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Influence of classic massage on cardiac autonomic modulation

Influência da massagem clássica sobre a modulação autonômica cardíaca

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Abstract

Introduction: Massage can be defined as the rhythmic and smooth manipulation of body tissues, with the aim to promote health and well-being. **Objective:** To assess the influence of classic massage on cardiac autonomic modulation. **Methods:** Cross-sectional study that evaluated healthy participants, with mean age between 18 and 25 years, divided into two groups: test group (TG, n=11) and control group (CG, n=10). The TG had their heartbeat recorded for 5min before receiving a classic massage for 40min and during three periods after this procedure: 0-5min, 5-10min and 10-15min. The CG had their heartbeats recorded at the same time; without receive massage. Cardiac autonomic modulation was investigated by heart rate variability (HRV). **Results:** The mean values of HRV rates were: pNN50, respectively, for the TG: before massage (10.5 ± 9.5%), and after massage: 0-5min (11.6 ± 7.2%), 5-10min (12.1 ± 8.0%) and 10-15min (11.1 ± 7.9%), with no significant statistical difference. The same result was found for the mean values of rMSSD index of the TG; before massage: 52.1 ± 46.2 ms, and after massage: 0-5min (50.0 ± 21.6ms), 5-10min (52.0 ± 27.4 ms) and 10-15min (48.2 ± 21.1 ms). Also, the values of LFnuand HFnu indexes did not change significantly before and after massage, and they were not statistically different from the values presented by the control group. **Conclusion:** The study results suggest that one session of classic massage does not modify cardiac autonomic modulation in healthy young adults.

Keywords: Heart Rate. Massage. Autonomic Nervous System.

Resumo

Introdução: *A massagem pode ser definida como a manipulação dos tecidos corporais feita de forma rítmica e suave com a intenção de promover a saúde e o bem estar.* ***Objetivo:*** *Avaliar a influência da massagem clássica sobre a modulação autonômica cardíaca.* ***Métodos:*** *Estudo transversal que avaliou voluntárias saudáveis*

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com idades entre 18 e 25 anos divididas em dois grupos: grupo testado (GT, n=11) e grupo controle (GC, n=10). As do GT tiveram seus batimentos cardíacos registrados por 5min antes de uma sessão de massagem clássica recebida por 40min e durante três momentos após a mesma: 0-5min, 5-10min e 10-15min. As do GC tiveram registrados seus batimentos cardíacos nos mesmos momentos, porém não receberam a massagem. A modulação autonômica cardíaca foi investigada por meio da variabilidade da frequência cardíaca (VFC). ***Resultados:*** *Os valores médios de índices da VFC, foram: pNN50, respectivamente, para o GT: pré-massagem (10,5±9,5%), e após a massagem: 0-5min (11,6±7,2%), 5-10min (12,1±8,0%) e 10-15min (11,1±7,9%), sem diferença estatística entre eles. O mesmo aconteceu com relação ao índice rMSSD do GT, sendo: pré-massagem: 52,1±46,2ms, e pós-massagem: 0-5min (50,0±21,6ms), 5-10min (52,0±27,4ms) e 10-15min (48,2±21,1ms). Os valores de BFune AFunpré-massagem e pós-massagem também não se modificaram, e também não se diferiram significativamente dos valores apresentados pelo GC.* ***Conclusão:*** *O estudo sugere que não há modificação da modulação autonômica cardíaca em jovens saudáveis após uma sessão de massagem clássica.*

Palavras-chave*: Frequência Cardíaca. Massagem. Sistema Nervoso Autônomo.*

Introduction

Massage can be defined as the rhythmic and smooth manipulation of body tissues, with the aim to promote health and well-being (1). The first reports of massage date back to 2000 years before Christ, and reveal that this practice was part of many ancient cultures, which inhabited the territories where the modern nations of China, Egypt, Greece, India, Japan and Italy are today (2).

From antiquity, there are reports of Hippocrates praising massage as a resourceto relieve muscle and joint stiffness. Celsius and Galen, on the other hand,emphasizedthe medicinal and therapeutic benefits of massage, relating them to other procedures such as anointing oils, baths and physical exercise (3).

In the early nineteenth century, massage received a boost with the creation of classic or Swedish massage, developed by Per Henrik Ling. Ling had no higher education, but succeeded in his therapeutic proposals, and later taught these to physicians interested in knowing them, and also passed them on to other colleagues (4,5).

