Physiother. Res. Int. 14(2): 128–136 (2009)
Published online 30 September 2008 in Wiley InterScience
(www.interscience.wiley.com) **DOI**: 10.1002/pri.421

Watsu approach for improving spasticity and ambulatory function in hemiparetic patients with stroke

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ABSTRACT **Background and Purpose**. *This study reports the effect of Watsu as rehabilitation method for hemiparetic patients with stroke.* **Method**. *Watsu consisted of 40 treatment sessions for 8 weeks, delivered underwater or at water surface level, it applied in three patients. Outcome measures included tools for assessing spasticity and ambulatory function.* **Results**. *All patients showed decreased scores in the TAS and RVGA after Watsu application.* **Conclusions**. *Watsu was helpful in controlling spasticity and improving ambulatory function of the patients with hemiparesis. Copyright © 2008 John Wiley & Sons, Ltd.*

Key words: ambulation, spasticity, Watsu

INTRODUCTION

Loss and impairment of ambulation ability is one of the major devastating outcomes of post-stroke hemiparesis (Francisco and Boake, 2003). The restoration and improvement of ambulation ability in the hemiparetic patient with stroke constitutes a major treatment goal of physical therapy (Laufer et al., 2001). The loss of the ambulation ability may be the result of hemiparetic paralysis and the loss of voluntary muscle control (Sahrmann and Norton, 1997). These problems are further aggravated by spasticity (Lamontagne et al., 2001). Regaining the ambulation ability depends not only on restoring normal motor function, but also on managing spasticity.

Spasticity is defined as an increase in muscle tone and resistance to movement caused by lesions in upper motor neurons (Bogey et al., 2004). It also causes pain, muscle stiffness, contracture, limb deformity and problems with ambulation (Fheodoroff et al., 2001). Spasticity may be a factor that negatively impacts the effects of rehabilitation in people with hemiparesis (Hesse et al., 2001). There are many

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treatment methods to control spasticity, including medication, Botox, the positioning of spastic limbs, assist devices and plaster cast, as well as physical modalities such as diathermy, ultrasonic therapy, electric stimulus therapy and electromyogram biofeedback (Rösche, 2002). However, the roles and efficacy of these current remedies, for the most part, have been poorly researched, and diverse treatment methods have been under study (Watanabe, 2004).

Watsu is a new therapeutic technique that incorporates static passive stretches and a structured sequence and of passive limb, head and neck movements or patterns performed at water surface level. Watsu employs the Zen Shiatsu theories of meridians and energy flow in submerged condition. The name 'Watsu' means 'water shiatsu'. Watsu was created in the early 1980s by Herold Dull, a Shiatsu practitioner, when he applied the moves and stretches of Zen Shiatsu to people floating in warm water of 95°F (Vargas, 2004). Warm water is beneficial to release muscle tone and to reach deep physical and mental relaxation (Vargas, 2004). Once the patient is relaxed, physical flexibility and mobility are more easily achieved in the submerged condition with weightlessness. The patient is cradled and supported by the practitioner while the various movement sequences are carried out at water surface level. In this way, Watsu may be beneficial for patients with movement disorder.

Treatment in submerged condition has commonly been used to improve physical symptoms of patients with chronic musculoskeletal problems such as rheumatic diseases, osteoarthritis and chronic low back pain (Lineker et al, 2000). However, submerged rehabilitation, especially Wastu, in patients with neurological deficits has received little attention, despite having many potential advantages for patients. Accordingly, the present study attempted to identify specific effects of Watsu performed in submerged condition on spasticity and ambulation in patients with hemiparesis caused by stroke.

CASE DESCRIPTION

This study included three patients with hemiparesis caused by stroke. Selection criterion for participation were as follows: 1) first attack, 2) no significant cognitive deficit — more than 25 points in the Mini-Mental Status Examination (Folstein et al., 1975), 3) 10 points or more in the tone assessment scale (TAS) and 4) independent walking, either with or without ambulation aids. Subjects who complained of severe pain or had orthopedic problems were excluded from the study. All patients were able to walk independently with ankle foot orthorsis (AFO) and/or cane. Patient 1 showed independent ambulation with the eyes open and on normal floor surface, but loss of balance when turning the opposite direction of his body and when standing on a foam surface. Patient 2 used a wheelchair for community ambulation due to decreased walking endurance; however, he could walk short distances with the assistance of a cane. Patient 3 needed an AFO for ambulation due to ankle spasticity. The characteristics of the three participants are presented in Table 1.

MEASUREMENTS

Measurements were performed before the initiation and after the completion of Watsu session. We assessed spasticity and ambulation ability to determine the effect of the Watsu approach.

