heart rates of professional cyclist were recorded during races[3,4].
- Statistical analyses of the data were done using "R". Shapiro-Wilk test was used to find if data was normally distributed. Bartlett's test was used to check if the variances were homogeneous. Finally we used an independent t-test to see if the groups were significantly different. The level of significance for all tests was set at 0.05.

Results

- The maximum heart rate of the university students was 188.8 beats per minute as shown in Table 1. Considering the maximum heart rates of males and females in (Tab 1), an independent t- test was conducted and no significant difference was observed (t=-0.0754, df=15, p-value= 0.9409).
- The maximum heart rate of professional athletes was 175.27,shown in Figure 2, a significant difference was observed between the professional athletes and the university students(t=3.336, df=30, p-value=0.002274).

Groups	Max Heart Rate (bpm)	Standard Deviation	Sample Size
Male	189	15.126	11
Female	188.5	7.369	6
Both	188.8	12.65	17

Table 1. Max Heart Rates of University Students.

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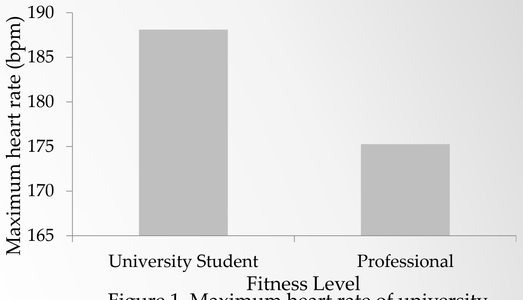

Figure 1. Maximum heart rate of university students and professional athletes.

Discussion

- The maximum heart rate of a university student is around 188.8 bpm, this is lower than we expected. This could be due to students stopping before complete exhaustion or because their muscles were tired from earlier exercises.
- The heart rates of males and females were not significantly different, this allowed us to use them as a single data set when comparing students to professional athletes.
- We confirmed our hypothesis that the maximum heart rate of professional athletes is significantly lower than that of a university student; this can be explained by the fact that athletes have hearts that are able to pump more blood[2]. Other studies have shown that the resting heart rate of a non-athlete is around 60-100 bpm while the resting heart rate of an athlete is around 40 bpm[5] and has been recorded as low as 28 bpm in Miguel Indurain[6].

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