

The Impact of WATSU as Physiotherapy Method on Fatigue for People Diagnosed with Multiple Sclerosis

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SUMMARY

Aim: To identify the impact of WATSU method on fatigue which has an impact on sleep and quality of life, pain and depression or its aggravation.

Materials and Methods: The study involved the four participants. The following instruments were used: Multiple Sclerosis Quality of Life questionnaire; Pittsburgh Sleep Quality Index; Burns Depression Checklist; Fatigue Impact Scale. The study was carried out in medical center in Lithuania from 09-11-2019 till 18-01-2020 during 10 weeks. Each participant of the study received ten WATSU sessions. The research data was processed using SPSS Statistics 20. Qualitative Outcome Measures were conducted by content analysis, observation, semi-structured individual interview methods.

Results: After 10 sessions, fatigue lessened in all people investigated. Initially, the average of fatigue was 70 points and decreased to 34 points after the investigation. The average sleep quality index was as high as 5 points, after ten weeks the average decreased to 3 points. Changes in assessment of major to mild depression: initially, the average was 36 points, which decreased to 14 points after ten weeks.

Conclusions: The WATSU method was effective in reducing fatigue as a physiotherapy method. Along with changes in fatigue, the Pittsburgh Sleep Quality Index decreased, energy and motivation increased, quality of life improved, level of depression reduced, and the change was statistically significant. While assessing the quality of life, pain was found to be decreased – it became less frequent after ten weeks of sessions and less intense or even absent, its influence on daily activities decreased.

Key words: multiple sclerosis, fatigue, rehabilitation, aquatic physical therapy, WATSU

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INTRODUCTION

Studies with limited evidence have described the use of WATSU in people with stroke [1], cerebral palsy [2] and fibromyalgia [3, 4], which was effective in the latter in reducing pain, improving depression [3] and health related quality of life [4]. A watery rehabilitation environment is a form of exercise that provides the most appropriate therapeutic environment for individuals with multiple sclerosis. The National Association for Multiple Sclerosis recommends aquatic exercise therapies to patients. The effects of aquatic exercises on multiple sclerosis patients revealed a number of positive effects after investigations [5].

Multiple sclerosis (MS) is a chronic progressive neurological disease that is incurable yet [6]. It is an autoimmune inflammatory CNS demyelinating disease that attacks the protective myelin covering of the nerve fibers responsible for muscle functioning and senses [7]. Almost 2 300 000 people in the world suffer from MS and the overall prevalence of the disease is 33 out of 100 000. Epidemiological studies suggest that the incidence and prevalence of MS are geographically dependent [6]. The prevalence of the disease in the world is

unevenly distributed between economically strong and weak countries. In North America and Europe >100 out of 100 000 population have MS, whereas in Asia and Africa only 2 out of 100 000 population are affected by the disease [8]. The numbers of MS patients are increasing globally (from 2.1 million in 2008 to 2.3 million in 2020). Among the 29 European states Lithuania ranks 23rd by MS morbidity rate. Lithuania belongs to the area of high MS prevalence, with 70–80 new cases of multiple sclerosis registered each year, and approx. the total number of patients may reach 3 000. The average age of the patients is 29 years. In Lithuania MS is more common in women than men with 2:1 MS incidence rate between women and men [9].

Fatigue is the most common symptom among multiple sclerosis patients. It occurs at an early stage of the disease, often earlier than other symptoms, and may indicate the disease progression [10]. Fatigue or exhaustion may be associated with physical (motor activity) and mental (cognitive or emotional) activity. Usually it is a normal reaction of the body. However, it is considered pathological when it bothers and affects the social, physical and work activities of individual [11]. There are

two types of MS related fatigue: primary and secondary. The primary fatigue occurs without any reasons and it comes directly from the disease. The secondary fatigue is the consequence of other conditions related to MS, most often related to the side – effects of MS medication or physical activity. The fatigue has a negative effect on quality of life and cognitive functions of the patient. The primary fatigue may be difficult to tell apart from the secondary fatigue because it can be caused by other co – morbid conditions such as depression [6, 12]. MS patients feel abnormal subjective fatigue and many other neurological disorders due to a possible increase in the brain workload to perform a cognitive or physical task or due to a mismatch between the desired workload and the actual workload that neurons can perform [13]. The fatigue can be peripheral (inability to maintain muscle contraction) and central (increased effort and decreased endurance during long – term physical or cognitive activity). The central fatigue is associated with metabolic and structural disorders that disrupt the normal functioning between the basal nuclei, the limbic system, and the primary sensory areas [14]. The fatigue can be acute or chronic. The acute fatigue is usually related to acute conditions, whereas in the case of MS the fatigue is chronic [15]. Different studies and meta analyses revealed that 50–90 percent of MS patients suffer from a certain level of fatigue [15, 16]. It is often one of the first symptoms that undermines daily activities and has a negative effect on the professional and personal relationships [17]. Our study will provide additional knowledge on aquatic rehabilitation methods for patients diagnosed with multiple sclerosis.

