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Case Study

Heart Rate Variability in Chiropractic Care: A Case Study

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Received: May 01, 2023; **Published:** June 16, 2023

Abstract

Heart rate variability is an evidence-based autonomic assessment that is appropriate for neurologically focused clinical practice. This case report provides an example of its use for an individual patient receiving chiropractic care from the author over a 5-month period.

Keywords: *Heart Rate Variability; Chiropractic Care; Vertebral Subluxation*

Introduction

The traditional focus of chiropractic care is on the patient's spine and nervous system. Neurological interference in the spine due to a slight vertebral misalignment is a condition known in chiropractic as vertebral subluxation [1-3]. The intervention for this condition is spinal adjustment, done by hand or instrument. In the chiropractic model, successful adjustment of the subluxation removes an obstacle to the body's inherent striving to heal itself.

Doctors of chiropractic have long recognized the importance of the nervous system. Various methods, such as paraspinal thermography have been used to assess neurological function. Heart rate variability (HRV) is a recent innovation for assessment of the nervous system, particularly the autonomic nervous system (ANS). Since it controls many vital functions, a healthy ANS is one of many important prerequisites for a long and healthy life [4,5]. There are various theories on how chiropractic care can influence the ANS [6,7].

As a neurological assessment, HRV is an appropriate clinical test in neurologically focused chiropractic practice [8]. One of the metrics in the HRV test is the root mean square of successive differences, abbreviated as rMSSD. This measure, rMSSD, is known as a time domain measure and assesses the variability of time between each heartbeat. Normally the time between beats varies a bit from moment-to-moment in healthy individuals. This is different from an irregular heart rate observed in arrhythmia or skipped beats. Heart rate variability is the natural fluctuation of time between beats and indicates how dynamic, adaptive, and resilient the patient's nervous system is. The present report provides an example of how the HRV test can be used for an individual chiropractic patient.

Case Report

An adult female presented to the author's chiropractic practice in 2019 with headaches, shoulder pain, and upper back pain. These symptoms were one consideration in the care of the patient. which improved following spinal adjustment. The other consideration, which

is the focus of this report, is the health of the patient's nervous system, based on the HRV findings. The patient signed a consent form for this case report and the Institutional Review Board (IRB) at Purdue University Global determined that IRB exemption criteria were met.

The author uses rMSSD not only as a periodic outcome measure but also as a guide on each office visit for determining when and when not to adjust the patient. Larger rMSSD values reflect a healthier, more adaptive ANS compared to smaller values [9]. In this report the terms HRV and rMSSD are used interchangeably, as are the terms autonomic and neurological.

HRV was measured using the smartphone app known as Heart Rate Variability Logger [10]. The app uses a photoplethysmography (PPG) sensor that attaches to the patient's ear lobe which sends a Bluetooth signal to the app [11] (Figure 1). The set-up has good agreement with ECG technology [11,12]. The 60-second HRV readings of the patient in this study were obtained under the following controlled conditions:

a. Minimum of 5-minutes rest in the seated position prior to measurement to achieve a true rested state;

b. 1-minute recording of HRV with the patient continuing to be rested in the seated position.

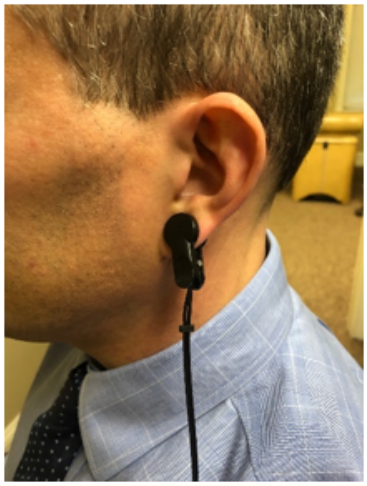

Figure 1: *Ear clip set-up.*

The patient's ANS was functioning less-than-optimally on the first three visits in this series, with rMSSD values ranging from only 8.3 ms to 9.4 ms (Figure 2 and 3). These values are lower (worse) than normal for healthy adult females, where the rMSSD should be about twice these values, at 19.0 ms [13].

Misalignment in the spine was detected using manual methods of palpation and leg length inequality checks.

With these two prerequisites, neurological disturbance and slight vertebral misalignment, spinal adjustment was indicated on the first three visits, and given by the author on dates shown in figure 2. All values in this report are pre-adjustment. Post-adjustment results were assessed on subsequent visits, e.g. the 1-20-20 adjustment was evaluated on the 2-22-20 visit.

