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Fizjoterapia u chorych zakażonych HIV/AIDS – demonstracja przypadku, zasady profilaktyki

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Bezpieczny wysiłek fizyczny u pacjentów z cukrzycą

Safe physical effort for diabetic patients

Odpowiedzialność cywilna Fizjoterapeuty

Po blisko 30 latach starań fizjoterapia została uznana za niezależny zawód medyczny. Wiąże się to nie tylko z podniesieniem prestiżu zawodowego czy wzmocnieniem pozycji Fizjoterapeutów wśród innych zawodów medycznych, ale również ze zwiększeniem odpowiedzialności cywilnej.

„Zgodnie z art. 2. Ustawy z dnia 25 września o zawodzie fizjoterapeuty, profesja ta jest samodzielnym zawodem medycznym."

Obecnie odnotowywana jest rosnąca ilość i wysokość roszczeń pacjentów względem podmiotów leczniczych oraz osób wykonujących zawody medyczne. W latach 2011-2016 do sądów cywilnych pierwszej instancji wpłynęło ponad 5 400 spraw z zakresu ochrony zdrowia, a kwoty odszkodowań oraz zadośćuczynień jakich żądają pacjenci są z roku na rok coraz wyższe. Potwierdzają to dane statystyczne Ministerstwa Sprawiedliwości, z których wynika że w latach 2014–2017 kwota zasądzanych zadośćuczynień i odszkodowań wzrosła o 70% w porównaniu do lat ubiegłych.

Błąd podczas wykonywania świadczenia może kosztować nawet kilka milionów złotych.

Sąd Najwyższy w czerwcu 2018 r. na rzecz rodziców i trwale niezdolnego do samodzielnego funkcjonowania dziecka zasądził kwotę zadośćuczynienia w wysokości 3 235 000 zł. W tym precedensowym wyroku Sąd Najwyższy stwierdził, że cierpienie z powodu kalectwa dziecka można traktować podobnie jak śmierć.

Odpowiedzialność majątkowa Fizjoterapeuty uzależniona jest od formy wykonywania zawodu. W przypadku wykonywania zawodu w oparciu o umowę o pracę, zobowiązanym do wypłaty świadczenia na rzecz poszkodowanego pacjenta będzie podmiot zatrudniający. W określonych sytuacjach może on jednak zwrócić się do pracownika o pokrycia wyrządzonej szkody do trzech wysokości miesięcznego wynagrodzenia, a w przypadku winy umyślnej – do pełnej wysokości zasądzonego odszkodowania, zadośćuczynienia czy renty.

Sprawa wygląda inaczej w przypadku zatrudnienia na podstawie umowy cywilnoprawnej (również kontraktów), wówczas to sprawca odpowiada za wyrządzoną szkodę do pełnej wysokości, nieograniczonej limitem.

Najlepszym sposobem zabezpieczenia się przed odpowiedzialnością cywilną jest dobra polisa ubezpieczeniowa.

Dobra, czyli dopasowana do zawodu Fizjoterapeuty pod względem zakresu, sum gwarancyjnych oraz składek. Zabiegi manualne (mobilizacje oraz manipulacje), akupunktura, akupresura, igłoterapia oraz osteopatia są nieodłącznym elementem pracy z ludzkim ciałem i wiążą się z ryzykiem wyrządzenia szkody.

Dedykowany program ubezpieczeniowy kierowany wyłącznie interesami Fizjoterapeutów, który oprócz wyżej wymienionych zabiegów obejmuje również czynności ujęte w Międzynarodowej Klasyfikacji Procedur Medycznych ICD-9-CM, znajduje się na stronie ptfubezpieczenia.pl.

Formularz dopasowuje rodzaj ubezpieczenia do formy wykonywania zawodu, a sam proces przystąpienia w całości odbywa się online.

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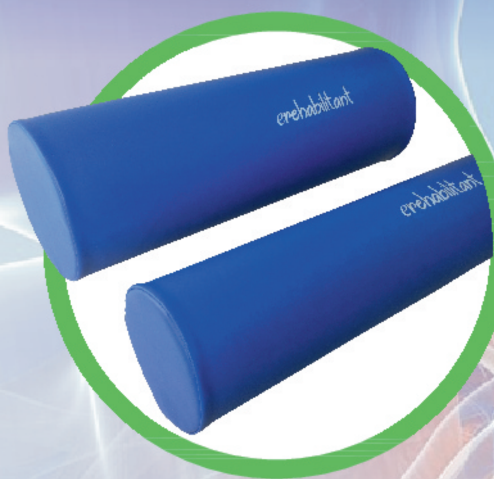
W5 Wałek Ø25×60 cm
W6 Wałek Ø30 x80 cm
W7 Wałek Ø30×100 cm
W8 Wałek Ø40 x80 cm
W9 Wałek Ø40 x100 cm
W10 Wałek Ø50×80 cm
W11 Wałek Ø50×100 cm



PÓŁWAŁKI

P1 Półwałek Ø30×25×5 cm
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P4 Półwałek Ø60×15×10 cm
P5 Półwałek Ø60×18×12 cm
P6 Półwałek Ø60 x30x10 cm
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P8 Półwałek Ø60 x36x18 cm
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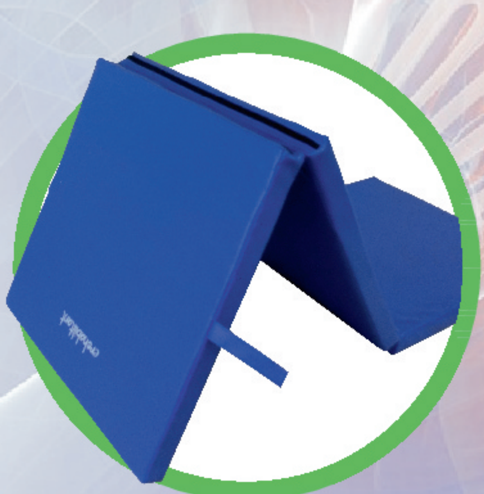