WATSU (portmanteau word: English “water” and Japanese 指圧 “Shiatsu”) was first described by its originator Dull in the 1980s as a treatment consisting of Japanese Shiatsu bodywork applied in thermal water [18]. To practice WATSU, a therapist stands in thermoneutral water ($35^{\circ}\text{C} = 95^{\circ}\text{F} = 308.15\text{ K}$), supporting the supine receiver with hands, forearms, or shoulders and softly moving her / him in slow and spacious circular motion sequences following elaborate movement patterns related to receiver’s and therapist’s level of experience [18]. The hands of the therapist function as a grip to facilitate movement and at the same time to stimulate acupuncture points. Gentle traction is applied to the body of the receiver to mobilize joints and stretch myofascial structures, as well as meridians, channels through which the life-energy (Chinese 氣 “qi”, flows in the concept of Traditional Chinese Medicine [18, 19]. During immersion, hydrostatic pressure influences fluid distribution, metabolism, and respiration. The impact of gravity is greatly reduced, thus decreasing joint loads and allowing maximal flexibility in the positioning of the treated individual [20, 21]. The thermoneutral temperature of 35°C is recommended because it allows passive immersion of about 60 minutes without causing temperature-induced stress [21-23]. Originally WATSU was created as a non – therapeutic application to support wellbeing and relaxation, and was consequently adopted by therapists. Therefore, therapeutic indications of WATSU are reported in the literature, e.g. to address musculoskeletal conditions [4, 24], neurologic diseases [25-27] and mental distress [28-30], to complement palliative

care [31, 32] or to meet the needs of cognitively impaired individuals [33-36]. Originating in the Asian philosophy of maintenance and restoration of health, WATSU can be considered as a floating massage, a tool for rehabilitation, a guided meditation to foster mindfulness and resilience, and a mediator of personal and spiritual growth [37-39].

AIM

The study purpose was to identify the impact of WATSU method on fatigue which has an impact on sleep and quality of life, pain and depression or its aggravation.

MATERIALS AND METHODS

PARTICIPANTS

The participants were selected using the targeted sampling method. The study involved the members of Multiples Sclerosis Society in Klaipeda. The goals and methods of the study were explained to the participants of the study and the consent form was signed. The participants who agreed to participate in the study were acquainted with the progress of the study and possible inconveniences. Four MS patients (three females and one male) participated in the study. The study participants filled in a compound questionnaire, which contained questions about the duration and the progress of the disease, potentially provocative factors and the currently experienced symptoms. Each participant answered the MSQOL-54 questionnaire prior the study [40]. The data were collected before WATSU Session 1 and after Sessions 5 and 10.

Inclusion criteria:

- Age: 20–60 years;
 - Progress of the disease: Relapsing - Remitting;
 - Patients with light and moderate levels of the diseases according to EDSS (Expanded Disability Status Scale) (1–6.5 points);
 - Experience of secondary fatigue;
 - Sleep disorders;
 - Frequent mood swings;
- Presence of at least mild depression;
Low energy levels during the day.

Exclusions criteria: acute form of the disease; current treatment with experimental drugs.

The average age of participants was 52 ± 9.3 years. Duration of the disease – 11.5 ± 5.6 years. Disability level according to EDSS [41] was found 4.2 ± 1.5 . All available medical records were reviewed in accordance with the rules on confidentiality and data protection and the demographic data were revised for the study. The identities of the participants were not disclosed. The participants were encoded using Roman numerals (I, II, III, IV). Two participants withdrew from the study due to the exacerbation of the disease. The criterion of gender distribution among the participants was not taken into account.

RESEARCH DESIGN

Fatigue, sleep, quality of life, and the severity of depression were studied. All instruments and methods used in the study did not infringe intellectual property rights because their descriptions are publicly accessible on the Web. The following instruments were used:

Multiple Sclerosis Quality of Life questionnaire (MSQOL-54) [40]. This instrument was used to gain a better understanding of the patient's condition, well-being and health. The instrument consists of 54 questions: 36 general health-related questions address the health condition (physical condition, perception of own health, capacity, limitations due to physical conditions, sex life, social well-being and health disorders). The maximum score is 100. 18 specific questions address the mental condition (health disorders, general quality of life, emotional well-being, limitations due to emotional condition, and cognitive function). The maximum score is also 100.

Pittsburgh Sleep Quality Index [42]. This instrument was used to assess the quality of sleep. It consists of seven components to rate the subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Each item is scored from 0 to 3 (0 = no problems, 3 = significant sleep disorders). The total PSQI score may range from 0 to 21. The higher the Index score, the lower is the quality of sleep. The total PSQI score above 5 indicates a deteriorating quality of sleep.

Burns Depression Checklist (BDC) [43]. The severity of depression was self-rated according to the Burns Depression Checklist, which is a reliable instrument to determine depression and to measure the severity of this disorder. The Burns Depression Checklist consists of four sections containing 25 items about thoughts and feelings, activities and personal relationship, physical symptoms (senses) and suicidal urges. Each item is scored from 0 to 4 (0 = not at all, 1 = somewhat, 2 = moderately, 3 = a lot, and 4 = extremely). The total score may range from 0 to 100. The severity of depression is determined according to the total score. 0–5 = no depression, 6–10 = normal but unhappy, 11–25 = mild depression, 25–50 = moderate depression, 51–75 = severe depression, 76–100 = extreme depression.