In the twentieth century, some therapeutic effects of massage that had hitherto been unproven were demonstrated and accepted by modern science. However, according to Moyer et al. (3), the current literature is still very lacking on the topic, and many researchers continue to present their findings without proper scientific evidence. In other circumstances, theories are presented, but important details are omitted.

Currently, classic or Swedish massage is recognized as the most common form of massage, used primarily by athletes for various purposes. Among the objectives and benefits attained from massage, the following are highlighted: anti-stress effect, increased venous return, increased local circulation and decreased muscle spasms (6). There are also studies that showthe effects of massage on stimulation of the parasympathetic nervous system (3,7).

Nevertheless, there is a general consensus that many of the studies related to massage techniques are empirical, and there is a need to conduct more consistent studies with larger samples. The same can be said regarding studies that evaluate the possible effect of classical massage on cardiac autonomic modulation.

Current paradigms on this topic show that classic massage alters the cardiac sympathovagal balance by increasing the parasympathetic tone while simultaneously reducingcardiovascular activity and stress hormones, thereby promoting a sense of calm and well-being (7-9). In contrast, studies show that classic massage increases cardiac sympathetic activity (10).

In addition to the current debate over how classic massage affects cardiac autonomic modulation, there are few studies that evaluate these effects after just one massage session. For instance, more effective research on the effects of a single massage session on cardiac autonomic modulation could bring new information on the efficiency of so-called“quick massage”, and could also form the basis of new paradigms related to this important treatment technique.

Thus, the aim of this study was to evaluate the effects of a single massage session on cardiac autonomic modulation.

Methods

Study participants

Sample size was calculated using the GraphPadStatMatesoftware, version 1.01 (San Diego, California, USA). To achieve statistical significance ($p<0.05$) with 80% power, a sample size of nine participants was needed to demonstrate the difference of data before and after classical massage.

Therefore, given the calculation of the sample size, 21 college women aged between 18 and 25 years were selected, all of whom were considered healthy and sedentary. These were randomly dividedinto a test group (TG) (n=11) and a control group (CG) (10). Inclusion criteria were: not being in any regular physical activity program in the last six months, and having a body mass index (BMI) between 23 and 30 (obesity is a factor that interferes with cardiac autonomic modulation).

Exclusion criteria were: having cardiovascular and/or respiratory problems detected by clinical examination, being a current smoker or having used tobacco up to two months prior to data collection, making current use of any medication, drinking alcohol more than once per week, being pregnant, having anxiety syndrome and refusing to sign the free and informed consent form.

The 21 participants selected in previous clinical examinations remained in the study, and there was no need to modify or insert other participants. The fact that only women participated in the study was due to the fact that only women showed interest in participating.

The study was approved by Human Research Ethics Committee of the Pontifical Catholic University of Campinas(protocol no. 757/09), and adhered to the principles of the Helsinki Declaration.

Procedures

Each participant visited the physical therapy outpatient clinic in order to become familiar with the environment where they would undergo the tests. The participants then responded to a questionnaire on lifestyle habits and cardiovascular profile on the data shown in the inclusion and exclusion criteria, and then underwent anthropometric and clinical evaluations.

Anthropometric evaluation

To characterize the study sample, weight and height were measured in order to calculate BMI. To obtain body weight, the participants were positioned without shoes on a Filizola® scale(São Paulo, Brazil) pre-calibratedin 100g units, on which each participant stood with their back to a metal Toesascaled in centimeters, and were asked to maintain a horizontal view so that the researcher could measure their height exactly at the point where the Toesa touched theparticipant's head.

Clinical evaluation

In order to avoid any cardiovascular disorder, each patient underwent an anamnesis and benchmarking of the heart rate (HR) and blood pressure (BP). The HR was obtained using a Polar® heart rate monitor, model S810i (Kempele, Finland), after the participant remained in the supine position for 5 min, in an air-conditioned room with a temperature between 23 °C and 25 °C. While still in the supine position, BP was measured using a mercury sphygmomanometer and a Littman® Classic II stethoscope (São Paulo, Brazil). This also enabled pulmonary and heart auscultation, according to techniques widely described in the literature.

After undergoing the evaluation procedures described above, eachparticipant received a brochure with guideline information on the24hours before the scheduled date of their massage, which included instructions not to practice physical exercise, consume alcohol, take medicines, drink coffee or tea, eatchocolate, and to try to get at least eight hours of sleep the night before the massage.