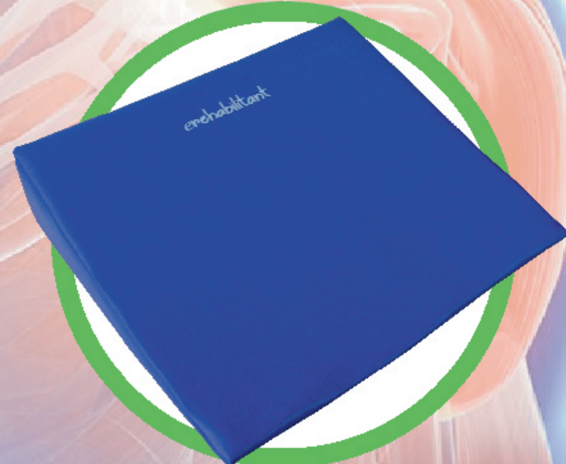

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180x60x5 cm
195x80x5 cm
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195x100x5 cm
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195x120x5 cm
195x120x10 cm

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K1 Klin 30x15x21 cm
K2 Klin 30x20x16 cm
K3 Klin 50x35x20 cm
K4 Klin 60x60x12 cm
K5 Klin 60x60x15 cm
K6 Klin 70x60x25 cm
K7 Klin 70x60x30 cm
K8 Klin 80x50x50 cm
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Głównie są to wyroby medyczne pomocne w rehabilitacji. Materiały użyte do produkcji posiadają atesty i certyfikaty i są zgodne z wymaganiami Ustawy o wyrobie medycznym WE.

OFERUJEMY WYROBY WYSOKIEJ JAKOŚCI W KONKURENCYJNYCH CENACH

fizjoterapia polska
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Zmiany ruchomości lędźwiowego odcinka kręgosłupa pod wpływem serii zabiegów magnetoterapii niskiej częstotliwości – badanie randomizowane z pojedynczą ślepą próbą

Changes in mobility of the lumbar spine under the influence of a series of low-frequency magnetotherapy procedures – randomized single-blind study

一系列低频磁疗疗程影响下的脊柱活动度变化 – 单盲试验的随机抽样试验。

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Streszczenie

Wprowadzenie. W literaturze odnajdujemy wiele prac, w których podkreślana jest ogromna rola, jaką pełni fizykoterapia w leczeniu schorzeń kręgosłupa. Terapia polem magnetycznym niskiej częstotliwości wykorzystywana jest głównie, jako jeden z wielu elementów kompleksowej rehabilitacji.
Cel pracy. Celem badań była ocena wpływu serii zabiegów z użyciem magnetoterapii niskiej częstotliwości na ograniczenie ruchomości lędźwiowego odcinka kręgosłupa, a także określenie, czy wartość BMI oraz wiek pacjentów, wpływa na uzyskany wynik zakresu ruchomości.
Materiał i metodyka. Badaniami objęto 40 osób, w wieku od 30 do 71 lat. Ruchomość zmierzono pierwszego oraz ostatniego dnia terapii, za pomocą zmodyfikowanego testu palce – podłoga. Badanie było randomizowane z pojedynczo ślepą próbą. W grupie A zastosowano zabieg magnetoterapii niskiej częstotliwości, a w grupie B symulację zabiegu. Analizę statystyczną wykonano w programie Statistica 12.
Wyniki. Różnice wyników uzyskanych przed oraz po serii zabiegów w poszczególnych grupach badanych stanowiły wartość nieistotną statystycznie (p = NS).
Wnioski. Magnetoterapia niskiej częstotliwości nie wpływa na zakres ruchomości lędźwiowego odcinka kręgosłupa. Wartość wskaźnika masy ciała w nieznacznym stopniu wpływa na zakres ruchów, a także nie ma związku pomiędzy wiekiem osób biorących udział w badaniu a zakresem ruchomości danego odcinka kręgosłupa.

Słowa kluczowe:
magnetoterapia, pole magnetyczne, lędźwiowy odcinek kręgosłupa, ograniczenie ruchomości

Abstract

Introduction. In the literature, we find many works emphasizing the great role of physical therapy in treatment of spinal disorders. Low-frequency magnetic field therapy is mainly used as one of many elements of complex rehabilitation.
Aim of the study. The aim of the study was to evaluate the effect of a series of low-frequency magnetotherapy procedures on the limitation of mobility of the lumbar spine, as well as to determine whether the value of BMI and the age of patients affect the obtained result of the mobility range.
Material and methods. 40 people aged 30 to 71 were examined. The mobility was measured on the first and last day of the therapy using a modified fingertip-to-floor test. It was a randomized, single-blind study. Low-frequency magnetotherapy was applied in group A and simulation of the procedure in group B. Statistical analysis was conducted in the Statistica 12 programme.
Results. Differences in results obtained before and after the series of procedures in particular groups of patients were statistically insignificant (p=NS).
Conclusion. Low-frequency magnetotherapy does not affect the mobility range of the lumbar spine. The value of the body mass index has a slight influence on the range of movements, and also there is no relation between the age of the participants in the study and the range of mobility of a given section of the spine.

Key words:
magnetotherapy, magnetic field, lumbar spine, mobility limitation

摘要

简介。我们在文献中可以找多许多强调理疗对脊柱疾病治疗上产生巨大影响的研究，低频磁场疗法为综合复建的主要元素之一。
研究目的。研究目的在评估使用低频磁疗的系列疗程对脊柱活动受限的影响，以及确定 BMI 值及患者年龄对取得活动范围的结果是否有影响。
材料及方法。共 40 名年龄在 30 至 71 岁间的患者接受测试，活动性测量于治疗第一天及最后一天通过修正过的手指-地板测试进行。该研究为单盲随机抽样测试，A 组中使用低频磁疗，而 B 组采模拟疗程，统计分析以 Statistica 12 程序进行。
结论。特定测试组在疗程前后所取得的结果差异在统计上不显著（p=NS）。
结论。低频磁疗对脊柱运动范围无影响，体重指数的值对运动范围有轻微影响，然而受试者的年龄与脊柱活动范围无关系。

关键词：
磁疗、磁场、腰椎、活动受限

Introduction

One of the most common types of back pain are those located in the lower part of the spine. It is believed that about 80% of people have experienced it at least once, and its nature can be determined starting from those of short duration and low intensity, up to those that occur chronically and induce very strong pain sensations [1]. Spinal injuries, which cause pain, most often occur as a result of excessive strain, in comparison to the strain that can be tolerated by tissues (e.g. L5 vertebra can take a load of about 90N, that is 10kg). In the case of automatic performance of daily activities, the generated strain can increase up to 20 times [2].