Fatigue Impact Scale (FIS) [44]. This scale was used to evaluate the impact of fatigue. It is a general type questionnaire consisting of 40 items that assess the fatigue in three aspects: physical, social and cognitive. Each item is scored from 0 to 4 (0 = no problems, 4 = significant problem). The total score may range from 0 to 160 scores. The higher is the total score, the stronger is the fatigue.

Expanded Disability Status Scale (EDSS) [41]. This instrument was used to quantify the overall disability in the participants of the study. The scoring was based on the examination by the neurologist. The total score of the scale may range from 0 (no disability) to 10 (death due to MS). The score ranging from 0 to 3.5 indicates that the patient is active and independent at home and at work; step 4 to 4.5 indicates the progress of the disease and limitations in the patient's life; step 6 to 7.5 indicates the loss of independence and required assistance from others; step 8 to 10 indicates the required support and total dependence on others.

EXPERIMENTAL PROCEDURE

The study was carried out in the medical center in Klaipeda, Lithuania from 09-11-2019 till 18-01-2020. The study lasted for 10 weeks. Each participant of the study received ten WATSU

sessions. The sessions were delivered once a week, always at the same time before noon. One session lasted for 60 minutes. The sessions were delivered by a licensed physiotherapist. The sessions took place in a vertical bathtub of 1.45 m depth. The water temperature was maintained between 32-35°C. Room temperature was 26°C. WATSU floats were placed on the patient's legs to support the floating on the water. During the session the patient's face was always kept above water. To ensure the patient's safety, the WATSU physiotherapist held the patient on her arms throughout the entire session.

WATSU movements:

- Section I – Still point, Water Breath Dance, Offerings Simple/ One Leg/ Two Leg; Accordion; Rotating Accordion; Free Spine, Gate Hold; Explore Flow Simple/ Heart Gate/ Near Gate/ Far Gate; Free Arm; Distant Stillness; Seaweed; Seaweed Roll; Seaweed Rock; Hara Rise; Slide Up Back.
- Section II – WBD and Spiral Offering; Near and Far Leg Rotation; Back Opening; Arm Breath Squeeze; Hand Hold; Pull Around; Swing; Push Around; Arm Leg Rock I and II; Shoulder Rotation; Arm Play and Lift; Chest Opening; Back Lift Roll Hook; Thigh Press; Corner Spread; Hand Opening; Arm Back Around.
- Section III – Hara Rock; Hara Spiral; Turn and Pull; Sweep under Shoulder; Lengthening Spine; Twist Over; Sweep Around; Side Stroke; Spine Pull; Undulating Spine; Hip Tug; One Turn, Pull and Under Shoulder.
- Section IV – Side Saddle; Sandwich; Face Head Neck Shoulder Arm; Pulling Back (Bladder Meridian); Leg Roll and Lunge; Knee and Foot; Heel to Buttock; Head Lift; Twists; Sandwich; Explore Movement; Head on Heart; Heart Rock Completion [18].

The patient's condition was carefully monitored. The agreement with the patient provided for the possibility for the patient to withdraw in the event of any negative symptoms. The therapy was conducted in silence.

ETHICAL CONSIDERATIONS

The research protocol was formally approved by the Ethics Committee of Klaipeda University, Faculty of Health Sciences, Holistic Medicine and Rehabilitation Department on 26th of September 2019. Good scientific practice was followed throughout the study (All European Academies [ALLEA] 2017). The ethical approval for the entire research project was received from the *Ethics Committee* of Klaipeda University. In addition, the approval from Medical centre was received. Permissions for using the instruments were received from their copyright holders. Before signing consents all participants received an information letter concerning the study, the voluntariness of participation, confidentiality and the right to withdraw at any stage of the study according to Helsinki Declaration.

STATISTICAL ANALYSIS

The research data was processed using IBM SPSS Statistics 20 and Microsoft Office S Excel 16 software. The software was used to calculate arithmetic means, rates, standard deviations, and mean errors. The statistical data reliability was evaluated by using Student's T criterion (where $p > 0.05$

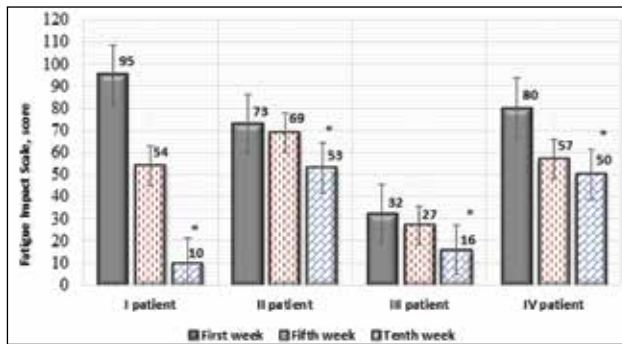


Figure 1. The change of the participants' fatigue within the period of 10 weeks according to the Fatigue Impact Scale. Statistically significant * $p \leq 0.05$

means the difference is statistically insignificant and $p < 0.05$ means the difference is statistically significant). Qualitative Outcome Measures were conducted by content analysis, observation, semi-structured individual interview methods. Participants were asked to answer following questions right after their WATSU treatment: How was your experience being treated with WATSU? Which changes did you notice in response to your WATSU treatment? Which aspects of your WATSU treatment were less pleasant for you?