The leaflet also had information on clothing that the participant should bring to the clinic on the day of massage. Finally, with data extracted from the initial interview, the schedule strictly adhered to the criterion that the massage be performed at least three days after and five days before menstruation, so that hormonal interference on cardiac autonomic modulation was minimized.

Application of massage

All the participants of the TG were scheduled to receive the massage at the same time of day (between 2:00 pm and 5:00 pm), so that the circadian effects of the HR did not interfere in data collection. On the scheduled day and time, the participant went to the outpatient physical therapy clinic and, before the massage was started, responded to questions about whether she had followed all the guidelines. It was also noted whether the participant had gone to the bathroom minutes before to empty their bladder. Before the start of the massage and when properly dressed, the participantwas directed to, from that moment forward, not talk to the researcher nor move.

Data recording began after the heart monitor was attached to the participant's chest. After staying in the same position for 5min, the participant's heart rate was recordedduring 5 min.After this recording, the massage was started, which was performed always by the same professional. Specific aspects of classic massage were applied, including: surface sliding, deep sliding, kneading, friction, percussion, vibration and surface sliding again. These procedures were performed for 40 min, with 8 min dedicated to each region of the body, beginning with the face and proceeding to the upper limbs, and then the lower limbs.Immediately at the end of the massage, and without the participant having moved, the HR was recorded again for 15 min.

The CG participants remained lying down and under the same conditions of the TG, yet did not receive massage. The location, date and time of the CG procedurewas also scheduled, and their heartbeats were recordedduring the same time of day as the TG.

Interpretation and analysis of heart rate variability (HRV) data before and after application of classic massage

The heartbeats recorded before and immediately after the classic massage session were transferred to a computer via an IRPolar®interface,and analyzed using the softwarePolar Precision Performance®.

Cardiac autonomic modulation analysis was performed by evaluating heart rate variability (HRV) for 15 min after the massage, divided into three 5 min parts, analyzed during the time slots 0-5 min, 5-10 min and 10-15 min. A very strong filter (existing in the software)was appliedto prevent artifacts and ectopic heartbeats from being considered in analysis of the RR intervals.

The softwarecreated a report of the HRV, dividing it into analysis done in the time domain (TD) and analysis done in the frequency domain (FD), the parameters of which are explained below.

For analysis of HRV in FD, the Fast Fourier Transform (FFT) algorithmwas used. The FFT algorithm analyzes spectral power in certain frequency bands, already established as bands related to the predominantly sympathetic activity and bandsrelative to the parasympathetic activity(11-13).

Statistical analysis

Statistical analysis of the data on the parameters of the TD and FD of the HRV, compared before and after the massage, and between the TG and CG, was carried out using the softwareGraphPad Prism® 4.0 (San Diego, USA). Repeated Anova test measurements were performed for comparison of intra-group values of the TG (pre- and post-massage), and comparison of these data with those of the CG. The significance level was $p<0.05$.

The variables used in the study (HRV parameters) and their respective information are presented as follows.

Time domain (TD)

The root mean square standard deviation (rMSSD) is the square root of the mean of the sum of squares of the differences between adjacent normal RR intervals (RRi) in a time interval expressed in milliseconds (ms). The higher the value of this calculation, the greater the cardiac vagal activity present (13-15).

The pNN50 is the percentage of adjacent RRi with a difference of more than 50 ms.The higher the value of this percentage, the greater the parasympathetic activity at the time (13-15).

Frequency domain (FD)

a) The low-frequency (LF) band ranges from 0.04 to 0.15 Hz, and the spectral power focusing on this band expresses the joint action of the parasympathetic and sympathetic cardiac activity, however, most authors believe that the sympathetic activity is more effective in this frequency band (16,17).

b) The high-frequency (HF) band varies from 0.15 to 0.4 Hz, and the greater the spectral power focusing on this band, the greater the parasympathetic activity. It expresses the vagal activity on the heart (15-17).

In this study, both LF and the HF components were calculated in normalized units (n.u.), which represent the relative values of each component in proportion to total output, minus the ultra lowfrequency (ULF) and very low frequency (VLF) components (12,13,18).

c) The low/high frequency ratio (LF/HF ratio) expresses the division of the LF value by the HF value. Whenever the value is greater than1, it means that at the moment of the particular record, greater cardiac sympathetic tone exists, while a value of the LF/HF ratio less than one indicates parasympathetic predominance on the heart (14,15).