Pain occurs mainly when the movement is performed or when the affected part of the body is under strain. In order to avoid it, the person limits activity and takes painless positions, while when trying to perform passive movement, the so-called "muscle defense" takes place, that makes it impossible to perform it through reflex muscle tension. This way the body tries to prevent further damage, but the opposite result is obtained. Lack of movement causes shortenings of muscles, which in turn leads to metabolic disorders in tissues, as well as ischemia. This results in increased muscle tension, which increases pain.

Reduction of spine mobility leads to difficulties in performing operations with upper limbs, and the limitations are compensated by movements of lower limbs. An example may be the lifting of objects from a low surface, e.g. the floor, where the goal is achieved by doing a squat. Reduced mobility of the trunk also leads to disorders of internal organs, as well as of fluidity of walking [3].

Mobility limitations may relate to passive or active mobility. In the case of the first one, we distinguish anatomical causes, which are internal joint problems, such as osteophytes, fibrous or bone adhesions, free objects causing blockages, cartilage disorders or deformities of the joint surface, as well as extra-articular abnormalities such as contractures and stretching problems of the joint capsules, muscles or fascias, scars or extra-skeletal ossification. There are also non-anatomical causes, which include exudates and pain.

When active mobility is restricted, there is insufficient muscle strength to perform the full range of movement. We distinguish between the following causes: indirect, i.e. muscle defense in the form of tension in response to pain, or those that result from barriers related to passive mobility - mixed, i.e. when muscle function is disturbed due to joint and periarticular pathologies. Direct causes are also mentioned, resulting from muscle disbalance, as well as from muscle strength disorders [3].

The spinal muscles, due to the higher content of fast-twitch muscle fibers, will react with pain as a result of fatigue, while the task of the thoracolumbar fascia is to transfer tension in the lumbar spine and accumulate energy during its stretching. This function is disturbed in a person suffering from pain. Injuries resulting in adhesions and fibrosis can contribute to the loss of elasticity of the fascia. As a consequence, the mobility of the spine is limited [4].

A magnetic field is an element of an electromagnetic field. It is generated in magnetized bodies that are electric conductors and those that are electrically charged [5]. The response of tissues to variable magnetic fields depends on its physical properties [6]. An important property of magnetic field is the ability to penetrate through any structure of the body. This distinguishes them from other forms of energy, which are subject to the phenomenon of absorption to specific depths [7]. Magnetic field can be divided into static, the source of which is a magnet (currently not used) and dynamic, which is created under the influence of electric current that flows in the conductor. The magnetic field currently used in magnetotherapy procedures can be divided according to the frequency value. Those where the frequency value does not exceed 50Hz (in the USA - 60Hz) include treatments with the use of low-frequency magnetotherapy, while those with the use of high frequency include treatments in which the fields affect the body tissues, resulting in overheating, i.e. diathermy [7].

When determining the parameters of the procedure, the following variables should be taken into account: duration of the procedure, frequency and intensity of the magnetic field. The first parameter, which is time, is considered to be unlimited, as excess of exposure does not have any negative effects. It was assumed that the treatment time should not be shorter than 5 minutes and should not exceed an hour. The series includes from 5 to 15 treatments, of which the first ones should be performed daily, the subsequent ones every second day or twice a week. It should be remembered that after a few procedures a feeling of deterioration in health may appear. It is important that the procedure is performed until early evening, before 9 p.m., as it may cause sleeping problems in patients [7]. Due to the presence of biological rhythm, it is recommended to perform procedures at a fixed time for each patient [8]. The frequency in low-frequency magnetotherapy with higher induction values ranges from 1 Hz to 50 Hz (60 Hz). Its value in individual procedures depends on the patient's condition. In the case of acute states the value from 1Hz to 5Hz is used, in subacute states - from 5Hz to 20Hz, and in chronic states from 20 Hz to 50 Hz (60 Hz) [7]. There are different shapes of impulses: square, triangular, trapezoidal, sinusoidal and their variations. The field can be generated in continuous operation or with intervals from 0.6 to 8 seconds [9]. The intensity of magnetic field in low frequency magnetotherapy does not exceed 10 mT. As with frequency, the induction value depends on the patient's condition. In the acute period doses not exceeding 3 mT are used, in the subacute period - induction not exceeding 5 mT, and in the chronic state – doses higher than 5 mT [7].

The patient's position during the procedure should be comfortable, sitting or lying down, and allow the problematic area to be located inside the coil. Due to the fact that the magnetic field penetrates through the clothes, the patient does not have to remove them. What is important, the procedure can also be performed on people with plaster casts. The patient should be informed of the need to put away private items that may be damaged by field emissions, such as a watch, credit card, hearing aid etc. [8].

Aim of the study

The aim of the study was to evaluate the effect of a series of low-frequency magnetotherapy procedures on the limitation of mobility of the lumbar spine section, based on a modified fingertip-to-floor test. An additional aim was to determine whether the mobility range will improve in the group of patients in which the simulation of the procedure was conducted (placebo effect).

Material and methods

The research was carried out at the Non-Public Health Care Facility "Vertebron" in Chojna, in the period from January to April 2018. Participation in the research was voluntary and anonymous. Each patient was informed about the aim, the course of the experiment, as well as about the possibility of resigning from participation in the study at each stage. The series included 10 procedures performed from Monday to Friday. The sample consisted of 40 people, of which 24 were women (60 %) and 16 men (40 %). The age range among the respondents was 30-71 years of age. The mean age of the respondents was 55.6 years..