RESULTS

CHANGE IN FATIGUE

The fatigue of the study participants was rated according to the Fatigue Impact Scale (Figure 1). A higher level of fatigue causes more problems, it occurs more frequently and is very draining. Fatigue causes is a risk of depression or higher degree of depression, the sleep disorders and deteriorating quality of life.

ASSESSMENT OF PATIENT I

Patient I was a female. Her fatigue score at the beginning of the study was 95 (70 ± 26.94) of 160. The comparison of the scores before and after the sessions revealed a statistically significant ($p \leq 0.05$) reduction from 95 (70 ± 26.94) to 10 (34 ± 24.42). Out of four patients, Patient I reported the greatest reduction in fatigue level. During the interview about the feeling of fatigue, Patient I noted that she had felt more energetic during the week, that the feeling of fatigue was the most intense 1–2 hours after the WATSU session. Later the fatigue diminished and the energy boosted. After the first session she felt very tired and wanted to sleep. Upon return home she fell asleep and slept until the evening. On the next day she was more energetic than usual. Prior to the cycle of WATSU sessions the fatigue was one of the greatest problems, which the patient could not control except for pacing herself to save energy. After the WATSU sessions the mobility problem became less acute. After the sessions the patient did not have to limit her work load in order to save energy, her performance improved, her motivation to involve in more activities increased and she had to pace herself less in her physical activities. The duration of her physical activities also extended. Prior to the study the patient avoided stressful situations; now she can tackle them with more ease, she feels greater emotional stability. Before she felt muscle weakness

that caused fatigue; after the sessions the weakness was less frequent and was no longer an issue. The frequency of breaks for rest, which was an important issue ten weeks ago, had reduced and she did not name it as a problem. The feeling of blue has become less frequent, irritation and frequent attacks of anger have disappeared. Patient I can plan her time easier. Her self-esteem has increased, she enjoys cooking and experimenting, is eager to try new things. Her motivation in group work has increased, she can generate ideas and has energy to realize them, her performance has also improved.

ASSESSMENT OF PATIENT II

The second patient was also a female. At the beginning of the study her fatigue score was 73 (70 ± 26.94) of 160. The difference between the fatigue scale scores before and after the WATSU sessions was 20. The decrease of the fatigue was not as significant as in the case of Patient I, however it was statistically significant ($p \leq 0.05$). During the 10 weeks of the study the fatigue level was the highest 30 minutes after the session and in the first half of the day. In the evening the fatigue decreased, the patient was more energetic and in better mood reported as energy boosts. In the remaining days of the week the fatigue stabilized and did not increase. Answers to the questions of the FIS revealed Patient's II increased sensitivity, which was a serious issue before. The patient was able to increase the physical load, her performance level and motivation to participate in social activities increased. Her reasoning became faster, decision making and problem solving improved. She found it easier to concentrate on specific activities. The patient's agility and coordination improved, she needed minimum caution in performing physical activities and she was able to do physical activities longer. Before the study the patient named muscle weakness as a problem, which reduced after 10 weeks of WATSU sessions. During the study the limitations of physical activities decreased, breaks for rest were shorter and less frequent.

ASSESSMENT OF PATIENT III

Patient III was a female. At the start of the study her fatigue score was 32 (70 ± 26.94) of 160. During 10 weeks of the study the FIS score decreased from 32 (70 ± 26.94) to 16 (34 ± 24.42). The score difference before and after the sessions was 16. This difference was the lowest among all participants, however statistically significant ($p \leq 0.05$). The patient felt minimum fatigue after the sessions, she was happy and satisfied, felt a bit sleepy after the sessions, but later her energy level increased. Mobility was a minor problem to her and it disappeared after the study. Prior to the study her work load was limited due to the fatigue and the limitation decreased during the study. The patient's performance improved, she could plan her time better and maintain physical activity longer than before, her agility and coordination improved. The patient's emotions stabilized although she had not experienced serious mood fluctuations, irritation and anger attacks prior to the study.

ASSESSMENT OF PATIENT IV

The fourth patient was a male. At the start of the study his fatigue score was 80 (70 ± 26.94) of 160. During the study the fatigue score dropped from 80 (70 ± 26.94) to 50 (34 ± 24.42).

The score difference of 30 is statistically significant ($p \leq 0.05$) compared to the scores of Patient II and Patient III. The patient's mobility did not change much, however a slight improvement from 3 to 2 scores was observed during the study. Prior to the sessions, his daily work load had been reduced more than would be desirable, but during the study the workload the patient could bear gradually increased. The patient's performance improved and his motivation increased. The patient needs more efforts to finish the task that requires physical effort. Prior to the study, the patient's physical activity was limited and did not change after 10 weeks: coordination of movements was difficult, physical discomfort continues, he had to pace himself in his physical activities, saved energy and could not maintain physical activity for a longer time. The usual number of rest breaks did not decrease, but the breaks became shorter. It took less time for the patient to rest than before the study. After the sessions it was easier for the patient to concentrate and keep the attention longer. Decision making also became easier. The mood improved, the patient felt less irritated and anger attacks were seldom. He felt it easier to communicate with people and family members.

