Research

Comparison of Resting Pulse Rates in Chiropractic Students Versus the General Population

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Abstract

Introduction: Research typically shows that a lower resting pulse rate (RPR) is healthier than a higher RPR. Limited research on reduction of RPR following chiropractic care warrants further research. Accordingly, the present study compares RPRs between a small group of chiropractic student-patients and a similar group from the general population.

Methods: RPR data from a convenience sample of 17 chiropractic students, who were also chiropractic patients (CSP), were compared to a reference group from the general population. Both groups consisted of young adult white males and were compared using a two sample t test and effect size.

Results: The CSP group had a mean RPR of 65.2 BPM compared to the general population group whose mean RPR was 71 BPM, a difference that was statistically significant (p = 0.0097). A low-to-medium effect size (of 0.39) was observed for this difference as well.

Conclusion: This group of chiropractic student-patients had a lower average resting pulse rate compared to their reference group. Further study with random sampling and an accounting of other potential confounders such as physical fitness is warranted.

Introduction

Resting pulse rate (RPR) is a vital sign that has been measured since ancient times and can be obtained from technology such as an electrocardiogram (ECG) or from manual palpation of a peripheral artery. RPR is commonly obtained by palpating the radial artery and counting the pulse for example, 15 seconds and multiplying by 4 to get the pulse for a full minute. There are many factors that can affect RPR, such
as level of physical fitness and health care interventions. For the latter, one model in chiropractic pertains to the care of a condition known as subluxation. By definition, subluxation contains a neurological component which could include an autonomic nervous system (“autonomic”) disturbance. There are a limited number of options available to chiropractors for specifically analyzing a neurological (autonomic) component. These options include paraspinal thermography and heart rate variability. An option that could also be integrated into chiropractic practices for assessing an autonomic component is resting heart rate, also known as resting pulse rate (RPR).

RPR is a method of assessing autonomic function with the autonomic center located near the spine, in the brain stem, in particular, the medulla oblongata. Outcomes literature for RPR is rather robust, showing that a slower RPR is healthier than a faster one.

The use of RPR in chiropractic practice and research is not new. In practice, pulse rate is typically used as a routine vital sign, rather than assessing autonomic function for the purpose of determining when to apply a spinal adjustment. In research, RPR is generally used as an outcome measure, and similar to practice, is typically not used as an autonomic indicator for spinal adjustment. Some chiropractic studies show reductions in RPR following chiropractic care but generally, these decreases were not statistically significant. One study showed a statistically significant reduction in RPR but this was also observed in the study’s sham group. Two of these studies reported effect sizes that were either negligible or small. One multi-clinic study revealed a statistically significant reduction in RPR following chiropractic care.

The question this study addresses is: Are pulse rates different in a small convenience sample of chiropractic student-patients (CSP) versus the general population? In an effort to answer this question, the author compares RPRs between a CSP group and a group from the general population.

Methods

Chiropractic student-patients

The Institutional Review Board at Sherman College of Chiropractic approved the study. The CSP group consisted of a convenience sample of 17 white males, who were chiropractic students (at Sherman College of Chiropractic), and who were also chiropractic patients. The CSP group was recruited primarily from classes the author taught in 2011 and 2012. All CSP participants indicated no medical conditions or medications and their prior chiropractic care consisted of maintenance care for subluxation. Average time from the last occurrence of chiropractic care for the CSP group was 19.3 days (SD 30.2, with a range of 1 to 150 days. The second longest time period since previous chiropractic care for a chiropractic patient was 37 days).

The age range of the CSP group was 22-33, with a mean age of 25.5 (standard deviation [SD] = 3.2). These demographics (young white adult males) were selected because they provided the largest sample size of a specific group in the recruitment process. Specific demographics were sought to allow for a valid comparison to a reference group from the general population.

Lifestyle

For lifestyle habits, information was collected on the following two items: a) self-reported physical fitness and b) alcohol use on the day of the measurement prior to the reading (both of these have the
potential to lower RPR). Responses from 16 out of the 17 participants were received for these two items. For physical activity, 7 out of 16 (43.8%) indicated they either exercised 30+ minutes at least 5 days per week with moderate activity, or 20+ minutes vigorous activity 3 or more days per week. A median of 51.0% of adults (both genders) in the U.S. also indicated this in 2009. For alcohol use on the day of the measurement, prior to the reading, none indicated consuming any alcohol. To assess the relationship between physical activity and RPR for the sample of 16, a Spearman correlation test was performed between these two variables.

**RPR protocol**

For the CSP group, a minimum of 5 minutes rest in the seated position was observed prior to manual palpation of the radial pulse (also in the seated position). The participant’s radial pulse rate was taken for 15 seconds and then multiplied by 4 to obtain the full minute rate. The count began from 1 instead of 0 (which has been shown to have better agreement with ECG heart rates compared to beginning from 0). This duration, 15 seconds, is different than the duration used in the comparison group (30 seconds as described below). However, pulse counts using 15 seconds have been shown to not be significantly different from counts obtained with 30 or 60 second times.