A randomized, single-blind study was applied in this research. The patients were divided into two study groups. In group A, consisting of 20 people, low-frequency magnetotherapy was applied, while in group B, also consisting of 20 people, a simulation of the magnetotherapy procedure was used to check the occurrence of the placebo effect and its therapeutic effects. The equipment used in the research: MagnerPlus, Aster ABR VER: 2.2 SN:MP-11/05/06. The following parameters were applied in group A: sinusoidal pulse, magnetic field induction - 40 Gs, frequency - 30 Hz, continuous mode - break time - 0 seconds, magnetic field applicator - CSP 60, reel applicator - 60 centimeters, placed near the lumbar spine segment. Duration of the procedure – 15 minutes. In group B the procedure parameters were set to minimum values. Duration also 15 minutes. The methodology of the procedures performed corresponded to the commonly used standards.

Fig. 1. MagnerPlus, Aster ABR equipment

Fig. 2. Treatment with the use of low frequency magnetotherapy

The criterion for participation in the study was the state of health, which was not a contraindication for performing the procedure, and the presence of mobility restriction in the lumbar spine section. The mobility range was determined by means of a modified fingertip-to-floor test. The patient's task was to make a bow forward while in the correct sitting position on the couch, with their feet touching the wall with the sole side. The distance from the longest finger to the wall has been assumed to be the value of mobility limitation. The measurement was taken with an anthropometric measure, with a basic unit of 1 centimeter. In order to evaluate the progress of treatment, the mobility range test was repeated after the end of the series.

Each patient was informed about possible sensations during the series of treatments and asked not to use other physiotherapeutic services, as well as not to perform exercises that could change the range of spinal mobility, due to the possibility of falsification of test results.

The elaboration of the results was based on the statistical analysis of measurable (ordinal) features using the Wilcoxon test. For all measurable parameters the mean ($\bar{x}$), standard deviation (SD), minimum value (Min) and maximum value (Max) were determined, and for non-measurable parameters – the number and percentage. The analysis of the distribution of variables was carried out on the basis of the Shapiro-Wolf test. In the verification of all analyses, a significance coefficient was used (p) at the level of $\alpha = 0.05$, which allowed to recognize the statistically significant variables at $p < 0.05$. The analysis of variable compounds was performed on the basis of Pearson's test. Changes in intergroup significance were assessed using the Mann-Whitney U test. Statistical analysis was carried out using Statistica 12 software and an Excel worksheet.

Results

The group of respondents consisted of 40 people, 60% of whom were women (24), while 40% were men (16). In both groups, the number of people and the sex ratio were the same, i.e. the groups consisted of 20 people each with 12 women and 8 men (Tab. 1).

Table 1. Sex by study groups

Sex	A [n = 20]		B [n = 20]	
	n	%	n	%
Women	12	60	12	60
Men	8	40	8	40

The average age of the respondents was 55.6 years ±8.91. The average age of all women was 54.9 years, while men – 56.8 years. The youngest person was 30, the oldest 71 years old.

In group A, i.e. the one in which the low-frequency magnetotherapy procedure was performed, 20 people were qualified for the study. The youngest person was 44 and the oldest – 70 years old. The average age of the group was 55.8 years ± 7.21 (Tab. 2). The average age of women was 55.8 years, while that of men was 55.6 years.

Table 2. Average values and standard deviation of age in particular groups of respondents

	A [n = 20]		B [n = 20]	
	$\bar{x}$	SD	$\bar{x}$	SD
Age [years]	55.75	7.21	55.50	10.53

In group B with 20 patients, the low-frequency magnetotherapy procedure simulation was performed in order to assess the placebo effect. The average age of the group was 55.5 years ± 10.53 (Tab 2). Women were 53.9 years old on average and men – 57.9 years old. The youngest person was 30, the oldest – 71 years old. The average BMI was 24.25k g/m2 ± 3.18, which is a correct value (with 24.05 kg/m2 for women and 24.61 kg/m2 for men). The minimum, i.e. 18.83 kg/m2, was also within the correct range, while the maximum result - 32.63kg/m2, meant the first degree of obesity.

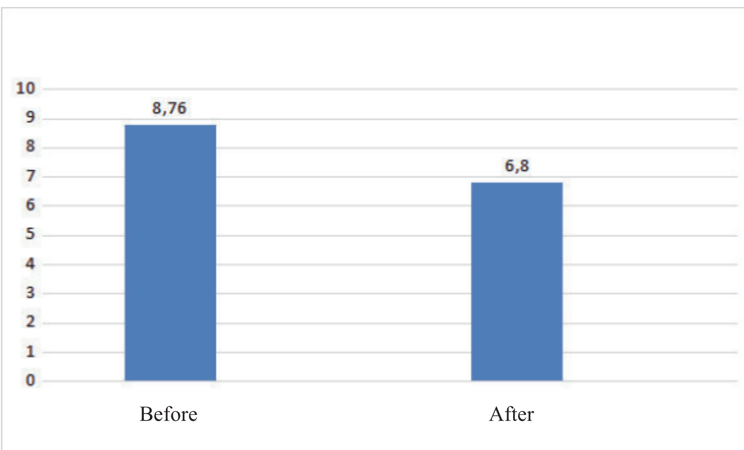
BMI in group A was 23.31 kg/m2 ± 3.06, i.e. correct value (Tab. 3). The person with the lowest body mass index showed its correct level, i.e. 18.82 kg/m2. The person with the highest BMI, i.e. 29.75 kg/m2, was overweight.

Table 3. Average values and standard deviation of BMI in particular groups of respondents

	A [n = 20]		B [n = 20]	
	x̄	SD	x̄	SD
BMI [kg/m2]	23.31	3.06	25.19	3.07

BMI in group B was 25.19 kg/m2 ± 3.07, which indicates overweight (Tab. 3). The person with the lowest body mass index showed its correct level, i.e. 20.47 kg/m2. The person with the highest BMI, i.e. 32.62 kg/m2, had the first degree of obesity.