CHANGE IN THE QUALITY OF SLEEP

The scores of the Sleep Quality Index (Table 1) showed changes in the quality of sleep of all four patients. Individual scores of the Sleep Quality Index revealed a statistically significant ($p \leq 0.05$) decrease, which means that the patients' quality of sleep improved. The greatest improvement was observed in Patient I and Patient II. The PSQI of Patient I reduced from 5 (5 ± 0.82) to 1 (3 ± 1.83), and from 4 (5 ± 0.82) to 2 (3 ± 1.83) in Patient II. The PSQI of Patient III and Patient IV also reduced, but not as much as of the first two patients. The PSQI of Patient III reduced by one score only. Prior to the study, Patient IV had the highest PSQI, which reduced during the study from 6 (5 ± 0.82) to 5 (3 ± 1.83). It should be noted that after the study the PSQI of all patients reduced indicating the improvement in the quality of sleep. The frequency of pain at night did not change after the WATSU sessions and remained once a week or less frequent. The patients' self-rated quality of sleep was good.

For Patient I the changes of all scores were statistically significant ($p \leq 0.05$). Significant changes in the quality of sleep were observed during the 10 weeks of the study. The hours slept have not changed (usually the patient sleeps 8–9 hours), but the time of falling asleep shortened from 20 minutes (prior to the study) to approx. 5 minutes (after the sessions). Prior to the study there were three or more times

of waking up in the middle of the night or early morning during the week. In the month following the two months of WATSU sessions the patient did not wake up in the middle of the night or early morning. She stopped coughing at night. She sometimes felt too cold or too hot. She stopped having pain after the therapy. She felt more alert than before, had more energy and greater interest in new activities.

Patient's II sleep quality index also indicated a statistically significant ($p \leq 0.05$) improvement (Table 1). The patient sleeps 8 hours during the night. The length of sleep did not change after the therapy. She wakes up with the alarm clock to go to work. Prior to the therapy sessions she had difficulties falling asleep longer than 30 minutes once a week or once in two weeks. This problem disappeared after 10 weeks of the therapy. Getting up to use the bathroom at night reduced from 3 or more times a week to once a week. Sometimes she had bad dreams before but in the last month of the therapy she did not have any bad dreams. Prior to the study she sometimes had pain at night but after the therapy she does not have any pains at night. The patient's self-rated quality of sleep was very good. Indifference and apathy to the environment decreased, the patient feels more energetic.

Patient III had a good sleep quality index score prior to the study, and after the study the total score reduced by one point only indicating an insignificant improvement in the quality of sleep. The change in the quality of sleep after the study is statistically significant ($p \leq 0.05$). After the WATSU sessions the sleeping time of 8–9 hours did not change, however the time of falling asleep reduced from 20 to 15 minutes; however, there were a few times in a month the patient could not fall asleep longer than 30 minutes. Before the study she sometimes felt hot or cold, had bad dreams. After the therapy these problems disappeared. The patient used to have pain at night three times a week or more often. After the WATSU sessions the frequency of the pain decreased to once a week or no pain at all. The patient noted that after the sessions she remained alert for a longer time. She rated the quality of her sleep as good.

Patient IV had the highest PSQI score before the study, i.e. the lowest quality of sleep among all study participants. During the study the patient's PSQI score reduced to 5 and this difference is statistically significant (Figure 2). The sleeping time did not change after the therapy. Frequent wake-ups (3 or more times a week) at night remained. The wake-ups may be related to the need to use the bathroom. After the sessions the heavy breathing, which made it difficult for the patient to sleep at night before the study, became easier. The patient also coughed less. The patient also experienced episodes of cold and

Table 1. Pittsburgh Sleep Quality Index results. The higher the Index score means the lower is the quality of sleep

Patient	Before research	Score	After Research	Score	Sleep Present
I	5	=5	1	<5	Good Sleep quality
II	4	<5	2	<5	Good Sleep quality
III	5	=5	4	<5	Good Sleep quality
IV	6	>5	5	>5	Bad Sleep quality

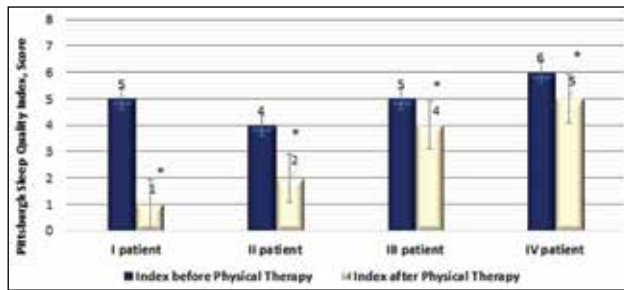


Figure 2. Results of the changes in the quality of sleep among the study participants according to the Pittsburgh Sleep Quality Index. Statistically significant $*p \leq 0.05$

heat, sometimes had bad dreams. The feeling of cold or heat reduced and there were no bad dreams after the therapy.

