THE JOURNAL OF ALTERNATIVE AND COMPLEMENTARY MEDICINE
Volume 12, Number 1, 2006, pp. 65–70

Changes in Blood Pressure After Various Forms of Therapeutic Massage: A Preliminary Study

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ABSTRACT

Objectives: The objective of this study was to determine the change in blood pressure (BP) in normotensive and prehypertensive adults resulting from a therapeutic massage, and the factors associated with such changes, including demographic and massage characteristics

Design: settings/location: National University of Health Sciences Massage Therapy Clinic, Lombard, IL.

Subjects: The subjects were 150 current adult massage therapy clients with BP lower than 150/95

Interventions: BP was measured before and after a therapeutic massage

Outcome measures: Change in BP and potential associated factors such as type of massage, duration of massage, specific body area massaged, amount of massage pressure, and demographic characteristics were studied

Results: Overall, systolic BP decreased by 1.8 mm Hg and diastolic BP increased by 0.1 mm Hg. Demographic factors associated with BP decrease included younger age ($p = 0.01$) and taller stature ($p = 0.09$). Type of massage was associated with change in BP: Swedish massage had the greatest effect at BP reduction. Trigger point therapy and sports massage both increased the systolic BP, and if both forms of massage were included in a session, both the systolic and diastolic BP readings significantly increased. No other massage factors were associated with a significant change in BP

Conclusions: Type of massage was the main factor affecting change in BP. Increases in BP were noted for potentially painful massage techniques, including trigger point therapy

INTRODUCTION

Massage is a commonly used form of treatment, accounting for almost half of all visits to complementary and health care providers.[1] This form of manual therapy is mainly used for musculoskeletal complaints and relaxation. As a result of the relaxation response and through the increase in blood flow throughout the body, an overall decrease in blood pressure (BP) is thought to occur. However, various studies have found conflicting evidence as to whether massage can produce a relaxation response and thus the decrease in BP. Kaufmann[2] and Longworth[3] show no significant difference in BP before and after massage, whereas several other studies demonstrate significant decreases.[4–10] Such variability in outcomes may result from the limited number of subjects within most previous studies along with a lack of clearly defined form of massage used. The purpose of this preliminary study is to measure the change in BP before and after receipt of a therapeutic massage in normotensive and prehypertensive adults, and to determine if BP changes are associated with certain patient characteristics or the type, duration, or force of massage. This is the first study to assess what specific characteristics of massage may affect BP, and these data will assist in determining a massage treatment for hypertensive clients in future clinical studies.

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Hypertension is defined as systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg. According to the 1999–2000 U.S. National Health and Nutrition Examination Survey (NHANES), nearly 29% of the U.S. adult population has hypertension, amounting to approximately 58.4 million Americans.[11] The majority of Americans take medications to control their hypertension; however, not all hypertensive patients can or are willing to take prescribed medications. An alternative, nonpharmacologic treatment for hypertension may be massage therapy.

Few previous studies have assessed the change in BP with massage. One clinical pilot study assessed chiropractic manipulation versus a massage control group for subjects with essential hypertension.[12] In this study, eight subjects received 5 to 10 second effleurage massages in two areas along the spinal column, for up to three visits per week during month 1 and two visits per week during month 2. Both systolic and diastolic BPs decreased at some point during the course of the massage treatments, however no statistical analyses were completed.

A second clinical trial compared massage therapy (n = 15) with a muscle relaxation control group (n = 15) to decrease hypertension.[8] Subjects in the massage group received ten 30-minute massages specifically formatted for this study including several techniques to the head/neck, arms, torso, legs, and back. The results of this study demonstrated that the massage group had significantly lower systolic and diastolic BP readings over time compared to the control group.

In both of these clinical trials, the number of subjects was small and the reader was left with the question of which form of massage was the most beneficial to the hypertensive client. The purpose of this study was to assess several demographic and massage factors potentially associated with change in BP in normotensive and prehypertensive adults. These data will assist in development of a massage protocol for future clinical trials on reduction of BP.

MATERIALS AND METHODS

Participants

Returning clients who were scheduled for a massage therapy appointment at the National University of Health Sciences Massage Therapy Clinic were approached for study participation. A description of the study and an Institutional Review Board (IRB) approved written consent form were provided to eligible clients. The subjects who consented to participate were asked to provide demographic information (i.e., height, weight, age), have an initial BP measurement taken, receive a therapeutic massage for $^1/_2$ to $1^1/_2$ hours, and then have a second BP measurement taken.

Subjects were excluded if they were not 18 years of age or older, not fluent and literate in the English language, had no time or interest to participate, or were first-time clients. New massage therapy clients were excluded from participation because it was expected that their BP would be elevated prior to the massage because of apprehension, rather than a true physiologic elevation, and could lead to false results.

Based on clinic regulations, subjects with a BP of 150/95 or greater are not allowed to be treated within the Massage Therapy Clinic without written consent from their primary care physician and therefore were not eligible for this study without consent.

Interventions

Massages were provided by 25 massage therapy (MT) students, 12 were in their second trimester of coursework and 13 were in their third (final) trimester. MT students were trained to provide massage based on client need, rather than structuring the massage for this study. Each massage was between 30 and 90 minutes, and integrated six possible types of massage, including Swedish massage, deep tissue massage, myofascial release, sports massage, trigger point therapy, and/or craniosacral therapy.

We defined the type of massage used in the study as follows: Swedish massage is considered the most "traditional" form of massage and uses compression, holding, gliding (effleurage), kneading (petrissage), shaking, tapping, and friction. Deep tissue massage is designed to reach the deep layers of muscle and uses a combination of compression, cross-fiber, and friction strokes. Myofascial release is a technique in which the fascia connecting and surrounding muscle is manipulated by the therapist. Sports massage is typically a more vigorous type of massage used to prepare athletes for peak performance and uses a combination of techniques including joint mobilization, stretching and/or postisometric relaxation, cross-fiber friction, and pressure point massage. Trigger point massage is a neuromuscular technique used to break the pain-spasm-pain cycle and uses focused ischemic pressure at sites of myofascial trigger points. Finally, craniosacral massage uses gentle touch on the head and sacral areas to release restrictions.

Details about the massage were collected from each therapist after each client's massage.

Objectives

The objective of this study was to determine the change in BP resulting from a therapeutic massage and the factors associated with such changes.

Outcomes

For this study, BP was measured using an automated cuff (similar to the cuff at a local drug store) because of the ease of use for the massage therapy students collecting the BP. Although automated cuffs may be less accurate than manual/standard methods (e.g., reading slightly high or low), the

authors were interested in the change in BP and were not concerned with an exact BP reading. Future studies will incorporate the use of manual BP measures.

A survey was developed to collect the details about the massage including: type(s) of massage provided, overall amount of pressure used during massage as perceived by the massage therapist, body areas massaged, and the length of time each massage session lasted. These data were collected from the MT students immediately after each massage.

Statistical methods

Analysis of variance (ANOVA) models were developed to determine continuous differences in systolic and diastolic BP changes (dependent variable) resulting from various categoric or ordinal independent variables including: (1) demographic patient characteristics such as gender, race, and medication use; (2) duration of massage; (3) pressure used during massage; (4) body area massaged; or (5) type of massage. Linear regression models were developed to assess associations between BP and continuous demographic variables such as age, height, and weight. For this preliminary study, significance values were set at $p < 0.10$.

RESULTS

Participant flow

From February 1, 2005 to April 29, 2005, 213 massage therapy clients were approached to participate in this research study. Of the 213 clients, 60 were not interested or asked the massage therapist to inquire later but subsequently did not participate. Of the 153 who agreed to participate, three were excluded leaving 150 active participants in the study.

Baseline data

The average BP at baseline was 124 (range: 90–187) for systolic blood pressure (SBP) and 73 (range: 50–105) for diastolic blood pressure (DBP). Because of the possible validity issues in the BP monitor readings (consistent false-high or -low), change in BP readings rather than actual readings are discussed.

As demonstrated in Table 1, the subjects were primarily female (61.3%), white (88.7%), and not taking BP medications (88%). The average age was 42.5 years (range: 19–79),

TABLE 1. BASELINE CHARACTERISTICS ASSOCIATED WITH CHANGE IN BLOOD PRESSURE

		Systolic change (before-after)	*Diastolic change (before-after)*
	Sample size	p-*value*	p-*value*
Gender		0.45	0.93
Male	58	−2.60	0.05
Female	92	−1.29	0.17
Race		0.96	0.61
Caucasian	133	−1.80	0.38
Black	2	−1.00	4.00
Hispanic	4	−5.25	−1.50
Other	11	−0.73	−3.09
Medication for high blood pressure		0.93	0.10
No	132	−1.83	0.52
Yes	18	−1.61	−2.78
Age		**0.01**[a]	0.67
19–31	40	−3.95	0.00
32–41	36	−1.25	0.53
42–53	40	−1.95	0.18
54–79	33	0.64	0.30
Height		**0.09**[a]	0.88
60–64	41	0.27	1.02
65–66	35	−1.09	−0.86
67–69	38	−3.82	−0.05
70–77	36	−2.72	0.25
Weight		0.33	0.10
105–150	43	0.81	1.37
151–175	32	−1.22	0.94
176–195	38	−4.21	−0.03
196–387	36	−2.50	−2.06

[a]Indicates significant group difference at $p < 0.10$.

TABLE 2 TREATMENT FACTORS ASSOCIATED WITH CHANGE IN BLOOD PRESSURE

		Systolic change (before-after)	*Diastolic change (before-after)*
	Sample size	p-*value*	p-*value*
Duration of massage		0.45	0.51
Unknown	2	−4.50	−0.50
30 minutes	12	1.00	2.50
60 minutes	134	−2.10	−0.11
90 minutes	2	4.00	2.50
Pressure		0.41	0.53
Light	1	2.00	−6.00
Light/medium	25	−3.60	2.12
Medium	48	−1.33	0.38
Medium/heavy	64	−2.44	−0.84
Heavy	12	3.17	0.67
Trimester of massage therapy intern		0.37	0.72
Trimester 2	46	−2.94	0.48
Trimester 3	104	−1.30	−0.03

average height was 67.0 inches (range: 60–77), and average weight was 176.2 pounds (range: 105–387).

Characteristics associated with blood pressure changes

Overall, the average decrease in systolic BP was 1.8 mmHg (range: −24–34) and the average change in diastolic BP was negligible increase of 0.1 (range: −53–18).

As noted in Table 1, some specific baseline characteristics demonstrated significantly greater changes in SBP, including younger age ($p = 0.01$) and taller stature ($p = 0.09$). Items that did not significantly affect the systolic or diastolic pressure in this study included gender, race, usage of BP medications, or weight; although there did appear to be a trend of decreased pressure readings in males, Hispanics, and heavier individuals.

The authors then assessed specific treatment factors, demonstrating no association with change in BP and duration of massage, amount of pressure used during the massage, and the trimester of the massage therapy intern (Table 2). Nor was there any association between change in BP and the specific body areas massaged (Table 3).

Finally, we assessed the type of massage, which appeared to be the significant factor affecting the change in BP. For the majority of subjects, some Swedish massage was provided, which appeared to be associated with a decrease in systolic BP, although no statistically significant findings were noted. Trigger point therapy and sports massage both increased the systolic BP, and if both forms of massage were included in a session, both the systolic and diastolic BP readings significantly increased. No significant effect in either direction of BP change was noted with deep tissue massage, myofascial release, or CranioSacral therapy.

DISCUSSION

The purpose of this preliminary study was to measure the changes in BP before and after receipt of a therapeutic mas-

TABLE 3 MASSAGED BODY AREAS AND ASSOCIATION WITH CHANGE IN BLOOD PRESSURE

	Sample size[a]		*Systolic change (before-after)*			*Diastolic change (before-after)*		
Received treatment?	*No*	*Yes*	*No*	*Yes*	p-*value*	*No*	*Yes*	p-*value*
Back	1	149	−1.00	−1.81	0.94	10.00	0.06	0.21
Head and/or neck	8	142	−0.88	−1.85	0.80	3.63	−0.07	0.20
Upper extremity	21	129	−2.38	−1.71	0.78	−0.57	0.24	0.67
Lower extremity	29	121	−0.59	−2.09	0.48	0.72	−0.02	0.65
Posterior hip	38	112	−0.68	−2.18	0.44	1.87	−0.46	0.12
Face	61	89	−1.90	−1.73	0.92	0.16	0.10	0.96

[a]Most subjects received massage on more than one body part during the massage session.

sage in 150 massage clients, and determine the factors associated with such changes. It was determined that some baseline demographic characteristics were associated with a significant *decrease* in systolic BP such as decreased age and increased height. It was also determined that certain types of massage were significantly associated with an *increase* in systolic BP, such as trigger point therapy and sports massage; and that there appeared to be a decrease in systolic BP with Swedish massage although this result was not statistically significant. No significant association was noted between change in BP and body area massaged, massage duration, or pressure used during massage.

Previous research studies on the topic of BP change through massage therapy demonstrate either no change or a significant decrease in both systolic and diastolic BP; however, results of this study demonstrate that the change in BP may be based on massage type, with certain forms of massage actually increasing the systolic BP. The most significant increase in BP within this study was through trigger point therapy, which may cause a pain response and thus an increase in sympathetic nerve activity and an increase in BP. Interestingly, a recent study by Delaney et al.[9] demonstrated a *decrease* in BP with trigger point therapy; however, the subjects in this study received a 20-minute massage that also included "linear stroking to the sternocleidomastoid muscles," which may have stimulated the carotid sinus, thereby causing a BP reduction. Future studies on BP changes in massage may include a survey question on pain felt during the massage in order to determine if this is the factor associated with BP increase.

Overall, these data are important for therapists in the field who treat hypertensive clients, and who are focused on reduction of BP. These data demonstrate that certain forms of massage (particularly those forms that may cause pain) may increase the client's BP rather than decrease it. As the U.S. population ages, hypertension will become a heavier health care burden within U.S. society and most therapists (knowingly or unknowingly) will be treating clients with this disorder.

As in all studies, this study did have some limitations. First, all independent data were self-reported and therefore may contain errors. For example, therapists were asked to indicate what forms of massage they used (Table 4), what body parts were massaged, and the pressure applied during the massage. Future studies may consider using more objective criteria to more specifically measure these factors, as well as train therapists to only apply one form of massage using a specific amount of pressure or only work on one specific body area. Likewise, as stated, the dependent outcome of BP was measured using automated BP cuffs that were not calibrated for validity; however, the authors believe that the equipment was reliable and therefore trusted the measure of BP change. Future studies should use manual BP readings to avoid this issue.

Second, this study was a case series and therefore was not powered for multiple statistical tests. It is acknowledged that the statistics in this study were overused and that some findings may result from chance alone because of multiple statistical testing. However, this was the first step in determining a change in BP based on different massage characteristics, and future studies should be powered based on a specific research question.

Beyond these limitations, this study was completed on a large sample size ($n = 150$) and did provide some useful information. Future studies are encouraged.

CONCLUSIONS

A case series of 150 massage therapy clients was completed to determine change in BP and factors associated with this change. It was determined that certain types of massage

TABLE 4 TYPE OF TREATMENT AND ASSOCIATION WITH CHANGE IN BLOOD PRESSURE

	Sample size[a]		*Systolic change (before-after)*			*Diastolic change (before-after)*		
Received treatment?	*No*	*Yes*	*No*	*Yes*	*p-value*	*No*	*Yes*	*p-value*
Swedish massage	15	135	0.07	−2.01	0.46	−1.07	0.26	0.54
Deep tissue	88	62	−2.33	−1.05	0.46	0.26	−0.06	0.81
Trigger point (TP)	118	32	−2.79	1.84	**0.02**[b]	−0.41	2.09	0.12
Myofascial release (MR)	136	14	−2.16	1.71	0.18	0.07	0.64	0.80
Sports massage (Sp)	142	8	−2.16	4.63	**0.07**[b]	0.09	0.75	0.82
CranioSacral	149	1	−1.91	14.00	0.12	0.09	5.00	0.54
TP + MR	142	8	−2.09	3.25	0.16	−0.16	5.13	**0.07**[b]
TP + Sp	145	5	−2.07	6.00	**0.09**[b]	−0.11	7.00	**<0.05**[b]
MR + Sp	145	5	−1.91	1.40	0.48	0.15	−0.60	0.84
TP + MR + Sp	147	3	−1.84	0.00	0.76	−0.01	6.67	0.15

[a]Most subjects received more than one type of massage during the massage session.
[b]Indicates significant group difference at $p < 0.10$

were significantly associated with an *increase* in systolic BP, such as trigger point therapy and sports massage; and that there appeared to be a decrease in systolic BP with Swedish massage, although this result was not statistically significant. Likewise, a combination of trigger point therapy and sports massage was associated with an increase in systolic as well as diastolic BP. No significant association was noted between change in BP and body area massaged, duration, or pressure used during massage

ACKNOWLEDGMENTS

The authors thank the National University of Health Sciences for their financial support and many student massage therapists for their help with this study

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