Before starting the therapy, the patients' lumbar spine mobility was assessed according to a modified fingertip-to-floor test. The average limit was 8 .76cm ± 4.99. The maximum value is 22 cm and the minimum value is 2cm. The minimum value of the limitation after the completion of the therapy was 0cm. The average is 6.80cm ± 6.09. The maximum after completion of treatment was 24 cm (Fig. 3).



*The Wilcoxon test

Fig. 3. Modified fingertip-to-floor test

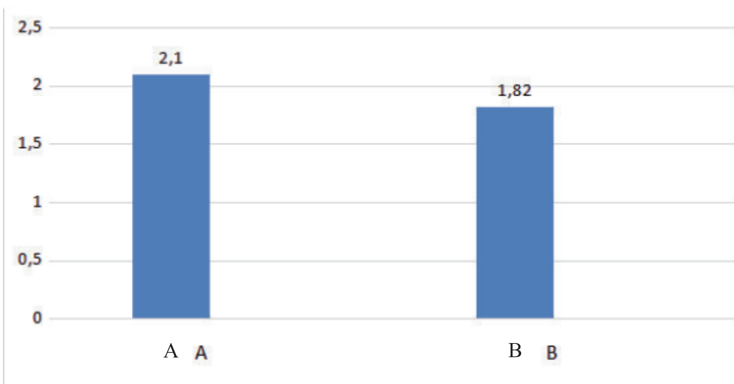
The average limitation of mobility in group A was 7.45cm ± 3.53. The smallest value of the limitation is 2cm, while the largest is 14cm. The average limitation of mobility after completion of therapy was 5.35cm ± 4.51. The lowest value of the limitation is 0 cm, while the highest value is 17 cm (Tab. 4).

Table 4. Average values and standard deviation in the modified fingertip-to-floor test in particular groups of respondents

	A [n = 20]				B [n = 20]				p*
	x̄		SD		x̄		SD		
	Before	After	Before	After	Before	After	Before	After	
Modified fingertip-to-floor test	7.45	5.35	3.53	4.51	10.07	8.25	5.91	7.16	p < 0.001

*The Wilcoxon matched-pairs test

The average limitation of mobility in group B was 10.07 cm ± 5.91. The lowest value of the limitation in the group was 3 cm, while the highest was 22 cm. Average limitation of mobility after completion of the therapy is 8.25 cm ± 7.16. The lowest value of the limitation is 0cm, while the highest value is 24 cm (Tab. 4).
The value of limitation of the lumbar spine mobility was analyzed in the entire study group before and after a series of procedures. The obtained result indicates a statistically significant difference p = 0.000024 (p < 0.001).
The differences in the results obtained before and after the series of treatments in particular study groups were analyzed. The result obtained constitutes a statistically insignificant value (p = NS) (Fig.4).



*Test U Manna-Whitneya / *The U- Mann-Whitney test

Fig. 4. Differences in the results obtained in the modified fingertip-to-floor test

The relationship between body mass index - BMI and lumbar spine mobility range was analyzed using the Pearson correlation coefficient. The obtained value (r = 0.28) indicates a small relation between the analyzed values (p < 0.05) (Fig. 5).