CHANGES IN DEPRESSION

Observations were made whether the severity of depression in the study participants measured by Burns Depression Checklist changed along with the reduced fatigue during the ten weeks of the study (Figure 3). A statistically significant improvement in depression scores was observed in all study participants. The most significant change was observed in Patient I, who had the highest degree of depression before the study. The patient was diagnosed with depression as a comorbidity in MS. During the ten weeks of the study her depression severity reduced significantly from 54 (36.25±16.26) to 4 (13.75±9.18) scores (Table 2). Patient’s II results ranked second by the change in depression severity. The comparison of the checklist results before and after the WATSU sessions showed a difference of 19 scores and the depression severity changed from moderate to mild. Patient’s IV degree of depression measured according to Burns Depression Checklist reduced from 35 (36.25±16.26) to 23 (13.75±9.18) (Table II) and the severity changed from moderate to mild. Patient III had a mild degree of depression before the study and after the therapy the degree of depression reduced.

Patient I was the most emotional of all study participants. Mood and occupation were very important to her and these factors particularly affected the patient’s emotional state. The patient noted that after the therapy sessions she seldom experienced low mood. Her sensitivity, which provoked crying, has diminished, and the patient’s self-esteem has increased. Her interest in the family life and people around increased, she spends more time with people and does not feel so lonely any more. The patient’s interest in the immediate environment

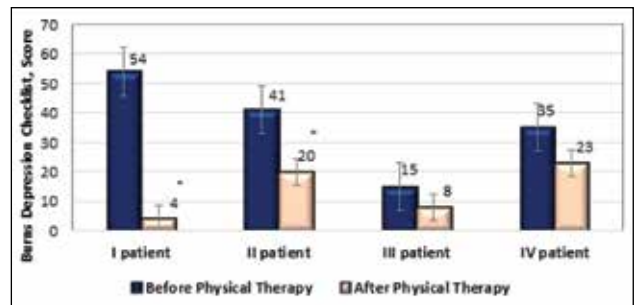


Figure 3. The change in the degree of depression of the participants according to the Burns Depression Checklist before and after the study. A statistically significant ($*p \leq 0.05$) improvement in depression scores was observed in all study participants

and motivation to engage in different activities increased. The feeling of satisfaction and joy of life has returned. Prior to the study the patient gave the highest score of 4 to severe and bothersome fatigue, sleep problems, loss of libido, and worrying a lot about her health. After the ten weeks of the therapy the patient had a 0 score for all the above symptoms. The patient reported that after the WATSU sessions her personal relations and activities improved and that even her friends and family had noticed positive changes.

Patient II. The comparison of the checks describing the symptoms in BDC inventory revealed that the biggest changes were in the items of the categories Thoughts and Feelings and Activities and Personal Relationships. After the therapy sessions the patient’s mood has improved, she seldom felt depressed and unhappy, she became less tearful and the crying spells have disappeared. The patient’s confidence and self-esteem have increased. She stopped feeling lonely and paid more attention to the family. He motivation to involve in different activities has increased. The patient reported that her fatigue had reduced, that she could fall asleep faster than before, her excessive anxiety about her health had diminished.

Patient III was happy, confident, and communicating well before and after the study. She had mild depression according to BDC results. The change in depression degree after the study was not significant, but still visible. Before the study, the patient sometimes felt unhappy, sad or was in low mood, sometimes she lacked confidence. After the study the symptoms have significantly reduced and became almost unnoticeable. Before the study the patient often felt lonely and these feelings have disappeared after the therapy. Health related anxiety has also diminished.

Table 2. Results of depression rating using Burns Depression Checklist

Patient	Score before research	Evaluation	Score after research	Evaluation
I	54	Severe Depression	4	No Depression
II	41	Moderate Depression	20	Mild Depression
III	15	Mild Depression	8	Normal but unhappy
IV	35	Moderate Depression	23	Mild Depression

Patient IV had a moderate degree of depression according to the Burns Depression Checklist. After the study the total scores indicated moderate depression and at the end of the study the total score showed mild depression. Sometimes the patient had suicidal thoughts. The patient reported that after the therapy sessions he felt happier than before. The patient's confidence improved and the feeling of hopelessness diminished. The patient did not have any crying spells before the study. After the study he was more willing to spend time with friends and family, the feeling of loneliness has disappeared. Prior to the study, he often felt very tired. During the study, the fatigue became less intense, and the patient could fall asleep easier. The anxiety about his health also diminished as with the other three patients.

CHANGES IN THE QUALITY OF LIFE AND PAIN PERCEPTION

The self-rating of the quality of life showed the improvement between Week 1 and Week 10 of the study (Figure 4).

