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RESEARCH ARTICLE

EFFECTS OF PASSIVE AQUATIC THERAPY WATSU (WATER SHIATSU) IN PREGNANCY: RESULTS OF A CONTROLLED PILOT STUDY

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ABSTRACT

Background: WATSU (Water Shiatsu) are therapeutic treatment methods comprising passive stretches, active movements and massage techniques administered in 35°C warm water. Pregnant women need safe methods to reduce pain, stress, and fatigue. Therefore, we conducted a pilot study evaluating the effects of WATSU on pregnancy-related complaints in pregnant women. **Methods:** Nine healthy pregnant women at gestational week ≥ 28 were included in an intervention group (receiving WATSU) and compared to eight women in a passive control group (receiving no treatment). WATSU was performed on days 1 and 4 of the study. Outcomes include physiological and psychometric as well as qualitative data. Participants in the control group completed questionnaires only. **Results:** WATSU was found to significantly lower participants' levels of stress and pain and to improve their mental health-related quality of life and mood. In comparison to the passive control group, participants in the intervention group reported reduction in perceived stress from day 1 to day 8 ($P=0.036$, Cohen's $f=0.57$). Qualitative data indicate that WATSU was appreciated as enjoyable and deeply relaxing. No negative side effects were reported. **Conclusion:** Our findings support the notion that WATSU yields therapeutic benefits for pregnant women and warrant further research.

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INTRODUCTION

Several aquatic therapy researchers propose that, during pregnancy, maternal mental and physical wellbeing are transferred to the fetus resulting in epigenomic changes for a lifetime (1– 5). Moreover, maternal effect, attitude and beliefs during pregnancy at any trimester are also predictive factors for postnatal depressive symptoms (6), which in turn are likely to affect the child's wellbeing. WATSU (an acronym based on Water and shiatsu) is an aquatic body-based method (7) using buoyancy, passive stretches, and myofascial release techniques that is administered in warm water. WATSU has been described as applicable during pregnancy (8), where it is claimed to reduce pregnancy related low back pain, SI joint pain, pubic joint pain and to relax hypertonic muscles including those of the uterus, to improve the overall sense of wellbeing, and to strengthen the relationship of the mother with her unborn child. The increased clinical application of WATSU in multi-disciplinary treatment settings such as rehabilitation and wellness facilities indicates a growing acceptance of this aquatic body-based complementary therapeutic intervention; it is used as a component in treatment settings focusing on posttraumatic stress disorder, and anxiety (9, 10, 11), chronic pain and fibromyalgia (11, 12), stress related illnesses (13), depression (11, 14), and sexual dysfunction (15, 16, 17). Taking into consideration, physiological effects on the cardiopulmonary system due to physical exposure to hydrostatic pressure, certain cardiac conditions, for example, chronic heart failure (18) and respiratory impairments such as cystic fibrosis (19) can be regarded as potential indications for this treatment.

However, several clinical trials investigating therapeutic effects of WATSU are still very few. As per our knowledge, till date, only three small scale trials on WATSU have been published (12, 16, 20). Active aquatic therapy techniques during pregnancy is considered to be favorable and safe (24, 25), while the effects of passive aquatic therapy techniques during pregnancy so far have not been the subject of scientific research. Therefore, we designed a pilot study to examine safety of WATSU as well as to address a broad range of issues to identify those pursuing future research, that is, potential therapeutic effects of WATSU on self-reported stress, pregnancy-related pain, mood, quality of life and amount of amniotic fluid. Additionally, qualitative data reflecting participants' perception of the intervention were assessed.

METHODS

Study Design: We conducted a controlled clinical pilot study at the Department of Obstetrics and Gynaecology at Aqua Centric investigating the effects of WATSU on pregnant women with pregnancy-related complaints at week ≥ 28 of gestation. Potential participants were provided with complete written and verbal information about the study and written consent was obtained prior to participation. Interested healthy women with a singleton pregnancy in the 28th or greater week of gestation underwent a telephone-screening. Exclusion criteria were any pathological findings during pregnancy, neurological deficits resulting from low back pain, WATSU-treatment within the past four weeks, and poor language

skills. Women reporting a breech presentation were included in the study if they did not plan external cervical version. Participants in the intervention group received standardized WATSU treatments at days 1 and 4 after WATSU treatment and on day 8. Participants were allocated to the passive control group if they refused to undergo intervention, or if they lived too far from the site of the intervention. If allocated to the passive control group, participants did receive neither WATSU nor any alternative treatment on the part of the study. All participants were free to maintain additional medical and/or therapeutic treatments during the study. Assessments took place on days 1 (baseline), 4, and 8 (follow-up). Participants were not financially compensated; participants in the control group were offered a free WATSU-treatment after study completion.