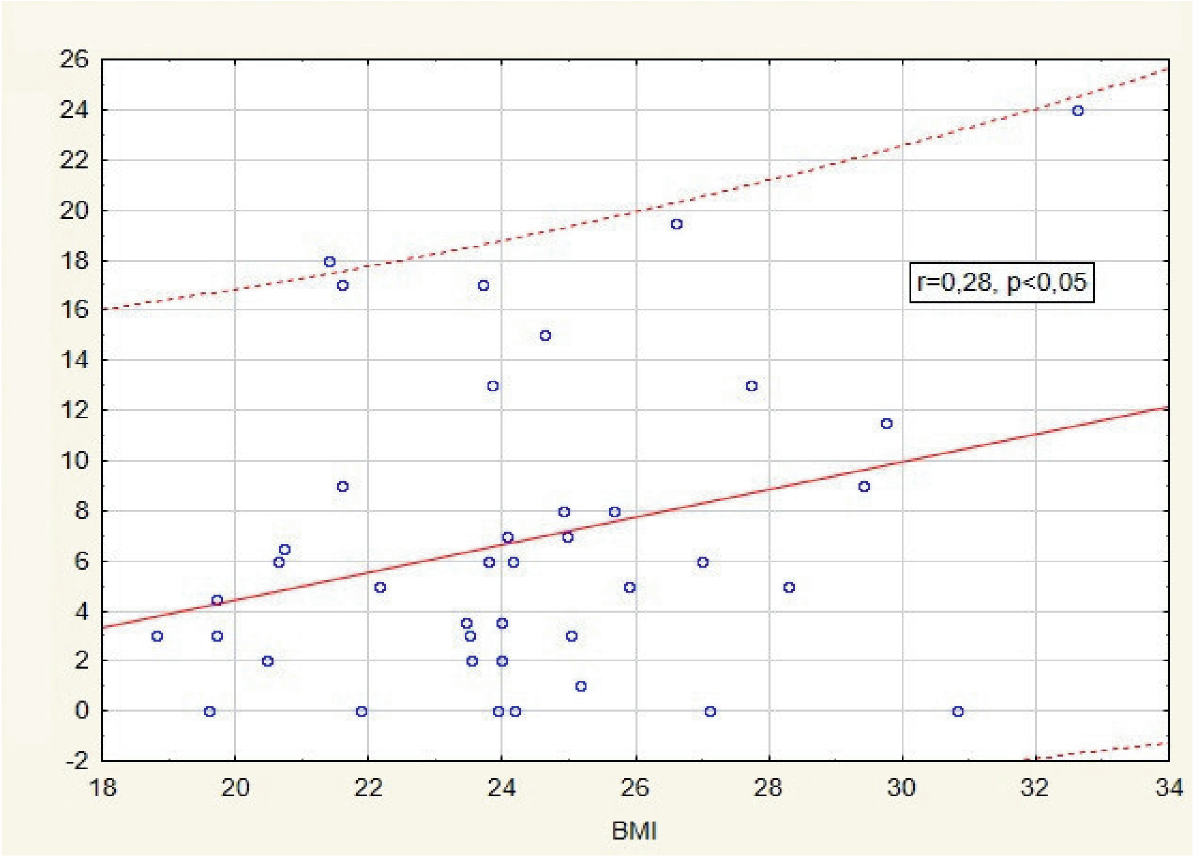


Fig. 5. The relationship between the BMI and the lumbar spine mobility range

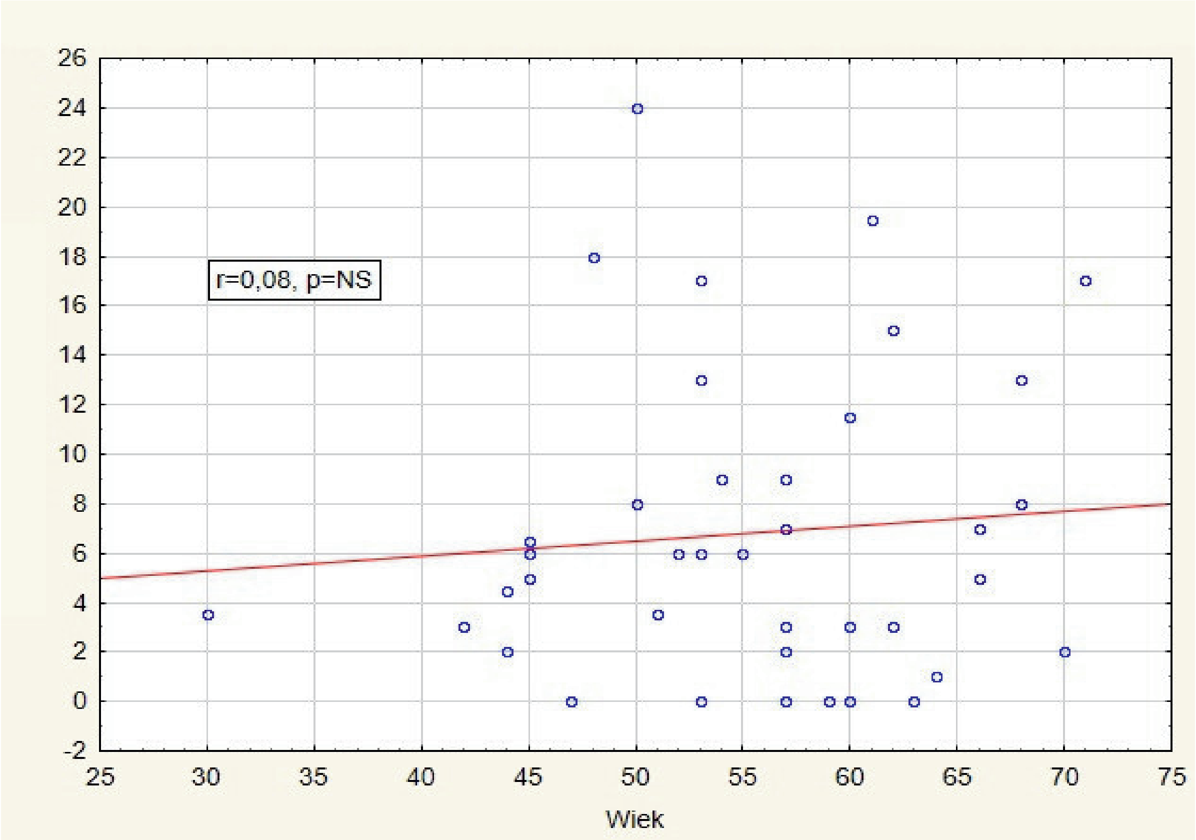


Fig. 6. The relationship between the age of respondents and the lumbar spine mobility range

The relationship between the age of the respondents and the lumbar spine mobility range was analyzed using the Pearson correlation coefficient. The obtained value indicates a lack of relation between the analyzed values (r = 0.08; p = NS) (Fig. 6).

Discussion

In the current literature we can find many works that unanimously point to the huge role that physical therapy plays in the complex treatment of spinal disorders. The choice of the type of procedure depends on the diagnosis and duration of the condition, the occurrence of health contraindications for the use of physical stimuli, as well as on the experience of physicians and access to the equipment [10].

The aim of the study was to evaluate the effectiveness of a series of low-frequency magnetotherapy procedures on the mobility of the lumbar spine. The results show the lack of therapeutic effects of magnetotherapy. Relatively few up-to-date papers describing magnetotherapy as an effective form of improving the range of mobility in the lumbar spine have been published.

Currently, magnetotherapy is performed mainly as a part of complex rehabilitation [11-16]. In combination with other physiotherapeutic procedures, it gives very good therapeutic effects. In view of the above, we can find very few up-to-date scientific papers on the selected topic of research.

In the paper of Zgorzalewicz-Stachowiak et al. [17] the application of classical massage and magnetotherapy in the treatment of chronic pain syndromes of the lumbar spine was studied. The back massage in group I was performed for 20 minutes with body care oil, using the basic classical massage moves. In group II procedures, the Magner Plus device - Aster ABR VER: 2,2 SN:MP-07/12/08 was used: The following parameters were used: magnetic field induction values - from 1mT to 5 mT, frequency - from 5 Hz to 20 Hz, pulse shape - sinusoidal, treatment time – 15 minutes. The results of both groups of respondents were comparable in terms of the degree of pain experienced, evaluation of motor skills in daily functioning, assessed using the modified Oswestry scale. Changes in the mobility range, statistically significant in the massaged group, were observed in the straightening, whereas in the group undergoing magnetotherapy these were straightening moves and side flexions. Statistically significant results of Schober test were noted only in group I, whereas the changes in the fingertip-to-floor test proved to be insignificant in both groups. In own studies, the parameters of the procedure, as well as the average age of the study group, can be considered as values similar to those found in the authors' work. In both cases an identical device model was used. The average body mass index (BMI) was not included in the authors' work, but in own studies it has a regular value. The Zgorzalewicz-Stachowiak et al. study does not indicate any significant improvement in spinal mobility measured with the fingertip-to-floor test, which is similar to the results obtained in this study, where there was no improvement observed.