Patient I rated her quality of life after the study as very good. She felt that her health was much better after the therapy than a year ago. Daily activities that require a lot of energy remained limited. The activities of medium intensity became less limited, and the required breaks between activities became less frequent and shorter. During the participation in the study, the patient's working intervals extended, she works more than usual, the work requires less effort. Her mood was good during the 10 weeks of the study and the improved mood had a positive effect on the quality of life. The patient's physical and emotional condition improved her communication with family and friends. The pain has eased and did not have a negative effect on the quality of life during four weeks, her daily habits improved. During the weeks of the study the patient's sleep improved and the degree of depression diminished. The patient was almost satisfied with her sexual life. After the sessions her sexual drive increased. On the 10-point scale, where 1 is very bad and 10 is excellent, she rated her quality of life by 9 points (very good).

Patient II rated her health as good although she did not perceive significant changes in her health condition by comparing it a year ago and after the study, except for less frequent and less intensive fatigue and weakness as well as tremor after the therapy. The time required to do the work remained the same; however, the physical limitations experienced in certain jobs reduced. She became more emotionally stable in her job. Throughout the study the patient's physical and

emotional condition did not hinder her communication with her colleagues, family and friends. During the four weeks of the study the patient felt only a light pain, which did not impact her job or housework. The patient reported that she had remained energetic for the larger part of the day. The patient started feeling exhausted later than before. The patient did not report any problems in her sexual life. The previously reported problems diminished during the study. According to patient, after the sessions her previous bowel and bladder problems no longer interfered with her social life. On the 10-point scale, where 1 is very bad and 10 is excellent, she rated her quality of life by 8 points (good).

Patient III rated her health condition as good and noted that some health aspects were rated better after the study than before the study. Before the study the patient's physical activity was not limited, but it was not intensive. She attempted to move more. Fatigue effected hew working day less. The patient's emotional condition did not have a negative effect on her daily activities. The patient's physical and emotional condition had no influence on her communication with family and friends. In the last four weeks the patient did not feel any pain and thus she could not assess the effect of pain on the quality of her life. Most of the day the patient felt energetic, was calm and happy. On the 10-point scale, where 1 is very bad and 10 is excellent, she rated her quality of life by 8 points (good).

Patient IV rated his health after the study better than before the study. However, the comparison of his health condition a year ago and now after the study showed almost no changes. All mobility related activities remained limited: dressing up took quite some time, home chores were difficult to cope with, climbing stairs was also difficult (the patient always uses a lift, where possible). The patient reported that his physical and emotional condition hindered his communication with the family and colleagues. During the four weeks of the study he felt a light pain that had little effect on the quality of his life. After the study the patient was more energetic, he felt well for most of the day; the fatigue occurred later. The patient felt the best in the morning. On the 10-point scale, where 1 is very bad and 10 is excellent, he rated his quality of life by 6 points (satisfactory).

DISCUSSION

The results of the study showed that the decrease in the level of fatigue in the participants was statistically significant ($p \leq 0.05$). The tests revealed that a personalized program can ease the experienced fatigue irrespective of the disability level. Although the results are positive and significant, the benefit is short – term. Regular physiotherapy sessions are required for long – term improvements [45]. There is a proof of research that regular kinesiotherapy sessions reduce fatigue. Water is a good environment to reduce the patients' fatigue, therefore, aquatic activities are very helpful [46, 47]. Sakaliene R. recommends energy saving physical activities to combat fatigue. Heat exhaustion should be avoided in such activities. She advises to take longer breaks between the activities or more difficult tasks, to do the most difficult tasks in the morning, to priorities the tasks and to set realistic goals. Patients with chronic diseases must know the relaxation methods [48].

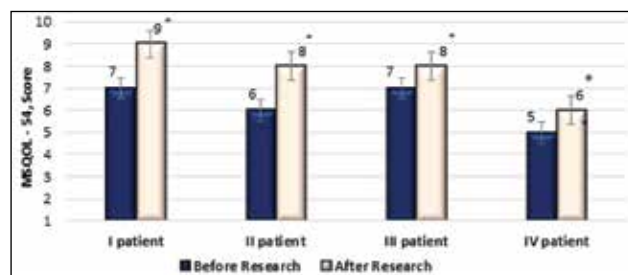


Figure 4. Results of Multiple Sclerosis Quality of Life questionnaire (MSQOL-54). Self-rated quality of life in a 10-point scale before and after the study. Statistically significant $*p \leq 0.05$

The increased clinical implementation of WATSU in interdisciplinary treatment settings such as rehabilitation facilities indicates a growing acceptance of this body-based complementary therapeutic intervention. It is used as a component in multimodal treatment settings focusing on posttraumatic stress disorder, and anxiety [49, 50], chronic pain and fibromyalgia [4, 50], stress – related illnesses [51], depression [29, 50] and sexual dysfunction [52]. WATSU has also been recommended as a treatment for patients with hemiparesis, multiple sclerosis, cerebral palsy and spinal cord injury [1, 21].