To assess the subjects' muscle tone, we used the TAS, which is composed of items assessing posture at rest, response to passive

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TABLE 1: General characteristics of subjects

Participant	*Sex*	*Age (years)*	*Affected side*	*Onset (months)*	*Stroke type*	*Functional level*
1	Female	62	Right	10	Hemorrhage in left middle cerebral artery	Independent walking with plastic leaf splint
2	Female	51	Left	8	Hemorrhage in the right internal capsule	Independent walking with quadri-cane
3	Male	49	Left	20	Infarction in right middle cerebral artery	Independent walking with ankle foot orthorsis and quadri-cane

movement and associated response to active movement attempt, and TAS is widely applicable because it can assess tone in muscles that are involved with a number of Joints (Barnes et al., 1999). The total score is ranged from 0 (no muscle tone) to 40 (severe muscle tone).

The Rivermead Visual Gait Assessment (RVGA) comprises two observations of the arms covering both swing and stance of gait, and 18 observations of the trunk and lower limb (11 observations during the stance phase and seven during the swing phase of gait). The RVGA is a 4-point scale to quantify the degree of abnormality for each of the component items. A total score can be calculated by summing the total numbers of deviation scores, ranging from 0 (normal gait) to 59 (grossly abnormal gait) (Lord et al., 1998). The RVGA is both a valid and sensitive measure of gait impairment in patients with neurological disease (Lord et al., 1998).

THERAPEUTIC INTERVENTION

The procedure for Watsu approach was described to patients prior to the initiation of the intervention, and consent was sought for each treatment session. Treatment using Watsu was carried out by a physiotherapist who had completed an 80-hour special course for Watsu application and had 3-years Watsu experience in the clinical setting. The therapeutic pool was 4.5×6 m, its depth could be adjusted between 1.2 m and 1.7 m, and the water temperature was 93.2°F. The air temperature of the pool room was 81°F, with 50% humidity.

The Watsu used in this study consisted of 11 basic components (Dull, 1997; Vargas, 2004), and the details of the Watsu are described in Table 2. In accordance with the Watsu method as recommended by Vargas (2004), the patient's support was mainly taken under back and head by physiotherapist's forearm. Patients were moved in flowing water with rhythmical motions, including intermittent gentle hydromassage and stretching. No conversation was had with the patient in order to facilitate deep relaxation in the Watsu sessions. The Watsu intervention consisted of a total of 40 sessions, averaging 40 minutes each, five times per week for 8 weeks.

TREATMENT OUTCOME

Figures 1 and 2 demonstrate the improvement with the intervention as measured by

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TABLE 2: Watsu approach used for the patients

Components	*Description*
Water breath dance	A deep breathing relaxation is performed. Facing each other, both the therapist and the patient hold both hands in standing posture with slight knee flexion in submerged state. Breathe in through the nose and out through the mouth slowly. Repetitions: 10 repetitions for 3 minutes
Head cradle	Putting head and neck of the patient on the cubital fossa of the left arm, the therapist brings the patient into a horizontal supine position. Repetitions: No
Open arm position	The therapist places the dorsum of the right hand on the patient's sacrum; the patient's body is allowed to float freely and the therapist performs a rocking movement side to side. Repetitions: 10 repetitions for 3 minutes
Accordion	The therapist swiftly moves the right forearm to the patient's popliteal fossa. The bilateral lower extremity flexion-extension pattern is executed. It is important for the therapist to match the passive knee-to-chest movement with the patient's breathing pattern. The patient exhales with knee flexion and inhales with knee extension. Repetitions: 15 repetitions for 3 minutes
Rotating accordion	The bilateral lower extremity rotational flexion-extension pattern is used. Adding up to the accordian technique, the patient's deep breathing pattern continues to be coordinated with rotation movements. It is critical to perform the component with the flow of water not being forced by the therapist. Repetitions: 15 repetitions for 5 minutes
Near leg rotation	This technique is carried out in the same way as Rotating accordion but only affected lower extremity is used. This not only increases hip and knee joint flexibility and mobility, but also guides dissociated movement in spastic lower extremity from trunk. Repetitions: 15 repetitions for 5 minutes
Capture	The therapist holds the patient's occipital and upper cervical region with one hand while the other hand holds the popliteal surface of the near knee. Repetitions: No
Arm-leg rock	After moving towards patient's head, the therapist performs contralateral passive stretches to the patient's shoulder flexors and adductors by one hand and to the hip extensors and adductors by the other hand alternately. Repetitions: 10 repetitions for 5 minutes
Twist	While maintaining hold on the patient's right knee with his left hand, the therapist places his right hand over the patient's right shoulder, and then, twists the upper and lower halves of the body in different directions. Unlike other components done in rhythmical flow of water, this technique is used in static position, directly transmitting rotation force to the trunk of the patient. Repetitions: 10 repetitions for 5 minutes
Knee head rock	An atlantoaxial and lumbosacral joint rotation is performed. The therapist supports the back of the patient's head with one hand while holding the knee at the popliteal surface with the other hand and rocks the patient back and forth. Repetitions: 10 repetitions for 5 minutes
Hip rock	Going back to top of patient's head, the therapist holds the patient's pelvis bilaterally with both hands. And then, the therapist begins to push lateral pelvis to the other side like seaweed movement, alternately. This movement includes transverse pelvic and sacroiliac joint rotation with lateral tilt. Repetitions: 10 repetitions for 5 minutes