Intervention: WATSU treatments were performed by aquatic therapists. Each participant in the intervention group received a standardized WATSU-treatment on the first and fourth day of study participation, administered by the same therapist. Sessions lasted 60 minutes in a therapy pool located at Aqua Centric private limited pool filled with 35°C fresh water. The administered motion sequence “WATSU-Transition-Flow” (9) was adapted for women in their pregnancy and was followed closely. During the WATSU-treatment, participants’ abdomens were not touched. Deviations from the standardized treatment protocol were documented for each treatment session. Each session started with a brief verbal description of the procedure and ended with the opportunity for the client to give verbal feedback. During WATSU treatment, participants rested in a supine position, predominantly being supported at the back of their head and at their pelvis or knees by their therapist’s forearms. To unburden participants’ lower backs, floating devices were attached to their thighs. In the course of treatment, therapist and participant were in continuous physical contact with distances varying from a full arm’s length to cradled positions. The participant was slowly floated back and forth through the water in large circular patterns, generated by the therapist’s rotation around her/his own body axis. Following the session, participants were asked to drink 500 mL of water to compensate for body fluid loss due to increased diuresis (26, 27).

Outcome Measures: Sociodemographic data (age, height, weight, prior deliveries, week of gestation, and fetal position) and baseline data (perceived stress, pain, and quality of life) were assessed on day 1.

Baseline Assessment on Day 1 and Follow-Up Assessment on Day 8 Included the Perceived Stress Scale (PSS) and the Medical Outcomes Study 36-Item Short Form Health Survey (SF-36). Both questionnaires referred to participants’ self-reported condition in the past week.

Perceived Stress Scale (PSS): This 10-item questionnaire assesses participants’ cognitive evaluation of stress perception (28). Participants estimate how unpredictable, uncontrollable, and overloaded they perceive their lives to be on a 5-point scale ranging from “never” to “very often.” Good internal consistency is reported (Cronbach’s $\alpha = 0.87$) (29).

Medical Outcomes Study 36-Item Short Form Health Survey (SF-36): Health-related quality of life was assessed using a questionnaire comprising eight subscales: “physical functioning,” “role physical,” “bodily pain,” “role emotional,” “vitality,” “mental health,” “general health perception,” and “social functioning.” The SF-36 shows good internal consistencies with Cronbach’s $\alpha > 0.70$ in all subscales except “general health perception” (0.57) and “social functioning” (0.69) (30).

Psychometric Assessment on Days 1 and 4 Immediately before and after WATSU Treatments Visual Analogue Scales (VAS) assessing pain and stress and the Multidimensional Mood Questionnaire (MDMQ). These instruments referred to participants’ self-reported actual condition.

Stress and Pain Related Visual Analogue Scales (VAS). Visual Analogue Scales have a length of 100 mm, with 0 mm indicating no stress, respectively, no pain at all, and 100 mm representing maximal perception of stress, respectively, high pain. VAS scales proved to be valid and reliable (31, 32). Multidimensional Mood Questionnaire (MDMQ). The validated mood questionnaire with good internal consistencies (Cronbach’s between 0.73 and 0.89) assesses treatment-related changes in self-reported mood. It consists of a list of 12 adjectives that address current mood, calmness, and alertness (e.g., “happy,” “nervous,” and “awake”) ranked on a 5-point scale ranging from “not at all” to “very much.” The sum score ranges from 12 to 60 with higher scores indicating better mood (33).

Qualitative Outcome Measures: Participants in the intervention group were asked to fill out a qualitative questionnaire answering the following questions right after their second 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?” and “Do you have any suggestions for improvement?”

Data Analysis: Quantitative data were analyzed based on intention to treat. For missing data, the last value was carried forward. Quantitative data analyses were conducted using SPSS (version 19) statistical software package for Windows (IBM SPSS Statistics, Somers, NY, USA). Prior to statistical analyses, all data were tested for homogeneity of variance and normal distribution employing Levene and Kolmogorov-Smirnov tests. Between-group differences in sociodemographic characteristics, baseline values, and mean change values of outcome measures from baseline to follow-up assessment were analyzed using Mann-Whitney test for continuous data, while the evaluation of categorical data was based on visual inspection. Analyses of outcome measures within the intervention group were performed using Wilcoxon test. All analyses were two tailed, with the level of significance set at with 95% confidence interval. All continuous data are presented as mean value \pm standard deviation (SD). For the purpose of international comparability, outcome values of the SF-36 main scales were standardized by employing the weighting coefficient for US population and transformed into percentages (30). Effect size parameters (d) were derived from partial values and were reported based on the following effect size conventions: $d = 0.10$ = small, $d = 0.25$ = medium, and $d = 0.40$ = large (36). Narrative questionnaire data reflecting participants’ experiences with WATSU were systematically organized into analytical units, which were inductively classified into thematic subcategories and main categories according to the Mayring-triangulation-model (37). All generated categories were quantitatively described by indicating frequency of mentions in absolute and percentage values. Qualitative data reflecting context-related information were narratively summarized.