The aim of the study of Taradaj et al. [18] was to evaluate the effectiveness of procedures involving the use of magnetic fields in the treatment of lower spine pain associated with discopathy. Over 100 patients were divided into 5 groups, in which the following procedures were performed: group I – magnetotherapy - magnetic field induction – 10mT, frequency – 50 Hz, treatment time – 20 minutes; group II – magnetotherapy – magnetic field induction – 5mT, frequency – 50 Hz, treatment time – 20 minutes; group III – placebo magnetotherapy; group IV – magnetostimulation – magnetic field induction – 49.2 μT, frequency 195 Hz; group V – placebo magnetostimulation. Patients were analyzed in terms of severity of pain, degree of disability and mobility range. Reduced mobility limitation was observed in all studied groups. The best and at the same time the only statistically significant result was recorded in group I, in which the highest parameters of the procedure were applied. In the remaining groups the results of the Schober test did not differ significantly from each other. The authors conclude that the parameters of magnetotherapy and magnetostimulation used in the remaining groups were pointless and ineffective. In this study there is a large number of people whose BMI value exceeds 30 kg/m2, which means first degree of obesity. In own studies, the mean BMI values were at a normal level. Despite the difference, as well as different parameters of the procedure, in the authors' work and in own studies a similar result can be observed.

The study of Borowicz et al. [19] evaluated the influence of magnetotherapy on the level of pain and spine mobility in patients with chronic pain in the lumbar and sacral spine sections as a result of degenerative changes. Patients underwent 10 magnetotherapy treatments performed with the Magnetotron device made by Alpha Electronics. Constant parameters of the procedure were adopted: induction value – 10mT, frequency – 25Hz, impulse shape - square, treatment time – 10 minutes. The hyperextension movement and side flexions of the spine (measured in degrees) as well as the flexion of the lumbar spine were examined by using the fingertip-to-floor test.(measured in centimeters). In addition, the straight leg raise test, the Laseque test was performed and the intensity of pain was assessed using the VAS ((Visual Analogue Scale). In the entire group a decrease in pain as well as an increase in the range of spinal movements were noted in all tests performed. The study was conducted on a group of people whose average age was 61.3 ± 9.3 years, which is higher than in the study group in the own research. Also in this case the average value of patients' BMI is unknown. Higher induction value than those from the own study was also used. Achieving similar outcomes may result from the above mentioned variables.

In the research Weber-Rajek et al. [20] magnetotherapy is used in addition to ultrasound and peloid wraps as a therapeutic treatment in a group of people with chronic lower spinal pain due to overload and/or degenerative changes. Patients were divided into three groups and each group was assigned a particular type of treatment. In the first group, peloid at the temperature of 42°C was used. After a 20-minute treatment, patients took a shower (water temperature of about 37°C) and then rested for 30 minutes. The second group was treated with ultrasound. Treatment parameters: frequency - 1 MHz, density – from 0.6 W/cm2 to 1.2 W/cm2, time – individual for each patient. Magnetotherapy was performed in group three. The following parameters were used: wave shape – triangular/ square, frequency – from 10 Hz to 20 Hz, magnetic field induction – from 10 mT to 15 mT. The parameters of the procedure were adjusted individually to the condition of the patients.

The Laitinen questionnaire, Oswestra questionnaire, VAS scale and Schober test wereused to verify the effects of the treatment . The results show a statistical improvement of all the examined indicators in each group. The best painkilling effect was obtained in the group treated with ultrasounds. Other tested values did not show significant differences between the groups. Among the treatments applied, magnetotherapy gave the smallest improvement in the range of spine mobility. Lack of data on the BMI value makes it difficult to compare the groups of participants in both studies. A different result in the own study, compared to the authors' research on the effectiveness of magnetotherapy, may result from the use of a different type of impulse, i.e. sinusoidal, as well as magnetic field induction.

Magnetotherapy, as an element of the therapeutic procedure, was also used in the research of Ratajczak et al. [16]. The aim of the study was to evaluate the influence of magnetotherapy in combination with laser therapy and kinesitherapy on mobility and the level of pain experienced by people with degenerative changes in the lumbar spine. The treatment involving the use of magnetic field was performed with the Magner D56A equipment produced by Marp Electronic. The CM – 600 coil was used. The following parameters of the procedure were adopted: magnetic field induction – 40 Gs, frequency – 25Hz, pulse shape – square, treatment time – 20 minutes. Laser therapy was performed with a 100 mW equipment by Marp Electronic. The following parameters were applied: wavelength - 808 nm, energy dose – 45 J, the contact method, at the pain area. The treatment time was 1 minute 52 seconds. Additionally, all patients performed 15-minute abdominal and dorsal muscles exercises with the intensity and pace individual for each patient. Measurement of the range of mobility was performed before and after the completion of a series of treatments, using the Saunders Digital Inclinometer in three planes of motion. The Laseque's test and examination of pain sensations, determined by VAS scale, were also performed. The therapy resulted in a significant increase in the mobility range in all directions examined, as well as a statistically significant reduction in pain and the positive result of the Laseque's test. The authors used the same dose of magnetic field induction, as well as a frequency value similar to that used in own research. There is, however, no information about the BMI value. The use of additional therapeutic stimuli in the form of exercises and laser therapy makes it difficult to assess the influence of magnetotherapy on changes in spinal mobility in the authors' studies.

Boerner et al. [11] evaluated the effect of magnetotherapy, in combination with topical cryotherapy, on the increase of mobility and reduction of pain in the knee joint of patients with diagnosed osteoarthritis. 10 local cryotherapy procedures with Crio-jet (Air) and magnetotherapy with Magnetronic MF-10 were performed. A coil with a diameter of 315 mm was used, which was placed at the height of knee joints. The following treatment parameters were adopted: field induction – from 6 mT to 7 mT, frequency – 20 Hz, treatment time – 20 minutes. Measurement of the mobility range of active flexion was performed before and after a series of procedures, using a goniometer. The level of pain was assessed using the VAS scale. Significant reduction of pain and increased range of motion in joints were observed. The average age of the study group is similar to the one presented by the study group in the own work. The application of local cryotherapy together with magnetotherapy distinguishes the work of Boerner et al. from the own research, where low-frequency magnetic field therapy was the only type of therapeutic treatment. In addition, the lack of BMI, as well as a noticeable lack of data on the type of impulse used, makes it difficult to assess the impact of magnetotherapy on the improvement of the mobility range, compared to own research.

