

# Collected Scientific Research Relating to the Use of Osteopathy with Heart-rate variability

## Important:

1) Osteopathy involves helping people's own self-healing abilities to work better, rather than focussing primarily on particular conditions.

2) Each person is different, and osteopathy treats them differently.

Therefore people respond to osteopathic treatment in different ways. Treatments that work for one person cannot be guaranteed to work for another person in the same way. The fact that there is scientific research supporting a treatment in a group of people does not mean that it will always work in the same way (which is probably true of all research).

A number of things make research into osteopathy challenging. These include the two aspects of osteopathy mentioned above, and also the lack of major commercial interests to provide funding in expectation of financial returns. At the same time, there is an emerging body of research demonstrating the usefulness of osteopathic treatment.

Please note: there is room for debate about the classifications used for these studies. Please let John Smartt know if you believe that any of these classifications are incorrect.

**The variability of the heart rate is considered to be an indication of the degree of control that the central nervous system is exercising over the activity of the heart; more variability is good.**

# These studies are from peer-reviewed journals

Number  
of studies:  
15

## Clinically and statistically significant results

Number  
of studies:  
15

## Systematic reviews

Number of studies: 1

Luis B, Borgesa A, Luiz G, Hugo B, Netoab P 2018 **Effects of spinal manipulation and myofascial techniques on heart rate variability: A systematic review** Journal of Bodywork and Movement Therapies Volume 22, Issue 1, January , Pages 203-208 <https://www.ncbi.nlm.nih.gov/pubmed/29332747>

"Background: The analysis of heart rate variability is important to the investigation of stimuli from the autonomic nervous system. Osteopathy is a form of treatment that can influence this system in healthy individuals as well as those with a disorder or disease.

Objectives: The aim of the present study was to perform a systematic review of the literature regarding the effect of spinal manipulation and myofascial techniques on heart rate variability.

Methods: Searches were performed of the Pubmed, Scielo, Lilacs, PEDro, Ibesco, Cochrane and Scopus databases for relevant studies. The PEDro scale was used to assess the methodological quality of each study selected.

Results: A total of 505 articles were retrieved during the initial search. After an analysis of the abstracts, nine studies were selected for the present review.

Conclusion: Based on the findings, osteopathy exerts an influence on the autonomic nervous system depending on the stimulation site and type. A greater parasympathetic response was found when stimulation was performed in the cervical and lumbar regions, whereas a greater sympathetic response was found when stimulation was performed in the thoracic region."

Fornari M, Carnevali L, Sgoifo A 2017 **Single Osteopathic Manipulative Therapy Session Dampens Acute Autonomic and Neuroendocrine Responses to Mental Stress in Healthy Male Participants**. *J Am Osteopath Assoc* Sep 1;117(9):559-567 <http://jaoa.org/article.aspx?articleid=2652668>

"Context: The efficacy of osteopathic manipulative therapy (OMTh; manipulative care provided by foreign-trained osteopaths) is supported by observational data and patient feedback, but there is still a need for objective, quantitative biomarkers that allow measurement of the underlying mechanisms. No study exploring the protective potential of OMTh for mental stress has been published, to the authors' knowledge.

Objectives: To explore the modulating effect of OMTh on autonomic neural regulation of the heart and verify its ability to influence the activity of the hypothalamic-pituitary-adrenocortical axis.

Methods: Healthy young adult men who had never received OMTh were exposed to either a brief protocol using craniosacral techniques or sham therapy (control) involving the same anatomical areas. A laboratory stress episode consisting of a 5-minute arithmetic task participants were required to perform in front of a committee preceded the therapy sessions. Continuous electrocardiograph recordings were done before, during, and after the stress episode. Heart rate and frequency-domain parameters of heart rate variability (specifically, high-frequency component power in normalized units and the ratio of low-frequency to high-frequency power) were measured to quantify the activity of the parasympathetic nervous system and the state of sympathovagal balance at the level of the heart, respectively. Saliva samples were also collected at points throughout the study to determine cortisol levels.