RESULTS

Seventeen of the 26 recruited women were included with nine participants being allocated to the intervention group and eight to the control group. Three participants in the control group were lost to follow-up. Finally, data from all seventeen study participants were analyzed according to the intention-to-treat principle. No adverse events were reported, and all of the WATSU-treatments were carried out as scheduled. Group and baseline characteristics did not differ significantly between the two study groups. Study participants were between 27 and 40 years of age and 69% of them were primiparous.

Quantitative Results

As presented, analyses within the intervention group revealed a significant improvement in mental health-related quality of life (SF-36: d) and a significant reduction in perceived stress (PSS: d) from baseline to follow-up assessment.

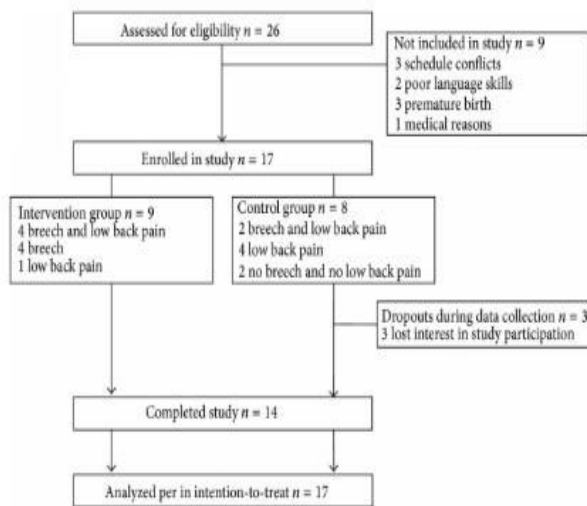


Figure 1 consort flow diagram

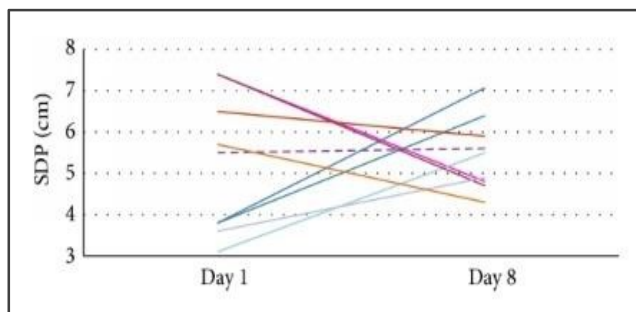


Figure 2 Changes in the amount of amniotic fluid

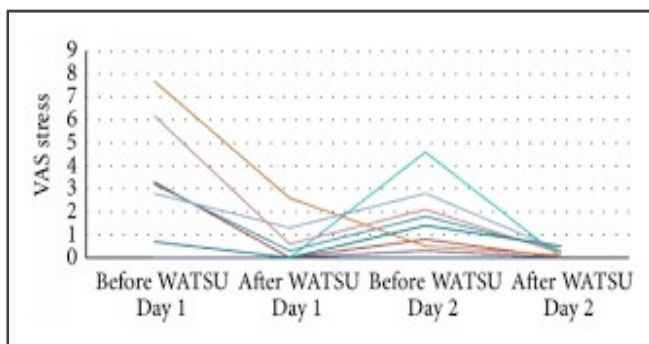


Figure 3 Changes in perceived stress measured by VAS (Visual Analog Scale)

Analyses of medium-term changes in psychometric outcome measures within the intervention group. Analyses examining immediate effects of the two WATSU-treatments on participants' level of stress, pain, and mood consistently showed significant improvements in all outcome. Analyses of short-term changes in psychometric outcome measures within the intervention group. Changes in perceived stress measured by VAS (Visual Analog Scale; higher scores indicate increased stress, maximum score: 10). In contrast to the control group, participants in the intervention group reported significant decreases in perceived stress from day 1 to day 8 whereas no significant group differences were found for mean change values of SF-36 main scales. Short term effects of WATSU on stress, pain, and mood that were observed within the intervention group were also present in comparison to the control group. Due to optimal tonus of the uterus, four of the participants in the intervention group underwent cephalic version on day 9 of the study, with two attempts being successful. Of the eight foetuses in breech position in the intervention group, one spontaneously presented in cephalic position

on day 4. The two foetuses in breech in the control group remained in this position up to day 8 and one attempt for cephalic version failed.