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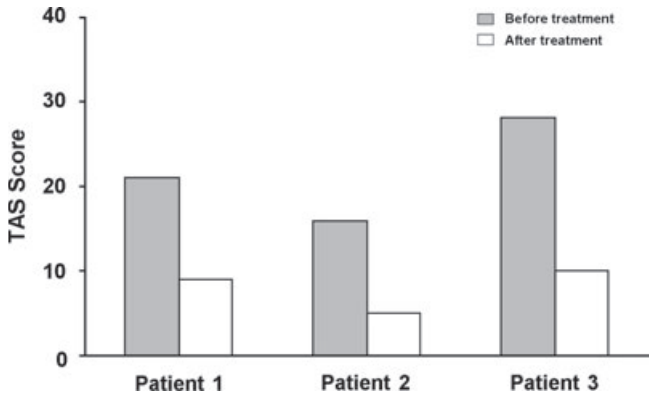

FIGURE 1: Changes in the Tone Assessment Scale (TAS) score for all three patients.

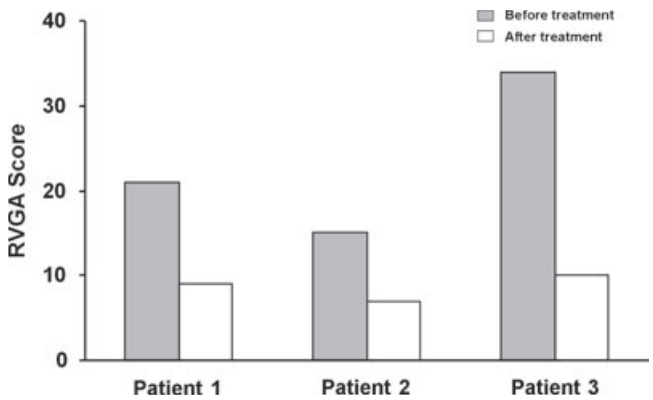

FIGURE 2: Changes in the Rivermead Visual Gait Assessment (RVGA) score for all three patients.

the TAS and RVGA scales. All patients showed decreased scores for spasticity and ambulation ability after all Watsu sessions. Subjective patient satisfaction associated with the Watsu application was high in after-intervention interview. Details in the TAS and RVGA scores for all patients were presented in Appendices 1 and 2.

DISCUSSION

This case study reports on the treatment procedure and outcome of hemiplegic patients with stroke. Improvements in spasticity and ambulatory function after the Watsu approach were shown. Although the findings of this case report are limited with only three-patient involvement, this evaluation is meaningful as the first trial to investigate the effect of the Watsu for managing physical symptoms of patients with hemiparesis.

Activities performed in the submerged condition can facilitate sensory/perceptual processing needed for more efficient coordination and special orientation (Vargas, 2004). Because of the supporting effect of water, it is often possible to facilitate more distally, therefore allowing

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more opportunity for the patient to be active proximally. Also treatment in the water can bring variety, challenge and motivation, especially in long-term rehabilitation. Despite having many advantages, Watsu is not considered as main conventional practice in clinical setting (Graham-Pole, 2001).

The primary objective of Watsu is to allow the body to drift into a deeper state of relaxation. Watsu has developed into a gentle form of body therapy combining elements of massage, joint mobilization, muscle stretching and dance. The rhythmic movement in the submerged condition has positive effects to facilitate relaxation, decrease pain, address abnormal muscle tone, ease muscle spasms, as well as encourage deep breathing and relaxation (Dull, 1997; Vargas, 2004). However, precautions are advised, particularly in the presence of osteoporosis, acute ligamentous instability, hypersensitivity to vestibular stimulation and potential of water in the ears (Dull, 1997).