Results: Osteopathic manipulative therapy reduced the overall chronotropic effect of the stressor ( $t=-2.9$ ,  $P<.05$ ) and counteracted the vagal withdrawal and the shift of autonomic balance toward sympathetic prevalence ( $t=-2.8$ ,  $P<.05$ ) that were observed in control participants. Moreover, OMTh participants had a much lower overall cortisol level during the mental stressor compared with control participants ( $t=-2.3$ ,  $P<.05$ ). Participants in the OMTh group did not show the statistically significant reduction in the amplitude of the cortisol awakening response observed in their control counterparts after the stress episode (control:  $t=2.7$ ,  $P<.05$ ; OMT:  $P=.83$ ).

Conclusion: The application of a single OMTh session to healthy participants induced a faster recovery of heart rate and sympathovagal balance after an acute mental stressor by substantially dampening parasympathetic withdrawal and sympathetic prevalence. The OMTh session also prevented the typical increase in cortisol levels observed immediately after a brief mental challenge."

Giles PD, Hensel KL, Pacchia CF, Smith ML, 2013 **Suboccipital Decompression Enhances Heart Rate Variability Indices of Cardiac Control in Healthy Subjects** *The Journal of Alternative and Complementary Medicine*. February, 19(2): 92-96 <http://online.liebertpub.com/doi/abs/10.1089/acm.2011.0031>

"Osteopathic manipulative treatment (OMT) focused on the upper cervical spine is theorized to affect the function of the vagus nerve and thereby influence the parasympathetic branch of the autonomic nervous system. This study was designed to determine the acute effect of upper cervical spine manipulation on cardiac autonomic control as measured by heart rate variability."

"Nineteen healthy, young adult subjects underwent three different experimental interventions administered in random order: cervical OMT, sham manipulation, and time control. Six minutes of electrocardiographic data were collected before and after each intervention, and heart rate variability was assessed by both time-domain and frequency-domain measures."

"The OMT protocol resulted in an increase in the standard deviation of the normal-to-normal intervals ( $0.12\pm 0.082$  seconds,  $p<0.01$ ), an increase in the high frequency spectral power ( $p=0.03$ ), and a decrease in the low/high frequency spectral ratio ( $p=0.01$ ) relative to the sham and time control conditions. No significant differences between sham and time control were observed ( $p>0.11$  for all variables)."

"These data support the hypothesis that upper cervical spine manipulation can acutely affect measures of heart rate variability in healthy individuals."

Castro-Sánchez AM, Matarán-Peñarrocha GA, Sánchez-Labraca N, Quesada-Rubio JM, Granero-Molina J, Moreno-Lorenzo C 2011 **A randomized controlled trial investigating the effects of craniosacral therapy on pain and heart rate variability in fibromyalgia patients.** Clin Rehabil Jan;25(1):25-35 <http://www.ncbi.nlm.nih.gov/pubmed/20702514>

"After 20 weeks of treatment, the intervention group showed significant reduction in pain at 13 of the 18 tender points ( $P < 0.05$ ). Significant differences in temporal standard deviation of RR segments, root mean square deviation of temporal standard deviation of RR segments and clinical global impression of improvement versus baseline values were observed in the intervention group but not in the placebo group. At two months and one year post therapy, the intervention group showed significant differences versus baseline in tender points at left occiput, left-side lower cervical, left epicondyle and left greater trochanter and significant differences in temporal standard deviation of RR segments, root mean square deviation of temporal standard deviation of RR segments and clinical global impression of improvement."

"Craniosacral therapy improved medium-term pain symptoms in patients with fibromyalgia."

Roy RA, Boucher JP, Comtois AS 2009 **Heart rate variability modulation after manipulation in pain-free patients vs patients in pain.** J Manipulative Physiol Ther May;32(4):277-86 <https://www.ncbi.nlm.nih.gov/pubmed/19447264?dopt=Abstract>

#### "BACKGROUND:

The purpose of this study was to examine heart rate variability (HRV) in the presence or the absence of pain in the lower back, while receiving one chiropractic treatment at L5 from either a manually assisted mechanical force (Activator) or a traditional diversified technique spinal manipulation.

#### METHODS:

A total of 51 participants were randomly assigned to a control ( $n = 11$ ), 2 treatment, or 2 sham groups ( $n = 10$  per group). Participants underwent an 8-minute acclimatizing period. The HRV tachygram (RR interval) data were recorded directly into a Suunto watch (model T6; FitzWright Company Ltd, Langley, British Columbia, Canada). We analyzed the 5-minute pretreatment and posttreatment intervals. The spectral analysis of the tachygram was performed with Kubios software.