**General population group**

The comparison sample from the general population (“general group”) consisted of survey data from the Centers for Disease Control and Prevention (CDC) for 1999-2008. Reported characteristics of this sample are: 20-39 years of age, white U.S. males, sample size of 1,424, mean pulse rate = 71 BPM, and standard error of the mean (SE) of 0.4. The age bracket of 20-39 is one of many age brackets in this publication. Protocol for the RPRs in this (general) group included an approximate 4 minute rest period in the seated position, followed by a 30 second count of the radial pulse also in the seated position, which in turn was multiplied by 2 to obtain the full minute rate. Specifically excluded from this sample were participants with RPR of 200 BPM or more, or who had conditions that could affect heart rate.

**Assumptions**

It is assumed that: a) the CSP and general groups are adequately similar; and b) the slight difference of protocol (5 versus 4 minutes for pre-test rest; and 15 versus 30 second readings) is inconsequential.

**Analysis**

Data analysis consisted of a two-sample t test calculator, using Stata IC 12.1 (StataCorp, College Station, TX) The calculator approach allows more information to be used (standard deviation [SD] and sample size) when only summary data is available (which was the case for the general group). The other option would be to use a one sample t-test which would only include the average heart rate from the CDC report (no SD or sample size). From the standard error (SE) provided in the CDC report for the general group (SE = 0.40), SD (which the Stata calculator calls for in performing the two sample t test in calculator mode) was calculated by multiplying the square root of the sample size by the SE. Thus, for the general group, SD = √1424 * 0.4 = 15.09. A two-tailed p-value less than or equal to the traditional alpha of 0.05 is considered statistically significant. In addition to the two sample t test, an effect size, using a pooled standard deviation was calculated in Excel 2010 (Microsoft Corp., Redmond, WA).
Results

Average pulse rate for the CSP group was 65.2 BPM (95% CI: 61.0 BPM to 69.3 BPM; SD 8.1) compared to 71 BPM (95% CI: 70.2 BPM to 71.8 BPM; SD 15.09) for the general group, a difference that was statistically significant (p = 0.01) using the unequal variance option (evidenced by the unequal standard deviations). This difference revealed an 82.5% power and a low-to-medium strength effect size of 0.39. A statistically non-significant, negligible strength correlation was observed between physical activity and RPR (r = 0.086, p = 0.7528).

Discussion

Lower RPR in the CSP group may be due to factors other than their chiropractic care such as healthy lifestyle habits. Thus, it can only be claimed from this study that this small convenience sample of young, white male chiropractic students, rather than chiropractic care, showed a lower average RPR compared to the general population.

It may be theorized that some participants in the general group may have also previously received chiropractic care. It is estimated that only 8% of the general adult population receives chiropractic care within a 12 month period. Moreover, any chiropractic care in the general group would be estimated to result in, if detectable in a large sample, a lower RPR, not higher. Thus, the possibility of the general group having some participants who also received chiropractic care would not appear to resemble the CSP group because of the relatively low percent of estimated chiropractic patients in the general group (an estimated 8% versus 100% in the CSP group). Consequently, the CSP group is assumed to be substantially more “chiropractically saturated” than the general group. The two groups are therefore reasonably assumed to be “chiropractically different.”

Interestingly, the next older bracket in the CDC report, 40-59 years old, has the same mean and SE as the group used in the present study (mean of 71 BPM and SE of 0.4). This suggests that even though the age ranges between the samples in this study are not precisely the same (22-33 in the CSP group versus 20-39 in the general group), this difference appears to be inconsequential (due to the overlapping mean of 71 BPM in the general group). Although the report does not specifically mention whether the sample is drawn at random, it would seem that it is random given the large overall sample size of 35,302, which includes the aforementioned sample of 1,424.

Another assumption of the present study is that none in the CSP group were included in the 1999-2008 survey data. The odds of these 17 participants’ pulse rates ending up in the referenced study seem quite low. Even if all 17 of the CSP group participant data were included in the general group, any affect (which would be unlikely given the imbalance of sample sizes) would likely reduce the mean RPR in the general group, not increase it.

Although there is a substantial sample size imbalance, sample sizes need not be the same for two sample testing. As previously mentioned, an appropriate alternative statistical test would be to perform a one sample t test, with no information about the sample size of the general group. Consequently, the two t sample test, performed with the Stata calculator is considered an appropriate approach for comparing these two groups (CSP group versus the general group).
The sample size for the CSP group may seem small (n = 17). However, statistical power for detecting statistically significant differences between these two groups (CSP versus general) was adequate (power = 82.7%). Additional limitations to the study are: a) the CSP group was a convenience sample, and b) their survey responses are susceptible to self-reporting bias.

Conclusion

The chiropractic student-patient group in this study had a lower average resting pulse rate compared to a similar group from the general population. The explanation for the lower pulse rates is unclear and beyond the scope of this study. Future study should include a random sample of chiropractic patients as well as an accounting of potential confounding determinants such as various lifestyle habits.

References