The impairment of motor function limits independence and interferes with daily activities and the quality of life (Meythaler et al., 1997). It should be considered an important goal that patients with hemiparesis recover the walking ability and motor function (Francisco and Boake, 2003). Spasticity is influenced by the effort to maintain balance and to move against gravity. Exercising in water where the effect of gravity is different, may contribute to reductions in spasticity. This can be a starting point to develop appropriate sensory-motor experiences. The findings of this case study highlight the potential clinical effect of the Watsu in treatment of spasticity and ambulation of patients with stroke hemiparesis, which is supported by previous studies related to hydrotherapy (Zamparo and Pagliaro, 1998).

This case study is of course limited with respect to small samples and no control group. However, all three participants showed an improvement in TAS and RVGA. It may be considered clinical evidence of previous study that the reduction of spasticity may contribute to improve ambulatory function (Richards et al., 1995). The Watsu may be used to augment the effect of physical therapy in stroke patients who exhibit an unstable walking pattern. However, the Watsu process must be clearly understood to work in parallel with other therapies to provide an effective means to control spasticity and increase the efficacy of stroke treatment. Further studies with increased sample size and longer interventions are required to clearly determine the clinical benefits of the Watsu.

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APPENDIX 1: TONE ASSESSMENT SCALE SCORES FOR ALL THREE PATIENTS ASSESSED BEFORE/AFTER WATSU

Subjects	*Before-Watsu*			*After-Watsu*		
	1	*2*	*3*	*1*	*2*	*3*
Posturing at rest						
1. Is the hand resting on the leg?	1	1	1	0	0	0
2. Are the shoulders level?	1	1	1	0	0	0
3. Is the foot flat on the floor?	0	1	1	0	0	0
Response to passive movement						
4. Can you straighten the fingers with the forearm in midposition and the wrist extended?	2	2	4	1	1	2
5. Can you flex the hand to the mouth and then fully extend the elbow within 2 seconds?	3	2	4	1	0	2
6. Is the lower limb flexible and the knee easily extended in sitting?	2	1	3	1	0	1
7. Can you dorsiflex the foot from 20° to 10° of plantarflexion?	2	1	4	1	0	2
8. Can you passively flex the hip/knee to 90° and return to full extension within 2 seconds?	2	2	3	1	1	1
9. Can you flex the knee with the hip extended, to move the foot over the edge of the bed, without resistance?	3	2	3	1	1	1
Associated reaction						
10. Does the hand remain stationary on the leg as the subject elevates the opposite arm above the head?	2	1	2	1	0	1
11. Can the hand remain at trochanter level or lower on standing up?	2	1	1	1	1	0
12. Can the foot remain on the floor on standing?	1	1	1	1	1	0
Total score	21	16	28	9	5	10

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APPENDIX 2: RIVERMEAD VISUAL GAIT ASSESSMENT SCORES FOR ALL THREE PATIENTS ASSESSED BEFORE/AFTER WATSU

Subjects	*Before-Watsu*			*After-Watsu*		
	1	2	3	1	2	3
Upper limb position						
1. Shoulder	1	1	2	0	0	0
2. Elbow flexed	1	1	2	0	0	0
Stance Phase						
3. Trunk flexed/extended	1	0	1	0	0	0
4. Trunk side flexed	1	1	2	1	0	1
5. Trunk and pelvis: lateral displacement	1	0	2	1	0	0
6. Contralateral drop pelvis	1	1	2	1	1	1
7. Hip extension decreased	1	1	1	0	1	0
8. Hip extension decreased with backward rotation	0	0	1	0	0	0
9A. Knee flexion excessive at initial contact		1			0	
10A. Knee flexion excessive throughout range		1			1	
or						
9B. Knee extension excessive at initial contact	2		2	1		0
10B. Knee extension excessive throughout range	1		2	1		1
11A. Ankle in excess plantar flexion	1		2	0		1
or						
11B. Ankle in excess dorsi flexion		1			1	
12. Inversion excessive	1	1	2	0	0	1
13. Plantar flexion decreased at toe-off	2	0	2	1	0	1
Swing phase						
14. Trunk flexed	1	0	1	0	0	0
15. Trunk side flexed	1	1	2	1	1	1
16. Hike pelvis (elevation)	1	1	1	1	0	1
17. Backward rotation pelvis	1	1	1	0	0	0
18. Decreased hip flexion	1	1	2	0	1	1
19. Decreased knee flexion	1	1	2	1	1	0
20. Ankle in excess plantar flexion	1	1	2	0	0	1
Total score	21	15	34	9	7	10

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(Submitted February 2008; accepted July 2008)

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