#### RESULTS:

All groups decreased in value except the control group that reacted in the opposite direction, when comparing the pretests and posttests for the high-frequency component. The very low frequency increased in all groups except the control group. The low frequency decreased in all groups except the sham pain-free group. The low frequency-high frequency ratio decreased in the treatment pain group by 0.46 and in the sham pain-free group by 0.26. The low frequency-high frequency ratio increase was 0.13 for the sham pain group, 0.04 for the control group, and 0.34 for the treatment pain-free group. The mean RR increased by 11.89 milliseconds in the sham pain-free group, 18.65 milliseconds in the treatment pain group, and 13.14 milliseconds in the control group. The mean RR decreased in the treatment pain-free group by 1.75 milliseconds and by 0.01 milliseconds in the sham pain group.

#### CONCLUSION:

Adjusting the lumbar vertebrae affected the lumbar parasympathetic nervous system output for this group of participants. Adaptation in the parasympathetic output, reflected by changes in high frequency, low frequency, and very low frequency, may be independent of type of adjustment. Therefore, the group differences found in the modulation of the HRV would seem to be related to the presence or absence of pain. The autonomic nervous system response may be specific and sensitive to its effectors organ."

Arroyo-Morales M, Olea N, Martinez M, Moreno-Lorenzo C, Díaz-Rodríguez L, Hidalgo-Lozano A 2008 **Effects of myofascial release after high-intensity exercise: a randomized clinical trial.** J Manipulative Physiol Ther Mar;31(3):217-23 [https://www.jmptonline.org/article/S0161-4754\(08](https://www.jmptonline.org/article/S0161-4754(08)

"Objective

The usefulness of massage as a recovery method after high-intensity exercise has yet to be established. We aimed to investigate the effects of whole-body massage on heart rate variability (HRV) and blood pressure (BP) after repeated high-intensity cycling exercise under controlled and standardized pretest conditions.

Methods

The study included 62 healthy active individuals. After baseline measurements, the subjects performed standardized warm-up exercises followed by three 30-second Wingate tests. After completing the exercise protocol, the subjects were randomly assigned to a massage (myofascial release) or placebo (sham treatment with disconnected ultrasound and magnetotherapy equipment) group for a 40-minute recovery period. Holter recording and BP measurements were taken after exercise protocol and after the intervention.

Results

After the exercise protocol, both groups showed a significant decrease in normal-to-normal interval, HRV index, diastolic BP ( $P > .001$ ), and low-frequency domain values ( $P = .006$ ). After the recovery period, HRV index ( $P = .42$ ) and high-frequency (HF) ( $P = .94$ ) values were similar to baseline levels in the massage group, whereas the HRV index tended ( $P = .05$ ) to be lower and the HF was significantly ( $P < .01$ ) lower vs baseline values in the placebo group, which also showed a tendency ( $P = .06$ ) for HF to be lower than after the exercise. Likewise, diastolic BP returned to baseline levels in the massage group ( $P = .45$ ) but remained lower in the placebo group ( $P = .02$ ).

Conclusion

Myofascial release massage favors the recovery of HRV and diastolic BP after high-intensity exercise (3 Wingate tests) to preexercise levels."

Delaney JP, Leong KS, Watkins A, Brodie D 2002 **The short-term effects of myofascial trigger point massage therapy on cardiac autonomic tone in healthy subjects.** J Adv Nurs Feb;37 (4):364-71 <https://www.ncbi.nlm.nih.gov/pubmed/11872106?dopt=Abstract>

"AIM OF THE STUDY:

To investigate the effects of myofascial trigger-point massage therapy to the head, neck and shoulder areas on cardiac autonomic tone. Background. No studies have reported on the effect of back massage on autonomic tone as measured by heart rate variability. This is especially relevant to the nursing profession, as massage is increasingly available as a therapy complementary to conventional nursing practice.

DESIGN/METHODS:

An experimental study in which subjects were initially placed in age- and sex-matched groups and then randomized to treatment or control by alternate allocation. The study involved 30 healthy subjects (16 female and 14 male, aged 32.47 +/- 1.55 years, mean +/- standard error). A 5-minute cardiac interbeat interval recording, systolic and diastolic blood pressure and subjective self-evaluations of muscle tension and emotional state were taken before and after intervention. Autonomic function was measured using time and frequency domain analysis of heart rate variability.

RESULTS:

Following myofascial trigger-point massage therapy there was a significant decrease in heart rate ( $P < 0.01$ ), systolic blood pressure ( $P=0.02$ ) and diastolic blood pressure ( $P < 0.01$ ). Analysis of heart rate variability revealed a significant increase in parasympathetic activity ( $P < 0.01$ ) following myofascial trigger-point massage therapy. Additionally both muscle tension and emotional state, showed significant improvement ( $P < 0.01$ ).

CONCLUSIONS:

In normal healthy subjects myofascial trigger-point massage therapy to the head, neck and shoulder areas is effective in increasing cardiac parasympathetic activity and improving measures of relaxation."

Ruffini N, D'Alessandro G, Mariani N, Pollastrelli A, Cardinali L, Cerritelli F, 2015 **Variations of high frequency parameter of heart rate variability following osteopathic manipulative treatment in healthy subjects compared to control group and sham therapy: randomized**

"Methods: Sixty-six healthy subjects, both male and female, were included in the present 3-armed randomized placebo controlled within subject cross-over single blinded study. Participants were asymptomatic adults ( $26.7 \pm 8.4$  y, 51% male, BMI  $18.5 \pm 4.8$ ), both smokers and non-smokers and not on medications. At enrollment subjects were randomized in three groups: A, B, C. Standardized structural evaluation followed by a patient need-based osteopathic treatment was performed in the first session of group A and in the second session of group B. Standardized evaluation followed by a protocolized sham treatment was provided in the second session of group A and in the first session of group B. No intervention was performed in the two sessions of group C, acting as a time-control. The trial was registered on [clinicaltrials.gov](http://clinicaltrials.gov) identifier: NCT01908920.

Main Outcomes Measures: HRV was calculated from electrocardiography before, during and after the intervention, for a total amount time of 25 min and considering frequency domain as well as linear and non-linear methods as outcome measures.

Results: OMT engendered a statistically significant increase of parasympathetic activity, as shown by High Frequency power ( $p < 0.001$ ), expressed in normalized and absolute unit, and possibly decrease of sympathetic activity, as revealed by Low Frequency power ( $p < 0.01$ ); results also showed a reduction of Low Frequency/High Frequency ratio ( $p < 0.001$ ) and Detrended fluctuation scaling exponent ( $p < 0.05$ ).

Conclusions: Findings suggested that OMT can influence ANS activity increasing parasympathetic function and decreasing sympathetic activity, compared to sham therapy and control group."

"The OMT intervention consisted in a patient's need based treatment, thus no pre-determined protocol was applied. Osteopathic session lasted 25 min, 10 min for evaluation and 15 min for treatment. Techniques used in the present study were left at the discretion of the operator but limited to balance ligamentous techniques, balance membranous techniques and cranio-sacral techniques"

## Other controlled clinical trials

Number of studies: 6

Henley CE, Ivins D, Mills M, Wen FK, Benjamin BA. 2008 **Osteopathic manipulative treatment and its relationship to autonomic nervous system activity as demonstrated by heart rate variability: a repeated measures study.** *Osteopathic medicine and primary care* Jun 5;2:7 <http://www.ncbi.nlm.nih.gov/pubmed/18534024>

"The relationship between osteopathic manipulative treatment (OMT) and the autonomic nervous system has long been acknowledged, but is poorly understood. In an effort to define this relationship, cervical myofascial release was used as the OMT technique with heart rate variability (HRV) as a surrogate for autonomic activity. This study quantifies that relationship and demonstrates a cause and effect."

"Predominantly parasympathetic responses were observed with subjects in the horizontal position, while a 50-degree tilt provided a significantly different measure of maximum sympathetic tone ( $p < 0.001$ ). Heart rate changed in all subjects with change in position; respirations remained constant. When OMT was performed in a sympathetic environment (tilt), a vagal response was produced that was strong enough to overcome the sympathetic tone.

There was no HRV difference between sham and control in either the horizontal or tilt positions."

"The vagal response produced by the myofascial release procedure in the maximally stimulated sympathetic environment could only have come from the application of the OMT. This demonstrates the association between OMT and the autonomic nervous system. The lack of significance between control and sham in all positions indicates that HRV may be a useful method of developing sham controls in future studies of OMT."

