Journal of Bodywork & Movement Therapies (2015) 19, 581–591

Available online at www.sciencedirect.com

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CASE REPORT

Yoga therapy in an individual with spinal cord injury: A case report

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Received 29 April 2014; received in revised form 28 July 2014; accepted 3 August 2014

KEYWORDS
Yoga;
Spinal cord injury;
Leisure;
Flexibility

Summary No known research addresses the effects of yoga in those with spinal cord injury (SCI), yet yoga has the potential to improve many impairments commonly associated with SCI. This case report documents the outcomes of a yoga program in an individual with an SCI. The participant was a 59-year-old male who sustained an incomplete C3–C6 SCI. He practiced Hatha yoga for 60-min sessions, twice per week for 12 weeks and despite neurological injury, was able to complete a yoga program with modifications. Improvements were noted in balance; endurance; flexibility; posture; muscle strength of the hip extensors, hip abductors and knee extensors; and in performance of functional goals. No changes were noted in gait velocity, satisfaction in performance of goals or in overall quality of life. The participant was able to practice yoga even though he used an assistive device to walk.

Background and purpose

The number of people with spinal cord injury (SCI) in the United States is estimated at 273,000 with 12,000 new cases annually. The largest number of SCIs result in incomplete tetraplegia (40.6%) and the estimated lifetime costs per person are approximately $3–4 million (National Spinal Cord Injury Statistical Center, 2013). Traumatic injury to the spinal cord can result in disruption of motor, sensory,

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http://dx.doi.org/10.1016/j.jbmt.2014.08.004
1360-8592/

and autonomic functions that ultimately affect balance, mobility and the ability to perform everyday activities (Scott et al., 2011). In addition, individuals with SCI are at increased risk for developing a number of secondary conditions such as muscle atrophy, muscle spasms, spasticity, limitations in flexibility, joint contractures, bone loss, chronic pain, fatigue and impairments in respiratory capacity (Scott et al., 2011; