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## COMPARISON OF ANALGESIC EFFECT OF CLASSIC AND DEEP TISSUE ON CARDIOLOGICAL PARAMETERS IN PEOPLE WITH LUMBAR SPINE PAIN

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### SUMMARY

#### Introduction

Chronic lumbar spine pain is more and more often occurring affliction in the society. This dysfunction is radically making functioning harder and reduces quality of life. Massage is one of many forms of therapy used in decreasing pain of lumbar spine. Despite of great numbers of studies in scientific magazines about massage of lumbar region there weren't any detailed reports about comparing effectiveness of deep tissue and classical massage.

## PORÓWNANIE ANALGETYCZNEGO WPLYWU MASAŻU KLASYCZNEGO ORAZ TKANEK GŁĘBOKICH NA ZMIANĘ PARAMETRÓW KARDIOLOGICZNYCH U OSÓB Z BÓLAMI ODCINKA LĘDŹWIOWEGO KRĘGOSŁUPA

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### STRESZCZENIE

#### Wstęp

Chroniczny ból odcinka lędźwiowego kręgosłupa jest coraz częściej występującą dolegliwością wśród społeczeństwa. Dysfunkcja ta radykalnie utrudnia funkcjonowanie oraz wpływa na obniżenie jakości życia. Masaż jest jedną z wielu form terapii stosowanych w celu redukowaniu dolegliwości bólowych odcinka lędźwiowego kręgosłupa. Mimo licznych badań opublikowanych w czasopiśmie naukowych, dotyczących masażu odcinka lędźwiowego kręgosłupa, nie odnaleziono szczegółowych opracowań na temat porównania działania masażu tkanek głębokich i masażu klasycznego. Fakt ten skłonił autorów pracy do podjęcia tego tematu badań.

**Aim**

Comparison of the effectiveness of analgesic classic massage and deep tissue massage performed in patients with lumbar spine pain on blood pressure and pulse parameters.

**Material and methods**

The study group consisted of 40 people (30 women and 10 men) with chronic lumbar pain ranging in age from 26 to 50. In order to create homogeneous groups of patients eligible for the study, inclusion criteria were used: age 26–50, lumbar pain present longer than 3 months (chronic character), referral for a massage from a physician, no contraindications for the procedure. Patients were randomly divided into two equal therapeutic groups. In Group I 10 deep tissue massage treatments were performed. In Group II 10 classical massage treatments were performed. Every patient was asked to complete Revised Oswestry Low Back Pain Disability Scale questionnaire. Before attending 1st meeting and after 10th meeting: pain intensity level NRS (Numerical Rating Scale), blood pressure and pulse.

**Results**

A statistically significant decrease in pain levels ( $p < 0.001$ ) was measured in both groups. In Group II the pain intensity was reduced by 90.7%. In Group I the pain intensity was reduced by 87.21%. In both groups the therapy led to lower blood pressure. In Group I an increase of the heart rate was measured, while in Group II the heart rate decreased.

**Conclusions**

The obtained data indicates that the deep tissue massage exhibits more effective analgesic effect than the classic massage. Both the classic massage and the deep tissue

**Cel**

Porównanie skuteczności analgetycznej masażu klasycznego i masażu tkanek głębokich wykonywanych u pacjentów z bólami odcinka lędźwiowego kręgosłupa na parametry ciśnienia krwi i tętna.

**Materiał i metody**

Badaniem objęto grupę 40 osób (30 kobiet i 10 mężczyzn) w wieku od 26 do 50 lat z dolegliwościami bólowymi odcinka lędźwiowego kręgosłupa. W celu stworzenia homogenicznych grup pacjentów kwalifikujących się do badań posłużono się kryteriami włączenia: wiek 26–50 lat, ból odcinka lędźwiowego obecny dłużej niż 3 miesiące (charakter przewlekły), skierowanie na masaże od lekarza, brak przeciwwskazań do wykonania zabiegu. Pacjentów podzielono losowo na dwa zespoły. W Grupie I wykonano serię 10 zabiegów masażu tkanek głębokich. W Grupie II wykonano serię 10 zabiegów masażu klasycznego. U każdego badanego przeprowadzono kwestionariusz Revised Oswestry Low Back Pain Disability Scale. Przed przystąpieniem do zabiegów i po 10 zabiegu wykonano pomiary tj.: poziomu natężenia bólu w skali NRS (ang. Numerical Rating Scale), ciśnienia skurczowego i rozkurczowego krwi oraz tętna.

**Wyniki**

W obu badanych grupach doszło do istotnego statystycznie spadku poziomu bólu ( $p < 0,001$ ). W Grupie II dolegliwości bólowe uległy obniżeniu o 90,7%. W Grupie I doszło do spadku natężenia bólu o 87,21%. W obu Grupach terapia doprowadziła do obniżenia ciśnienia krwi. W Grupie I wykazano wzrost tętna, natomiast w Grupie II doszło do jego spadku.

**Wnioski**

Uzyskane dane wskazują na to, że masaż tkanek głębokich wykazuje skuteczniejsze działanie analgetyczne niż masaż klasyczny. Zarówno masaż klasyczny jak i tkanek

massage lower the blood pressure. The classical massage decreases the heart rate, and deep tissue massage increases the heart rate.

**Keywords:** deep tissue massage, classic massage, pain, blood pressure, heart rate

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### Introduction

Spinal pain is present in 60–90% of the population and is one of the most common ailments of musculoskeletal origin (Farber and Wieland 2016). Spinal pain in the lumbar region is one of the main causes of job loss and the loss of an active social life. Spinal pain is more common in men (about 66% of the male population over 40) than in women (about 30% of the total female population over 40) (Depa and Drużbicki 2008).

There are many causes of lumbar spine pain and the most important one is the sedentary lifestyle. It leads to increased body mass and obesity, lowered muscle capacity (for example weakness of the transverse abdomen muscles), abnormal body movement, abnormal body posture, and consequently a decrease in spinal stability. Continuous haste, stress and irregular nutrition intensify spinal dysfunction. This leads to a decrease in the quality of life, sometimes even a reduction of the professional and the social activity (Farber and Wieland 2016). An additional strain for the lumbar region is the performance of repetitive movements of the lumbar spine such as bending and lifting movements (Depa and Drużbicki 2008). An important factor for lumbar pain in women is wearing high heels (Kozłowski *et al.* 2016). Chronic pain affects the psyche of patients, causing depression and personality disorders (Frey Law *et al.* 2008). Mental factors overlap with somatic problems, amplifying them (Sapuła *et al.* 2012). Risky sports can also adversely affect the

głębokich obniża ciśnienie krwi. W przypadku masażu klasycznego zaobserwowano spadek tętna, a w grupie masażu tkanek głębokich wzrost tego parametru.

**Słowa kluczowe:** masaż tkanek głębokich, masaż klasyczny, ból, ciśnienie krwi, tętno

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spine (for example hockey or sailing) by increasing the risk of injury (Faroog 2017).

One of the most often used forms of therapy used to improve the function of the spine is the use of massage. A very important function of the massage is causing numerous local reactions in the human organism, for example the relaxation of the muscle tissue and loosening of the ligament apparatus. Massage is also causing systemic reactions such as the acceleration of blood circulation and the release of endorphins.

In literature we can find numerous publications confirming beneficial therapeutic effects of massage in patients with spinal pain (Sritoomman *et al.* 2013; Majchrzycki *et al.* 2014).

Despite numerous studies being published in scientific journals, no detailed studies have been made on the comparison of deep tissue massage and classical massage. This suggests that this is an inadequately researched and described topic. This fact prompted the authors to work on this subject.

### Aim

Comparison of the effectiveness of analgesic classic massage and deep tissue massage performed in patients with lumbar spine pain on blood pressure and pulse parameters.

### Material and methods

40 persons of both sexes (30 women and 10 men) aged 26 to 50 (average age 41.4)

who reported chronic pain in the lumbar spine. All patients were informed about the purpose of the study and expressed a written consent for the participation in the study. Patients enrolled in the study were randomized into two equal groups: Group I (n = 20) who received a series of deep tissue massage

Group II (n = 20) who received a series of classic massage

The research was approved by the Bioethics Committee of Pomeranian Medical University in Szczecin (KB-0012/05/17).

#### Diagnostic procedures

The diagnostic procedures consisted of the following procedures: subjective examination with the Revised Oswestry Low Back Pain Disability Scale and the NRS score, and physical examination consisting of measurements of the systolic and diastolic blood pressure and the heart rate measurements.

##### ▪ Subjective examination

The degree of the disability was assessed in patients with spinal pain using a standardized Oswestry questionnaire. It contains 10 questions about important daily activities such as pain intensity, self-service, lifting, walking, sitting, standing, sleeping, socializing, traveling and working.

A pain assessment was performed using the NRS scale in all patients. The pain assessment test was performed prior to the initiation of the treatment and after the 10 therapeutic treatments. The results were entered into the study card.

##### ▪ Objective examination

In the room in which the tests were conducted, there was a constant temperature of the order of 22°C. In order to acclimatize the patients, they stayed in the examination room for at least 5 minutes in a sitting position.

Diagnostic procedure:

Measurements of the systolic and the diastolic blood pressure and heart rate

Measurements were made before and after each treatment using a HI-TECH

sphygmomanometer (KTA-875 model). Assessment of the cardiological parameters in Group I and II was performed before and after a series of 10 massage sessions.

Measurement description:

The measurement was made in a sitting position, on the slightly bent in the elbow of the left arm. The arm was resting on a table top. The cuff was placed directly on the patient's skin with the lower edge of the cuff resting 2–3 cm above the elbow joint.

#### Treatment

After the subjective and the objective examination, the procedure was started. Treatments were performed in a well-lit room. The temperature in the room was 22°C. The participant was receiving the treatment a prone position with the face placed in a special aperture. For the comfort of the patient a soft roller was placed under the ankles.

In Group I the deep tissue massage treatments were performed without the use of lubricants.

In order to perform a uniform deep tissue massage in all participants, the following method was used:

Group II performed 10 classic massage treatments using unscented massage oil (Ziaja) as a lubricant.

In order to perform a uniform classical massage in all participants, the following method was used:

During the course of the therapy cycle, patients did not receive pharmacological treatment in the form of painkillers, myorelaxants or hypnotic drugs.

The Statistical analysis was performed in STATISTICA (version 13 EN). In addition to descriptive statistics (mean value, standard deviation), the normal distribution of the tested parameters was determined using the Shapiro-Wilk test. For values that differ from the normal distribution the Unauthenticated Mann Whitney U test and the Wilcoxon test was used. For normal distribution variables, the t-student test was used. The

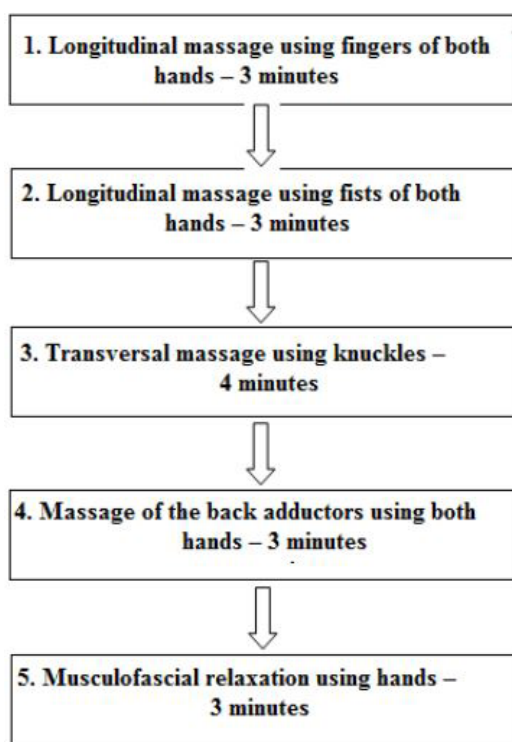


Figure 1. Massage procedure performed in Group I.

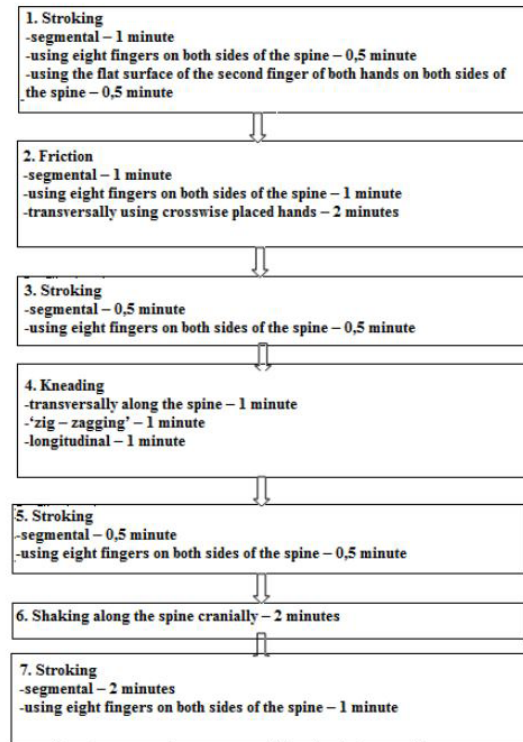


Figure 2. Massage procedure performed in Group II.

significance level of  $p < 0.05$  was used to carry out the aforementioned statistical analyses.

**Results**

At the beginning of the analysis of the results of this study, the data collected during the subjective examination of all participants is presented:

The following table shows the Revised Oswestry Low Back Pain Disability Scale score and the allocation of patients to each category based on their responses.

Table 1. Results based on the Revised Oswestry Low Back Pain Scale Disability Questionnaire.

Level of disability	Point range	n	%
No disability	0–4 pts	3	7.5%
Minimal	5–14 pts	19	47.5%
Moderate	15–24 pts	15	37.5%
Severe	25–34 pts	2	5%
Complete	35–50 pts	1	2.5%

As indicated in Table 1, the largest groups of participants were people with minor disability (47.5%).

The following graphs and tables show the mean pain intensity during the diagnostic procedures in Group I and II.

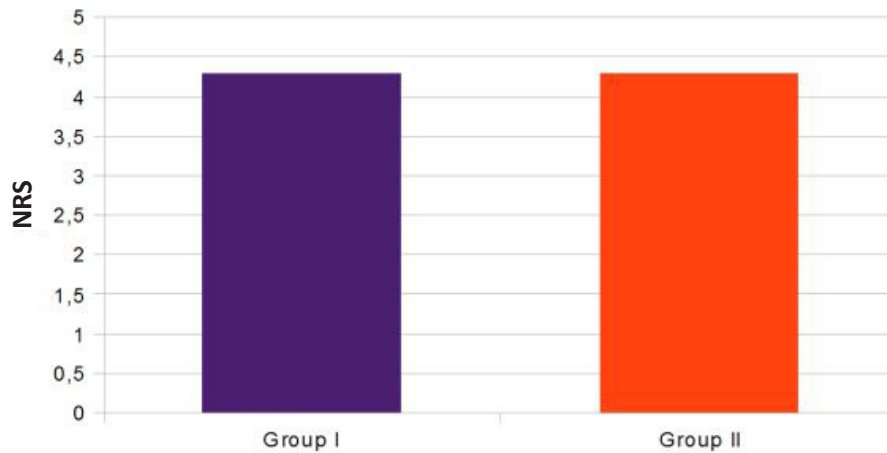
As shown in Figure 3, the average value of lumbar spine pain in both groups before treatment was at the same level of 4.3 in the 11-degree NRS scale.

By analyzing the results from Table 2, it was found that the mean values of cardiological parameters in both patient groups were similar and within the scope of the applicable European Society of Cardiology (ESC) standard (Jennings and Touyz 2014).

The subsequent presented results were collected after a series of 10 deep-tissue massages in Group I and classic massages in Group II. The assignment of participants to the appropriate groups was random.

The results in Table 3 show that in Group I where deep tissue massage was applied, there was a significant decrease in the mean value of pain intensity of (90.7%). In Group II the decrease in the mean value of pain intensity was 87.2%.





**Figure 3.** The mean value of the lumbar spine the pain intensity on the numerical rating scale. (NRS) in Group I and II measured during the diagnostic procedures.

**Table 2.** Mean values of blood pressure and heart rate of the participants during the evaluation.

Measured parameter	Group I (n = 20)	Group II (n = 20)
Blood pressure systolic [mmHg]	129	128
diastolic	82	86
Heart rate [bpm]	73	85

Abbreviations: n – number of participants in group, mmHg – millimeter of mercury, bpm – beats per minute

**Table 3.** Characteristics of the distribution of the pain intensity using NRS before and after 10 treatments.

Distribution character	Before treatment			After treatment		
	min-max	X (SD)	me	min-max	X (SD)	me
Group I (n = 20)	1–8	4.3 (1.81)	5	0–2	0.4 (0.68)	0
Group II (n = 20)	1–8	4.3 (1.78)	4	0–4	0.55 (1.1)	0

Abbreviations: n – number of participants in group, min – minimal value, max – maximal value, X – mean value, SD – standard deviation, me – median

As shown in Table 4, in both groups the mean decrease in systolic and diastolic blood pressure was observed after a series of massages. The treatment in Group I increased the average heart rate by 3.76%, while in patients in Group I the treatment decreased the average heart rate by 15.27%.

The table below is a statistical analysis of the distribution of pain intensity on NRS scale, systolic and diastolic blood pressure and heart rate.

### Discussion

Lumbar spine pain is currently one of the most common complaints among patients and belongs to a group of diseases known

**Table 4.** The change of the systolic and diastolic pressure and heart rate before and after a series of 10 treatments in Group I and II.

Measured parameter X (SD)	Blood pressure [mmHg]			Heart rate [bpm]
	systolic	diastolic		
Group I (n = 20)	Before treatment	129.35 (15.13)	82.4 (10.92)	73.15 (7.07)
	After treatment	121.15 (12.51)	79.55 (9.67)	75.9 (7.17)
	% decrease of mean value	6.34	3.46	–
	% increase of mean value	–	–	3.76
Group II (n = 20)	Before treatment	128.05 (24.55)	86.5 (13.45)	85.15 (15.21)
	After treatment	126.6 (13.5)	80.7 (7.92)	72.15 (8.56)
	% decrease of mean value	1.13	6.71	15.27
	% increase of mean value	–	–	–

Abbreviations: n – number of participants in group, X – mean value, SD – standard deviation

**Table 5.** Statistical significance of the obtained results.

Parameters X (SD)	Deep tissue massage [G]		Classic massage [K]	
	T0 (before treatment)	T1 (after treatment)	T0 (before treatment)	T1 (after treatment)
B	4.3 (1,81)	0.4 (0.68) ***T0 [G]	4.3 (1,78)	0.55 (1.10) ***T0 [K]
Cs	129.35 (15.13)	121.15 (12.51) **T0 [G]	128.05 (24.55)	126,6 (13,5)
Cr	82.4 (10.92)	79.55 (9.67)	86.50 (13.45)	80.7 (7.92) *T0 [K]
T	73.15 (7.07)	75.9 (7.17)	85.15 (15.21) **T0 [G]	72.15 (8.56) ***T0 [K]

Abbreviations: \* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

X – mean value, SD – standard deviation, G – deep tissue massage; K – classic massage; T0 – measurement before treatment; T10 – measurements made after the end of the treatment; B – NRS pain scale; Cs – systolic blood pressure measurement; Cr – diastolic blood pressure measurement; T – heart rate measurement

as the civilization diseases. Statistics show that they are present in about 80% of the population (Depa *et al.* 2008; Deutscher *et al.* 2014). They are a common cause of absenteeism in the workplace, hospitalization and disability.

One of the tools to enable assessment of the disability caused by lumbar pain is the Oswestry questionnaire. It is a reliable, widely used and recommended worldwide criterion for assessment of patients (Ruiz *et al.* 2014; Brodke *et al.* 2017). In our study the Oswestry questionnaire was used to prepare the data analysis of the group of 40 people with chronic lumbar spine pain. The results of this study indicate that 7.5% (n = 3) of the subjects did not experience any disability (0–4 points in the scale), 47.5% (n = 19) had minor disability (5–14pts), 37.5% (n = 15), had moderate disability (15–24p), and 5% (n = 2) were patients with severe disability (25–34p) and 2.5% (n = 1) of the group had complete disability. The validity of using this form in the assessment of described ailments is confirmed by numerous scientific papers (Topolska *et al.* 2011; Yoon *et al.* 2012).

One of the oldest therapeutic methods used in physiotherapy in patients with spine pain is massage. There are many published scientific studies that confirm the health effects of this form of therapy on the human body (Brown Menard 2015; Meftahi *et al.* 2014; Portillo-Soto *et al.* 2014).

Numerous scientific sources report on the analgesic effect of massage in patients with spinal pain (Bell 2008; Borges *et al.* 2014; Tanaka *et al.* 2002; Ćwirlej *et al.* 2005). Sritoomman *et al.* performed a ginger massage in a group of 140 subjects with chronic lumbar spine pain and obtained a statistically significant analgesic effect on the VAS scale (Sritoomman *et al.* 2013). According to a study by Ćwirlej *et al.* aromatherapy massage exhibits a better analgesic effect than classic massage. According to specialists, the two procedures can reduce the symptoms described. However, the aromatherapy treatment completely removed the pain in more patients in the aromatherapy group (66.7%) than in the classic massage group (38.5%) (Ćwirlej *et al.* 2005).

Brown, performing a study on 116 people with spinal pain, concluded that the combination of deep massage techniques and classic massage techniques along with mobilization techniques allow for a decrease in perceived pain at the level of p < 0.001 (Brown-Menard 2015).

There are few scientific reports comparing the synergistic effects of simultaneous deep tissue massage and classic massage.