Welch A, Boone R 2008 **Sympathetic and parasympathetic responses to specific diversified adjustments to chiropractic vertebral subluxations of the cervical and thoracic spine.** *J Chiropr Med* Sep;7(3):86-93 <http://www.ncbi.nlm.nih.gov/pubmed>

**"OBJECTIVE:**

The aims of this study were to investigate the response of the autonomic nervous system based upon the area of the spine adjusted and to determine if a cervical adjustment elicits a parasympathetic response and if a thoracic adjustment elicits a sympathetic response.

**METHODS:**

Forty patients (25-55 years old) met inclusion criteria that consisted of normal blood pressure, no history of heart disease, and being asymptomatic. Patients were evaluated pre- and post-chiropractic adjustment for the following autonomic responses: blood pressure and pulse rate. Seven patients were measured for heart rate variability. The subjects received either a diversified cervical segment adjustment or a diversified thoracic segment adjustment.

**RESULTS:**

Diastolic pressure (indicating a sympathetic response) dropped significantly postadjustment among those receiving cervical adjustments, accompanied by a moderate clinical effect (0.50). Pulse pressure increased significantly among those receiving cervical adjustments, accompanied by a large effect size (0.82). Although the decrease in pulse pressure for those receiving thoracic adjustments was not statistically significant, the decrease was accompanied by a moderate effect size (0.66).

**CONCLUSION:**

It is preliminarily suggested that cervical adjustments may result in parasympathetic responses, whereas thoracic adjustments result in sympathetic responses. Furthermore, it appears that these responses may demonstrate the relationship of autonomic responses in association to the particular segment(s) adjusted."

Milnes K, Moran RW 2007 **Physiological effects of a CV4 cranial osteopathic technique on autonomic nervous system function: A preliminary investigation** International Journal of Osteopathic Medicine 10(1):8-17 41 <http://www.sciencedirect.com/science/article/pii/S1746068907000089>

"Heart rate variability, respiration rate, galvanic skin resistance and skin temperature were measured in ten subjects (six females, four males) in an experiment consisting of five generic phases"

"On examination of heart rate variability, it became apparent that three subjects may have responded in a manner that was consistent with an increase in parasympathetic activity during the treatment phase. This identification leads to the notion that there may be both 'responders' and 'non-responders' to cranial treatment."

Budgell B, Polus B 2006 **The Effects of Thoracic Manipulation on Heart Rate Variability: A Controlled Crossover Trial** J Manipulative Physiol Ther Volume 29, Issue 8, Pages 603–610 [https://www.jmptonline.org/article/S0161-4754\(06\)00225-9/fulltext](https://www.jmptonline.org/article/S0161-4754(06)00225-9/fulltext)

**"Objective**

The objective of this study was to measure the effects of thoracic spinal manipulation on heart rate variability (HRV) in a cohort of healthy young adults.

**Methods**

A controlled crossover trial that was conducted on 28 healthy young adults (23 men and 5 women; age range, 18-45 years; mean age, 29 ± 7 years) measured HRV before and after a sham procedure and a thoracic spinal manipulation.

**Results**

In healthy young adults, thoracic spinal manipulation was associated with changes in HRV that were not duplicated by the sham procedure. The ratio of the powers of the low-frequency and high-frequency components increased from  $0.9562 \pm 0.9192$  to  $1.304 \pm 1.118$  ( $P = .0030$ , Wilcoxon signed rank test). In subjects undergoing sham spinal manipulation, there was no statistically significant change in the low-frequency or the high-frequency component of the power spectrum; neither was there any in the ratio of the two regardless of whether the comparison was made using the paired t test or the Wilcoxon signed rank test.

**Conclusion**

High-velocity and low-amplitude manipulation of the thoracic spine appears to be able to influence autonomic output to the heart in ways that are not duplicated by a sham procedure or by other forms of somatic/physical therapies."

Zhang J, Dean D, Nosco D, Strathopoulos D, Floros M 2006 **Effect of chiropractic care on heart rate variability and pain in a multisite clinical study.** *J Manipulative Physiol Ther* May;29(4):267-74 <http://www.ncbi.nlm.nih.gov/pubmed>

**"OBJECTIVE:**

The purpose of this study is to investigate the effect of chiropractic care in a multiclinic setting on sympathetic and parasympathetic nervous system activities using heart rate variability (HRV) analysis.