Magnetotherapy, which is an element of sanatorium treatment, was included in the study by Bolach et al. [13], the aim of which was to evaluate the influence of this type of treatment on pain reduction and improvement of functioning in patients with lumbar and sacral spine degenerative changes. A group of more than 100 patients underwent the following procedures: alternate brine baths (solution approx. 3%; water temperature from 36°C to 37°C; time – 15 minutes) and peloid (solution 1-2%; water temperature from 36°C to 38°C; time – 15 minutes); physical exercise – 30 minutes; magnetotherapy (acute state: frequency from 1 Hz to 5 Hz, magnetic field induction – from 5 Gs to 30 Gs; subacute state: frequency from 5 Hz to 20 Hz, magnetic field induction – from 30 Gs to 50 Gs; chronic state: frequency from 20 Hz to 50 Hz, magnetic field induction – up to 60 Gs to 100 Gs; pulse shape – square; treatment time – from 15 to 20 minutes), laser therapy (acute state 0.1 – 3 J/cm2; subacute state 3-6 J/cm2; chronic condition 6-20 J/cm2; wavelength – 810 nm; continuous operation mode; power 100 mW; treatment time – 1.5 minutes), interference currents (carrier frequency-4000Hz; therapeutic frequency AMF-100Hz; treatment time – from 10 minutes). Treatment progress was evaluated using the VAS scale, Schober tests as well as monitoring the value of BMI. A statistically significant improvement in the measured values was observed. The average BMI of women undergoing therapy is close to that recorded in own studies. Unfortunately, the authors did not apply a equal dose for the entire study group, and the use of magnetotherapy as one of the types of treatments used in the group of people undergoing sanatorium treatment, makes it difficult to assess the effectiveness of low-frequency magnetotherapy in a given study.

In other research by Bolach et al. [12] the effect of a 10-day ambulatory treatment program in patients with lumbar-sacral spine discopathy was assessed. In order to evaluate the applied therapy, the following were used: Schober test, fingertip-to-floor test, VAS scale, as well as Laitinen questionnaire. A group of 95 patients underwent the following treatments: laser therapy (trigger points technique, dose – from 6 J/cm2 to 9 J/cm2);

magnetotherapy (frequency – from 0 Hz to 50 Hz, magnetic field induction – from 6 mT to 10 mT, time – 20 minutes); systemic cryotherapy (treatment time – 3 minutes, of which: 30 seconds in the vestibule chamber at -60°C, then 2 minutes 30 seconds in a main chamber at a temperature of -110 °C to -130 °C); kinesitherapy (to strengthen the muscles and increase the mobility of the spine, time 20 minutes). The results indicate an improvement in the forward flexion range, measured using the Schober test. A significant reduction in the level of pain and values in the Laitinen questionnaire was also observed. The BMI, as well as the age of the study group in the authors' research differs from the group in own research. Significant improvement in the mobility range indicates the appropriateness of selected physiotherapy and kinesitherapy procedures, but it makes it difficult to assess the impact of magnetotherapy on the problem in question.

Treatment with variable low-frequency magnetic field is a part of comprehensive rehabilitation in the studies of Depa et al. [14], in patients with lumbar spine pain syndrome. A group of 75 people, for a period of three weeks, underwent the following treatments: diadynamic currents, iontophoresis with lignocaine, magnetotherapy, cryotherapy, dry massage, kinesitherapy, as well as psychotherapy and education about ergonomic aspects of rest and work. The treatment progress was verified using the VAS scale, Schober and Ott tests, as well as the Oswestry questionnaire. In 59% of patients the level of pain was reduced, while in 57% of patients an improvement in the range of mobility was observed. In own research, magnetotherapy is the only type of treatment applied. Lack of precise parameters of the procedures, as well as the application of all the selected procedures in one study group in the work of the authors, makes it difficult to assess the effect of magnetotherapy on the increase in the spinal mobility range.

In the study of Hawrylak et al. [15] the influence of magnetotherapy and kinesitherapy on functional parameters of patients undergoing hip replacement surgery was analyzed.

25 people on the 10th day after the treatment were subjected to a 6-week series of treatments with the following parameters: magnetotherapy (Magnetronic MF-10 equipment, magnetic field induction – 10 mT, frequency – from 40 Hz to 50 Hz, treatment time – from 20 to 30 minutes, pulse shape – square); kinesitherapy (learning to walk on the treadmill and stairs, rotor for lower limb exercises, general conditioning exercises, as well as active resistance exercises with and without relieving – the total of 2 hours of exercises). The progress of the therapy was examined with the Berg functional scale and goniometer, assuming that due to the risk of dislocation, the movements of external rotation and adduction in the operated joint will not be analyzed. The applied therapy improved the balance, walking and mobility range in the study group. The most significant improvement in the non-operated joint was observed in the field of external rotation, whereas in the operated hip in the flexions. In own research, low-frequency magnetotherapy was performed as the only type of treatment used. The use of kinesitherapy, as well as higher parameters of the procedure and the prolonged duration of the series makes it difficult to compare the results obtained by the authors with those obtained in the own study.

There is noticeable variety of results and conclusions of the authors of the studies as to the effectiveness and appropriateness of using low-frequency magnetotherapy procedures. This may result from the fact that there are no specific doses, as well as from differences in the state of health of patients examined in the cited studies. On the basis of own research, indicating the lack of effects of low-frequency magnetotherapy, further research is recommended in order to broaden the knowledge about the impact of a given physical procedure on spinal mobility limitations.

Conclusion

1. Low-frequency magnetotherapy does not affect the mobility range of the lumbar spine.
2. BMI slightly affects the mobility range of the lumbar spine.
3. There is no correlation between the age of the participants and the mobility range of the lumbar spine.

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