Our test results also showed a statistically significant improvement in the quality of life of the study participants. The results of our study confirm the findings of other researchers studying the effect of WATSU therapy on psycho – emotional state indicators. Components of WATSU including gentle touch are believed to act in a stress reducing manner [53, 54]. Considering physiological effects on the cardiopulmonary system due to physical exposure to hydrostatic pressure, certain cardiac conditions, for example, chronic heart failure [55] and respiratory impairments such as cystic fibrosis [56] can be regarded as potential indications for this treatment. In addition, the therapist's thoroughly compassionate attitude allows her/him to enter a parasympathetic state that the patient is nonverbally encouraged to join in [57]. During immersion, patients experience decreased heart rates [55] that are organically anticipating and promoting a parasympathetic state of relaxation. Reduced hypothalamic – pituitary – adrenal axis activity, that is, lower plasma cortisol levels along with increased mental and physical relaxation in context with immersion, has previously been reported [58, 59]. A potential mode of action promoting emotional wellbeing might be the activation of afferent C – tactile fibers during immersion. It has been proposed that these fibers transmit slow gentle touch – analogous to bypassing water – that has been observed to activate emotional brain areas [60, 61]. According to expert opinion WATSU might be alleviating excessive muscle tone and pain due to rotational movements of the trunk and gentle rocking of the whole body, leading to dampened muscle tone as a side effect of vestibular system activation [27].

The evaluation of the severity of depression before and after the study showed a statistically significant decrease in depression degree. The results of the study on the effect of WATSU therapy on people with Multiple Sclerosis showed that the method reduces stress and pain, improves mood and psychological well – being, improves the quality of life. WATSU therapy is most often used for pregnant women, but it is also recommended for patients with neurological disorders, including patients with multiple sclerosis [24]. Positive mood changes and eased pain was observed in the assessment of the psychological wellbeing of all study participants. There were tears and laughter, deep relaxation and contemplation during the WATSU sessions in our study. Some patients even fell asleep and woke up only after they touched the ground with their feet at the end of the session. After the therapy sessions the patients appreciated their feeling well, relaxation, the time spent alone with their thoughts. The boost of emotions even caused tears of joy in some of them. Better patients' mood was the most

noticeable. There was a statistically significant decrease in the degree of depression, improvement in the quality of sleep and the quality of life. No exacerbation of multiple sclerosis was observed during the 10 – week study. The test results showed that additional health issues mentioned in the pre-study interview, such as back ache, restricted leg and hand movements, tension and too high muscle tone, also improved. Back aches significantly reduced and finally disappeared after the WATSU sessions. The restricted amplitude of broken limbs increased and the feeling of discomfort of the movement reduced. The tension of the body and too high muscle tone characteristic of multiple sclerosis also reduced after the therapy. WATSU sessions are based on a gentle physical contact with another human and this contact eases the feeling of social exclusions and pain. Touching as a therapy method is discussed with respect to sensory neurons, the pain threshold, which especially react to a soft touch influenced by speed of the therapeutic touch and the temperature. Warm water is believed to have a stimulating effect, although not proved scientifically. The efficiency and success of the WATSU therapy depends on the trust in the therapist, the patient's mood and attitude towards the therapy. Water makes an individual to focus on him/herself. The patient does not hear extraneous sounds, feels lightness and thus relaxes [62]. Every movement in the therapy echoes the patient's needs. The therapist selects different movements in response of the patient's body language. The movements and their sequence are different in each session. Sometimes many movement modulations are performed, while in other sessions the movements are simple and relaxing because the patient's body resists to certain movements. All participants of our study noted that they were not aware of the time and space, time passed unnoticed, they did not feel being in the water, any foreign stimuli and the touch of the therapist. The temperature of water during the therapy is very important. Cooler water causes stress and has a negative effect on the efficiency of the therapy. The patient cannot relax in the cool water, his/her body becomes tense and it is difficult for the therapist to perform the procedure. Our test results showed a statistically significant improvement in the quality of sleep. The participants of our study also reported the reduced pain and improved physical activity. The participants' mood and communication with friends and family improved due to the reduced degree of depression. All these factors had a positive effect on the quality of life, which the patients rated higher than before the study. The results of our study do not contradict to the findings of Plecash A.R. According to Plecash A.R. one of the most effective treatment methods for Multiple Sclerosis patients is physical therapy. Regular exercise and physical activity are important at all stages of life to prevent illness, to feel good and to support one's quality of life. The role of physical therapy varies throughout the illness course. In addition, in general interventions are aimed to help the patient achieve and maintain their optimal functional independence. The Multiple Sclerosis researches showed that physical activity is effective to improve the physical health, especially the strength of the muscles and the gait, as well as emotional health, especially by reducing fatigue [63].

CONCLUSIONS

A statistically significant decrease in secondary fatigue was observed from the patients' self-rated data before and after the study. After the study, the total score of the Sleep Quality Index reduced with a statistical significance thus indicating the improved quality of sleep of the study participants.

The evaluation of the depression degree before and after the study showed a statistically significant decrease in depression degree: the severity of depression in all study participants changed to a milder form or disappeared. A statistically significant improvement of all indicators of the quality of life were observed in the progress of the ten-week study.

PRACTICAL RECOMMENDATIONS

The results of our study have shown that the WATSU therapy can be very effective in improving the quality of life of people with multiple sclerosis by reducing pain and fatigue, and by facilitating patients' mobility. Therefore, the method could be effectively applied in rehabilitation practice to improve the motor functions and psycho-emotional condition of MS patients.

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