Results

The data in Table 1 show the anthropometric and clinical values of the participants.All values are adequate, since they are within the normal range and met the inclusion criteria.

It should be noted that the mean BMI obtained confirms that none of the participants were overweight or obese, a condition which could interfere with data.

The pre-massage HR was important to show that the participants were not in a state of stress or anticipation, because the mean HR of 71.7bpm of the TG and 73.4bpm of the CG suggest the absence of factors which could have an impact on the data obtained and the HRV.

The mean pre-massage values of systolic BP of the TG were similar to those of the CG, with the TG having 111.8 ± 11.8 mmHg and the CG having 113 ± 10.6 mmHg, with no statistical difference. The same occurred with the mean pre-massage values of diastolic BP, for which the TG had 77.7 ± 12.9 mmHg and the CG had 79.2 ± 9.9 mmHg.

Table 1 - Anthropometric and clinical data (mean and standard deviation)

	TG	CG	
	(n=11)	(n=10)	p
Weight (kg)	55.0 ± 7.3	57.0 ± 6.9	p = 0.37
Height (m)	1.5 ± 0.0	1.6 ± 0.2	p = 0.83
BMI (kg/m²)	21.9 ± 2.4	22.3 ± 2.0	p = 0.43
Pre-massage HR (bpm)	71.7 ± 8.6	73.4 ± 7.8	p = 0.83
SBP (mmHg)	111.8 ± 11.8	113.8 ± 10.6	p = 0.22
DBP (mmHg)	77.7 ± 12.9	79.2 ± 9.9	p = 0.31

Note: TG = test group; CG = control group; BMI = body mass index; HR = heart rate; SBP = systolic blood pressure; DBP = diastolic blood pressure.

As presented in Figure 1, after the massage, the mean HR observed in the TG was: 0-5 min = 71.0±8.4bpm; 5-10 min = 71.8±8.3bpm; 10-15 min = 72.8±8.9bpm, with no CG or intra-group differences at all times recorded.

The same applies to the mean value of systolic BP (SBP) and diastolic BP (DBP), as they both show that the groups, despite being made up of sedentary individuals, showed normal values of these variables. These data were important to verify that the cardiocirculatory conditions prior to the beginning of the records were adequate.

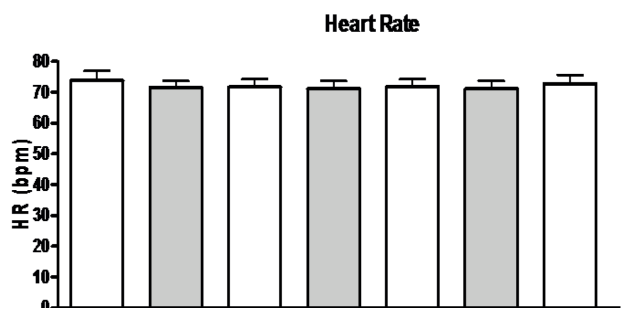

Figure 1 - Mean HR values obtained with the test group (white, n=11) and control group (gray, n=10). The HR values 0-5min, 5-10min and 10-15min refer to records made after application of the massage, which are compared to the same times of the CG, which remained lying down, but did not receive massage.ns = no significative. There was no statistically significant difference(s) between the data.

Figures 2 and 3 show the behavior of the values of the HRV variable relative to the TD. Both the pNN50 and the rMSSD reflect the vagal behavior on the heart, and it is shown that the classic massage had no influence on these values when the pre-and post-massage data were compared. Similarly, these values were not different from those presented by the CG.

The mean values of the pNN50 rate presented by the TG were, respectively: pre-massage (10.5 ± 9.5%), 0-5 min (11.6 ± 7.2%), 5-10 min (12.1 ± 8.0%) and 10-15 min after the massage (11.1 ± 7.9%), while the mean values of the rMSSD rate of the same group were: pre-massage = 52.1 ± 46.2ms, and post-massage at 0-5 min, 5-10 min and 10-15 min, respectively: 50.0 ± 21.6ms, 52.0 ± 27.4ms and 48.2 ± 21.1ms.

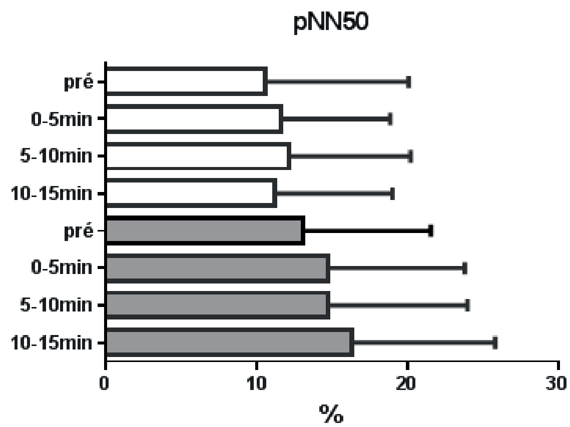

Figure 2 - Mean values of percentage of adjacent RR intervals, with duration difference greater than 50 milliseconds (pNN50), obtained from the tested group (white, n=11) and control group (gray, n=10). The HR values 0-5min, 5-10min and 10-15min refer to records made after application of the massage, which are compared to the same times of the CG, which remained lying down, but did not receive massage.
ns = no significative. There was no statistically significant difference between the data.

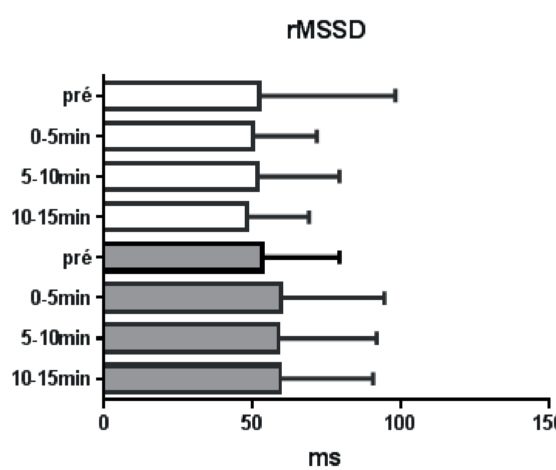

Figure 3 - rMSSD mean values, which represent the square root of the mean of the sum of the squared differences between normal adjacent RR intervals (iRR), obtained from the test group (white, n=11) and the control group (gray, n=10). The HR values 0-5min, 5-10min and 10-15min refer to records made after application of the massage, which are compared to the same times of the CG, which remained lying down, but did not receive massage.ns = no significative. There was no statistically significant difference between the data.

Table 2 shows the mean values of the LF and HF rates and the LF/HF ratio, calculated in normalized units (n.u.) before and after the classic massage and the values of the CG, at the same times. It was also found that the massage did not significantly affect these values, confirming what had been demonstrated in analysis of the TD rates.

Table 2 - Mean values of low frequency (LF) and high frequency (HF) calculated in standard units, from the analysis of the frequency domain (FD) of heart rate variability (HRV) pre- and post-classic massage (0-5min, 5-10min, 10-15min)

Test group (TG, n=11)

	Pre (%)	Post 0–5min (%)	Post 5–10 min (%)	Post 10–15 min (%)	p
LF (unit)	47.4 ± 20.9	42.8 ± 19.7	40.7 ± 19.2	42.9 ± 20.9	ns
HF (unit)	52.5 ± 20.9	57.1 ±1 9.7	59.2 ± 19.2	57.0 ± 21.0	ns
LF/HF ratio (unit)	1.26 ± 0.91	1.10 ± 1.12	0.91 ± 0.75	1.09 ± 0.95	ns

Control group (CG, n=10)

	Pre (%)	Post 0–5min (%)	Post 5–10 min (%)	Post 10–15 min (%)	p
LF (n.u.)	38.1 ± 14.9	37.6 ± 19.0	37.7 ± 19.2	38.2 ± 18.3	ns
HF (n.u.)	60.8 ± 14.9	61.3 ± 18.9	60.3 ± 19.42	59.6 ± 19.0	ns
LF/HF ratio	0.72 ± 0.48	0.82 ± 0.81	0.88 ± 0.70	0.97 ± 0.78	ns

Note: LF = low frequency; HF = high frequency; n.u. = normalized units.

Discussion

The main finding of this study was that in apparently healthy young adults, classic massage did not interfere in the cardiac autonomic modulation quantified by means of the HRV.

It is believed that the lack of effect of the massage on the parameters of HRV is partly due to the lack of documented changes prior to start of the massage on the participants, such as: bone and joint disorders, aches, malaise, stress, depression, and anxiety. This statement is based on the fact that, in most studies in which changes in the cardiac autonomic modulationwere observed after application of classic massage, there were previous situations of emotional and/or physical disorders (8,19).

One example is the study by Hulme et al. (6), who reported increased vagal tone during application of therapeutic massage. However, before the start of the massage, the participants presented high values of stress hormones, and therefore had greater cardiac sympathetic tone. That is, this study suggests that when the cardiac vago-sympathetic balance is leaning to the sympathetic side, massage can normalize it.

Similarly, it was found that the participants evaluated by Lindgren et al. (19), which had anxiety due to the aortic surgery that they would undergo, showed reduction of anxiety after being subjected to massage procedures.

Toro-Velasco et al. (20) also managed to show that with just one session of massage on the neck region, HRV rates were increased and perceived pain and tension were reduced in patients with pain from tension headache that existed prior to the massage.

Therefore, the presence of functional changes or problems that can interfere with cardiac autonomic modulation before the massage appears to be a strong indication that application of massage on those conditions can succeed.

Another aspect to be considered in a discussion about the positive effects of massage involves technical knowledge (what type of massage was done) and duration of massage. Because there are many techniques and different amounts of time of application of massage, analyzing these studies is difficult and the conclusions must be carefully assessed (3,21).

For example, when the mean HR values were evaluated after the massage, it was found that they did not change, and therefore were different from that observed in other, similar studies that, in general, showed a reduction in the value of this variable. In part, these differences also occurred for the reasons provided above, but there are other aspects to be taken into consideration.

Kaye et al.(22)showed that there was a significant reduction of mean HR of 10.8bpm, however, both the method of measuring the HR and the massage technique were different from the present study, thereby limiting comparison of the behavior of this variable between the two studies.

Also with regard to HR responses, Sethi and Bojadsen (23) concluded that massage significantly reduced HR during the first five minutes of the session, and also after 15 minutes. In the present study, it should be noted that the HR was not monitored during the massage session, because it was understood that data could be created in this period that would harm analysis of the HR and HRV. However, with respect to data recorded 15min after application of the massage, the results were also discordant because the TG showed an oscillation of only 2bpm in the value of the mean HR from the pre-massage rate until 15 min after its conclusion, showing great stability in the behavior of the variable.

However, the primaryfocus of the present study was not to ascertain whether the HR would decrease with application of classic massage, but also to verify if this reduction would be related to changes of the vago-sympathetic balance, which also did not occur (Figure 1).

It should be noted that in the study by Siqueira and Bojadsen (23), reduction of HR may not have been due to autonomic adjustment, because analysis of the HRV was not performed to obtain this knowledge. Hence, it cannot be concluded if the decreased HR was accompanied by increased vagal activity or reduced sympathetic activity, or if both situations occurred.

Although some studies are not clear with respect to the autonomic response of the HR due to massages, there are consistent studies that showed decreased HR and concomitant increased cardiac parasympathetic tone, as, for example, those conducted by Cottingham et al. (24) and Okvat et al. (25), although in these studies the massage technique applied was not the same as that used in the present study.

Some studies report that massage can cause increased permeability of the vessel walls, which leads to better irrigation of the dermis and subcutaneous tissue, thereby interfering in peripheral vascular resistance, and, consequently, on the BP value (24,25).

Others suggest that the effects of massage on BP have a cellular route, because it has been shown that by stretching the tissues, massage can modify the size and extent of fibroblasts, and also cause lower peripheral vascular resistance and reduction of BP (26).

One of the most relevant studies on this topic was undertaken in 2008 by Kaye et al. (22), whoapplied deep massage for 45 to 60 minutes on 263 participants (12% male and 88% female) with a mean age of 48.5 years. The results showed a mean reduction of 10.4 mmHg of the systolic BP (p = 0.06), and mean reduction of diastolic BP of 5.3 mmHg (p=0.04).

In the following year, Takamoto et al. (27) also obtained decreased BP, associated with increased-parasympathetic cardiac activity by means of application of compression of the trigger pointson the legs. However, in this study, there was technical application of breath control in conjunction with the massage, which can increase respiratory sinus arrhythmia and cardiac parasympathetic activity (14,28), causing bias and hindering establishment of the exact extent ofthe effect of the massage on the autonomic response documented.

This verifies that in both studies cited above, the massage techniques were different from those in the present study, but showed an relevant aspect, that being the possibility of reducing BP. However, there are strong indications that to achieve this goal, the massage should be deeper and more energetic than classic massage or conventional relaxation, performed with lighter touches and sliding on the skin.

The study by Diego and Field (29) appears to confirm exactly what was proposed in the paragraph above, because the participants who received massage for 15 min, with moderate pressure, showed an increase in the value of the HF rate and reduction of the value of the LF/HF ratio of the HRV, thus confirming elevation of the cardiac parasympathetic tone. On the other hand, those who received massage with light pressure had decreased HF rate value and elevation of the LF/HF ratio, suggesting increased sympathetic activity.

In the present study, the pNN50 analysis showed that the participants of the CG showed higher values than the TG and, during the time that they remained lying down, they showed a progressive increase of the mean value of the variable, yet without differentiating significantly from the TG. This behavior of the pNN50 value did not occur with the TG, which showed very similar values between the pre-massage and post-massage period, as shown in Figure 2.

Analysis of the rMSSD values (Figure 3) showed very similar behavior to what was obtained with respect to pNN50, and reinforced the main conclusion of this study, which was that classic massage, in the intensity and time it was applied, does not change cardiac parasympathetic tone.

By observing the results of Table 2, which shows the behavior of the LFnu and HFnu rates, and the LF/HF ratio of the analysis of the HRV on the FD, one can confirm what had been reported in relation to the parameters of the TD, because these also did not change after application of the massage and did not differ from the values of the CG.

Finally, the results of the LF/HF ratio observed in Table 2 serve to reinforce what was stated in the paragraph above. Although the TG showed a tendency to decrease sympathetic tone in a comparison of the pre-massage values and the values of 0-5min and 5-10min after the same, there was no statistically significant difference between these values. In addition, it was found that when the values of the variables were compared to CG, statistically significant difference was also not obtained.

Unfortunately, the authors of the present study were unable to find studies that applied the same methods, both for type of massage and parameters of HRV, so that they could deepen comparison between the results. Only the study by Diego and Field (29), cited above, also had a study sample composed of healthy young adults. However, although massage was applied for only 15 minutes, one of the massage intensities used was similar to that applied by the present study, and, in that condition, the results were equal, thereby showing that changes in the vago-sympathetic balance do not occur when pressures on the skin are very light or mild.

The absence of any difference between the pre- and post-classic massage values of HR, BP and HRV obtained in this study have their importance. These results can be used as a parameter in new studies focused on expanding knowledge about a therapeutic procedure used by physical therapists from all over the world, the practice of which appears to show good results, but that still requires further research on the actual physiological effects.

It should be noted that in the present study, the massage was not performed in the prone position, which would merit another comparative analysis of the behavior of the variables in the supine and prone positions, because there are studies showing differences in cardiovascular responses in these positions (30).

The fact that the massage was not applied on the back is one limitation of this study. However, it was not possible to perform the massage on this region due to the fact that the prone position causes pain or discomfort in the chest area due to compression of the heart monitor attached on this region.

As a suggestion for future studies, it would be interesting to carry out analysis of HRV after application of massage on each region on which massage was performed on the participants of this study. The idea is to know what region might be more effective to promote greater relaxation and eventual interference in cardiac autonomic modulation.

Conclusion

The main conclusionof this study is that a classic massage session performed on the face and limbs of healthy young women does not modify cardiac autonomic modulation, as measured by HRV compared before and up to 15 min after this procedure.

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References

1. CafarelliE, Flint F. The role of massage in preparation for and recovery from exercise. Sports Med. 1992;14(1):1-9.
2. Elton D, Stanley G, Burrows G. Psychological control of pain. New York: Grune& Stratton; 1983.
3. Moyer CA, Rounds J, Hannum JW. A meta-analysis of massage therapy research. PsycholBull. 2004;130(1):3-18.
4. Fritz S. Mosby's fundamentals of therapeutic massage. St. Louis (MO): Mosby; 2000.
5. Saved SG. Massage therapy: Principles and practice. Philadelphia: Saunders; 1999.
6. Weerapong P, Hume PA, Kolt GS. The mechanisms of massage and effect on performance, muscle recovery and injury prevention. Sports Med. 2005;35(3):235-56.
7. Sarafino EP. Health psychology: Biopsychosocial interactions. New York: Wiley; 2002.
8. Hulme J, Waterman H, Hillier VF. The effect of foot massage on patients´perception of care following laparoscopic sterilization the day case patients. J AdvNurs. 1999;30:460-8.
9. Schachner L, Field T, Hernandez-Reif M, Duarte AM, KrasnegorJ. Atopic dermatitis symptoms decreased in children following massage therapy. PediatrDermatol. 1998;15:390-5.
10. Barr JS, Taslitz N. The influence of back massage on autonomic functions. PhysTher. 1970;50:1679-91.
11. Akselrod S, Gordon D, Madwed JB, Snidman NC, Shannon DC, Cohen RJ. Hemodynamic regulation: investigation by spectral analysis. Am J Physiol. 1985;249(4 Pt 2):H867-75.
12. Heathers JA. Everything Hertz: methodological issues in short term frequency-domain HRV. Front Physiol. 2014;5:1-15.
13. Pagani M, Lucini D, Door A. Sympathovagal balance from heart rate variability: time for the second round? Exp Physiol. 2012;97:1141-2.
14. Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology. Heart rate variability: standards of measurement, physiological interpretation and clinical use. Circulation. 1996;93(5):1043-65.
15. Vanderlei LCM, Pastre CM, Hoshi RA, Carvalho TD, Godoy MF. Basic notions of heart rate variability and its clinical applicability. RevBrasCirCardiovasc. 2009;24(2):205-17.
16. Furlan R, Piazza S, Dell'Orto S, Gentile E, Cerutti S, Pagani M, et al.Early and late effects of exercise and athletic training on neural mechanisms controlling heart rate. Cardiovasc Res.1993;27(3):482-8.

17. Shin K, Minamitani H, Onishi S, Yamazaki H, Lee M. Autonomic differences between athletes and non-athletes: spectral analysis approach. Med Sci Sports Exerc. 1997;29(11):1482-90.

18. Malliani A, Pagani M, Lombardi F, Cerutti S.Cardiovascular neural regulation explored in the frequency domain. Circulation. 1991;84(2):482-92.

19. Lindgren L, Lehtipalo S, Winsö O, Karlsson M, Wiklund U, Brulin C.Touch massage: a pilot study of a complex intervention. NursCrit Care. 2013;18(6):269-77.

20. Toro-Velasco C, Arroyo-Morales M, Fernández-de-Las-Peñas C, Cleland JA, Barrero-Hernández FJ. Short-term effects of manual therapy on heart rate variability, mood state, and pressure pain sensitivity in patients with chronic tension-type headache: a pilot study. J Manipulative PhysiolTher. 2009;32(7):527-35.

21. Givi M. Durability of effect of massage therapy on blood pressure. Int J Prev Med. 2013;4(5):511-6.

22. Kaye AD, Kaye AJ, Swinford J, Baluch, Bawcom BS, Lambert TJ, et al. The effect of deep-tissue massage therapy on blood pressure and heart rate. J Altern Complement Med. 2008;14(2):125-8.

23. Sesay HP, Bojadsen TWA. Analysis of physiological changes from classical massage as a function of the time of application. S Magazine. 2006;3(2):59-72.

24. Cottingham JT, Porges SW, Richmond K. Shifts in pelvic inclination angle and parasympathetic tone produced by Rolfing soft tissue manipulation. PhysTher. 1988;68(9):1364-70.

25. Okvat HA, Oz MC, Ting W, Namerow PB. Massage therapy for patients undergoing cardiac catheterization. AlternTher Health Med. 2002;8(3):68-75.

26. Langevin HM, Bouffard NA, Badger GJ, Iatridis JC, Howe AK.Dynamic cytoskeletal fibroblast response to subcutaneous tissue stretch ex vivo and in vivo. Am J Physiol Cell Physiol. 2005;288(3):C747-C56.

27. Takamoto K, Sakai S, Hori E, Urakawa S, Umeno K, Ono T, et al.Compression on trigger points in the leg muscle increases parasympathetic nervous activity based on heart rate variability. J Physiol Sci. 2009;59(3):191-7.

28. Shields RW. Heart rate variability with deep breathing as a clinical test of cardiovagal function. Cleve Clin J Med. 2009;76Suppl 2:S37-40.

29. Diego MA, Field T. Moderate pressure massage elicits the parasympathetic nervous system response. Int J Neurosci. 2009;119(5):630-8.

30. Watanabe N, Reece J, Polus BI. Effects of body position on autonomic regulation of cardiovascular function in young, healthy adults. ChiroprOsteopat. 2007;15(19):1-8.

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