Qualitative Results

A total of 57 comments reflecting subjective perceptions of the intervention were obtained from nine participants and were classified into main and subcategories. Results from analysis of qualitative data reflecting participants' perception of the intervention. Relaxation was most frequently reported as a major overall impression of the WATSU-treatments but was also distinctly mentioned by participants as an effect of treatment on their physical and mental states. Participants shared observations regarding body-related changes, for example, regained mobility and flexibility and decreased pain. They empathically reflected on how this experience might be perceived by their unborn children and on the nature of jointly experiencing an aquatic environment. Some of the women expressed gratitude for having been able to participate in the study and emphasized their impressions of having learned something about relaxation and surrendering that they perceived as a very helpful preparation for the upcoming birth. The intervention was referred to using positive descriptions such as "like a dream." Mind-related aspects represented the majority (26.3%) of comments. All participants described WATSU as an experience they had fully enjoyed, and the opportunity to suggest improvements was instead used to emphasize satisfaction by six participants. The four stated suggestions concerning technical and process-related aspects of the study involved timing issues such as delays in ultrasound examination as well as a lack of clarity about where to hand in feedback-forms. One person mentioned a WATSU treatment-specific observation (having felt uncomfortable with hip flexion), and one woman suggested starting WATSU treatment earlier in pregnancy.

DISCUSSION

Active aquatic therapies have been studied extensively and proven to be beneficial for pregnant women (25). Since passive hydrotherapy was not yet scientifically investigated with respect to its effects on pregnant women, we conducted a controlled pilot study to investigate the effects of WATSU on women in their ≥ 28 th week of gestation, as well as to evaluate which of the investigated parameters would be suitable outcome measurements for further large-scale clinical trials. As the impacts of maternal stress on unborn children can be severe (1–5), interventions that effectively reduce stress during pregnancy are desirable. Significant short-term improvements measured with VAS and MDMQ and significant medium-term decreases in perceived stress (PSS), with respective increases in the mental component of SF-36 main scale, indicate an optimized situation concerning the emotional wellbeing of the participants in the intervention group. Components of WATSU including gentle touch are believed to act in a stress reducing manner (40, 41). 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 (42). During immersion, patients experience decreased heart rates (18) 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 (43, 44). 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—analogue to bypassing water—that has been observed to activate emotional brain areas (45, 46). Short-term effects on pain were significant in our study (see Tables 3 and 5). This is of clinical relevance as epidemiological data indicate that two out of three pregnant women suffer pregnancy-related low back pain (22). During pregnancy, it is recommended to refrain from analgesics (47), and thus non-pharmacologic alternatives are desirable. Prior research found that merely being immersed in warm water decreases pain (44, 48). Passive hydrotherapy offers in addition unique possibilities of

weightless mobilization in a quasi gravity-free environment with reduced joint compression forces. This in turn creates turbulence and currents causing a sensory overflow, which is regarded as one mechanism in pain reduction following immersion (17). 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 (49). Perceived relaxation and pleasantness seem to be among the most obvious features of passive hydrotherapy and were mentioned by participants in this study with great consistency in qualitative feedback. Interestingly, WATSU, despite its massage character, was attributed to mental effects most frequently. It appears to have been perceived by our participants rather as a mind-body intervention, particularly suitable to inviting serenity as well as broadened awareness and mindfulness. Comments suggest usefulness of WATSU during pregnancy, for example, potentially supporting women in overcoming ambivalence with respect to their motherhood.

Limitations

The following limitations of this study need to be addressed. The original study design implied ultrasound examinations on the control group as well to assess the natural course of changes in the amount of amniotic fluid (50). In fact, only one woman in the control group agreed to follow this procedure. Also blinding of any party but the statistician is a challenge. A small sample size may lead to the identification of large, clinically relevant effects; however, selection bias and overly weighted outliers cannot be ruled out.

Hence, caution is appropriate when interpreting the present results. Due to the small sample size, we were not able to definitively interpret all of our findings scientifically, particularly the impact of WATSU treatment on spontaneous versions of children in breech position. In qualitative data, saturation might have been achieved in terms of categories; however, since several aspects were mentioned only once, there might have been additional new statements concerning the experience, had more individuals participated in the survey.

CONCLUSION

To our knowledge, this is the first clinical study investigating the effects of passive hydrotherapy during pregnancy. It demonstrates significant benefits of WATSU with respect to stress, pain, mood, and mental health-related quality of life. The treatment was described as very agreeable by the participants and appears to be a safe intervention. These findings support the notion that WATSU yields therapeutic benefits for pregnant women; therefore, its integration into interdisciplinary treatment approaches should be considered. On the basis of this pilot study, larger trials should be established to further investigate and confirm the impact of the observed effects. Conflict of Interests The other authors declare that they have no conflict of interests regarding the publication of this paper.

Rewritten Content: Effects of Passive Aquatic therapy WATSU (Water Shiatsu) in being pregnant: outcomes of a managed Pilot examine

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