One of them is the Cherkin study was performed on 401 people with chronic lumbar pain aged 20–65 years. Patients were divided into three therapeutic groups: structural massage (a method similar to deep tissue massage, n = 132), relaxation massage/

classic massage (n = 136), and no massage intervention (n = 133) (Cherkin *et al.* 2011). Ten treatments were performed within 10 weeks, which unfortunately indicates one treatment per week, although each treatment lasted about an hour, which results in a greater length of treatment than the procedures described in this article (10 treatments of 20 minutes for 2 weeks). The results obtained from the research show that both treatments offer similar effects to the pain and dysfunction of the lumbar spine. For comparison, it was shown that structural massage had a slightly (3.79%) better analgesic effect than classic massage (Cherkin *et al.* 2011).

In a series of 10 intensive deep tissue massages in Group I and the same number of classic massages in Group II, there was a statistically significant decrease in pain for the patients ( $p < 0.001$ ). After performing a series of classical massage the pain was reduced by 87.21%. At the end of the series of deep tissue massages the reduction of pain by 90.7% was achieved. The results confirm the better analgesic effect of deep tissue massage.

Scientific reports indicate that, in addition to the healing of musculofascial injuries, deep tissue massage also affects the pressure and heart rate parameters. In the group of patients over 48.5 (n = 263) one treatment reduced the systolic blood pressure by 10.4 mmHg, and reduced the diastolic pressure by 5.3 mmHg. The heart rate was reduced by 10.8 bpm. treatment (Kaye *et al.* 2008). In our own studies, a decrease in systolic blood pressure of 8.2 mmHg, diastolic blood pressure of 2.85 mmHg was achieved, while heart rate increased by 2.75 bpm. The difference may be due to the fact that in the study one forty-minute procedure was performed, not a series of shorter treatments.

Classic massage of the entire back, neck and chest in healthy individuals results in a greater decrease in both the systolic and the diastolic pressure than in the group

where the massage is performed on the upper and lower limbs and the face (Nariman 2014).

Supa'at *et al.* performed a four-week cycle of classic massage once a week to demonstrate systolic pressure drop by 12 mmHg and diastolic blood pressure drop by 5 mmHg. Unfortunately, the implementation of such procedures in a small group (n = 8) did not show any significant reliability despite statistically significant results (Supa'at *et al.* 2013). Performing tests in a larger group (such as in the studies discussed in this paper) reduces the randomness of the results obtained.

Studies conducted by Chrzan *et al.* Found that in a group of patients with the mean value of age equal to 59 performing a series of ten twenty-minute treatments within 2 weeks reduced blood pressure. The highest differences were observed in patients with hypertension, but statistically significant results in other groups also were obtained (Chrzan *et al.* 2014). Considering the patient's initial pressure in the study gives a closer insight into the effects of massage on the patient's body, for example in hypertension. In the author's work, the results of pressure changes in reference to hypertensive, hypotensive, or normal pressure groups were not listed.

Scientific studies describing the response of young patients aged 21–31 years to a single 50-minute general classical massage showed no significant effect on blood pressure or heart rate. A series of treatments would be required to demonstrate the change in the parameters. Comparing the back massage with the lower limbs massage shows that the procedure performed on the back and on the limbs affects the systolic and diastolic pressure, and the heart rate. According to the study, both treatments reduce blood pressure and heart rate without significant differences between them (Walaszek *et al.* 2008).

In our own studies it was found that a series of classical massage therapy statistically



significantly decreased (by 1.45 mmHg) the systolic blood pressure ( $p > 0.05$ ) (1.13%), statistically significantly decreased (by 5.8 mmHg) the diastolic blood pressure ( $p < 0.05$ ) (by 6.71%). The series of classical massage statistically significantly decreased (by 13 bpm) the heart rate ( $p < 0.001$ ) (15.27%).

As shown in this study classic massage and deep tissue massage therapy, through an analgesic effect and their effect on blood pressure and heart rate parameters can be a great tool for a physiotherapist to work with patients with pain. The results of this study have prompted us to continue the extended research with the use of additional diagnostic equipment such as the algometer (used for level of pain measurement) which is likely to increase the accuracy of the measurement.

### **Conclusions**

1. Deep tissue massage exhibits a better analgesic effect than classic massage.
2. Both types of massage affected the decrease in systolic and diastolic blood pressure. Deep tissue massage has led to an increase of the heart rate, and classic massage to has led to a decrease of the heart rate, which should be taken into account when qualifying patients for the aforementioned treatments.

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