Spinal adjustments given on the first two visits (10-24-19 and 1-20-20) showed negligible improvement on subsequent visits. The adjustment on the third visit however, on 2-22-20, was followed by substantial improvement, evidenced by the rMSSD increase to 22.4 ms

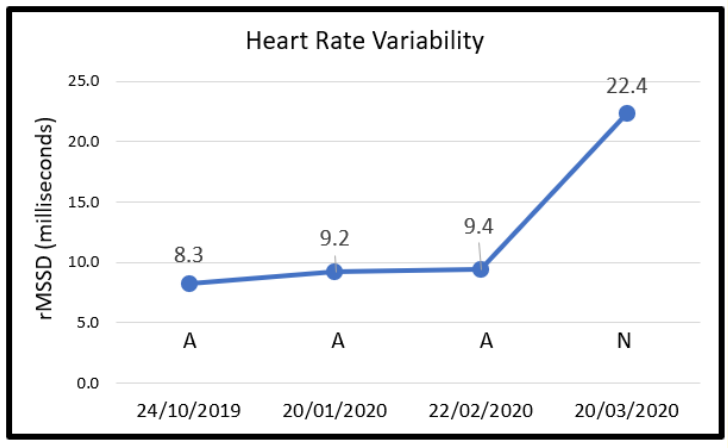

Figure 2: *HRV values by visit. A = Adjustment given; N = No adjustment given.*

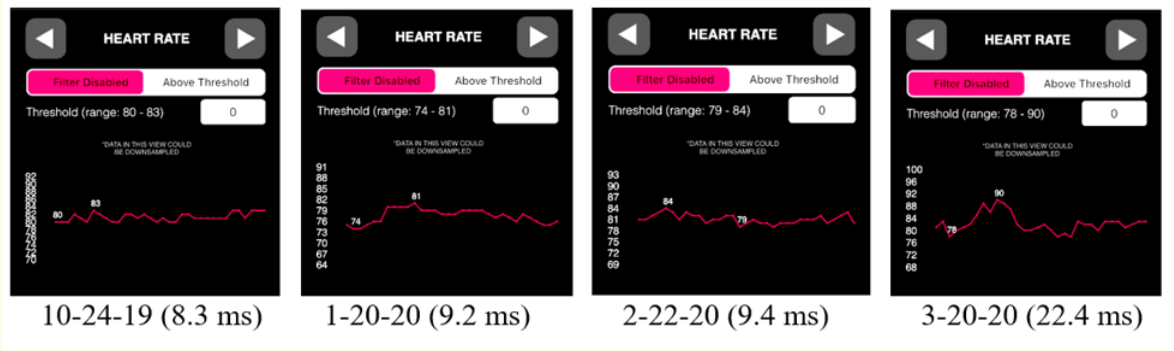

Figure 3: *Resting heart rate readings. Wavier lines indicate higher HRV. rMSSD values are placed in parenthesis.*

(on 3-20-20; Figures 2 and 3). This value was calculated as a statistical outlier using the inter-quartile method of outlier detection among all four HRV values. The outlier method's upper fence value was 18.2 ms, meaning values above this would be statistically unusual, further substantiating the improvement.

As far as other factors during the time between the last two visits that may have caused the improvement noted on 3-20-20, the patient stated there were no changes in medications or lifestyle during that time interval. This adds further weight to the author's claim that the chiropractic adjustment (on 2-22-20) appears to be the cause of the improvement noted on 3-20-20.

Table 1 shows the spinal area adjusted by visit. It is noteworthy that there is a difference between the successful atlas adjustment (on 2-22-20) versus the unsuccessful atlas adjustment (on 10-24-19). This difference pertains to direction of the adjustment (from the right

side on 10-24-19 versus from the left side on 2-22-20). Apparently, the finding of the misalignment direction was incorrect for the unsuccessful adjustment. Fortunately, no ill effects were observed for this possible error.

Date	Spinal segment(s) adjusted	HRV change
10-24-19	Right atlas (C1), T3) spinous right	Negligible
1-20-20	T3 spinous right	Negligible
2-22-20	Left atlas	Improvement
3-20-20	No adjustment	

Table 1: *Spinal area adjusted by visit and HRV change.*

Discussion

This case study provides an example of how an evidence-based neurological assessment such as HRV helps to determine if neurological progress is being achieved. The report is similar to others by the author published elsewhere [14-16].

Conclusion

In this report, heart rate variability was helpful in showing which spinal adjustment was neurologically beneficial for the patient and which one was not effective. More case studies on this topic (of HRV and chiropractic care) would be a good next step in this line of inquiry.

Acknowledgement

The author is grateful to Dr. Luke Henry (of Henry Chiropractic, Greenville, South Carolina) for his critique of this paper.

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Volume 15 Issue 7 July 2023