**METHODS:**

Physicians of chiropractic in private practice were provided with an HRV device to perform analysis before and after chiropractic adjustments on 10 subjects. At each site, 8 subjects were monitored before and after a single chiropractic adjustment, and 2 additional patients were followed for a 4-week period with 2 HRV recordings per week. Patient information forms and a visual analog scale (VAS) questionnaire were completed both before and after each chiropractic adjustment.

**RESULTS:**

Data from 96 physicians were divided into single-visit and 4-week groups. After 1 chiropractic adjustment, pain as analyzed by VAS was reduced significantly from 3.7 +/- 2.2 to 2.1 +/- 2.0 ( $P < .001$ ). The mean heart rate reduced from 76.7 +/- 12.7 to 74.3 +/- 12.4 ( $P < .01$ ), the SD of normal-to-normal QRS increased from a range of 55.8 to 44.6 to a range of 60.6 to 47.2 ( $P < .001$ ), the high-frequency component increased from 359 +/- 968 to 444 +/- 1069 ( $P < .01$ ), the low-frequency component increased from 403 +/- 753 to 465 +/- 755 ( $P < .05$ ), and the total power increased from 1063 +/- 1886 to 1265 +/- 2048 ( $P < .01$ ). After 4 weeks of chiropractic adjustments, pain measured by the VAS was reduced significantly before and after each visit as analyzed by t tests, but the significant changes were not found using analysis of variance analysis. The reduction of pain from each treatment was not maintained over the 4 weeks of study period. The analysis of variance on the HRV 4-week data found that changes in the SD of normal-to-normal QRS, total power, and low-frequency components reached statistically significant levels ( $P < .05$ ). The heart rate and the high-frequency component did not change significantly ( $P > .05$ ).

**CONCLUSION:**

In this study, HRV and VAS changed in patients as a result of chiropractic care."

Budgell B, Hirano F 2001 **Innocuous mechanical stimulation of the neck and alterations in heart-rate variability in healthy young adults.** *Auton Neurosci* Aug 13;91(1-2):96-9 [https://www.autonomicneuroscience.com/article/S1566-0702\(01\)00306-X/fulltext](https://www.autonomicneuroscience.com/article/S1566-0702(01)00306-X/fulltext)

"The present study examined the effects of cervical spinal manipulation, a widely applied form of physical therapy, which involves innocuous mechanical stimulation, on heart rate and heart-rate variability, in a cohort of healthy young adults. Using a cross-over treatment design, with a one-week washout period and, in contrast to a sham procedure, the authentic manipulation produced significant alterations in both heart rate and measures of heart-rate variability calculated from power spectrum analysis. In particular, there was an increase in the ratio of low-frequency (LF)-to-high-frequency (HF) components of the power spectrum of heart-rate variability, which may reflect a shift in balance between sympathetic and parasympathetic output to the heart."



Reis MS, Durigan JL, Arena R, Rossi BR, Mendes RG, Borghi-Silva A 2014 **Effects of posteroanterior thoracic mobilization on heart rate variability and pain in women with fibromyalgia**. *Rehabil Res Pract* 2014:898763 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4060169/>

"Fibromyalgia (FM) has been associated with cardiac autonomic abnormalities and pain. Heart rate variability (HRV) is reduced in FM with autonomic tone dominated by sympathetic activity. The purpose of this study was to evaluate the effects of one session of a posteroanterior glide technique on both autonomic modulation and pain in woman with FM. This was a controlled trial with immediate followup; twenty premenopausal women were allocated into 2 groups: (i) women diagnosed with FM (n = 10) and (ii) healthy women (n = 10). Both groups received one session of Maitland mobilization grade III posteroanterior central pressure glide, at 2 Hz for 60 s at each vertebral segment. Autonomic modulation was assessed by HRV and pain by a numeric pain scale before and after the intervention. For HRV analyses, heart rate and RR intervals were recorded for 10 minutes. FM subjects demonstrated reduced HRV compared to controls. Although the mobilization technique did not significantly reduce pain, it was able to improve HRV quantified by an increase in rMSSD and SD1 indices, reflecting an improved autonomic profile through increased vagal activity. In conclusion, women with FM presented with impaired cardiac autonomic modulation. One session of Maitland spine mobilization was able to acutely improve HRV."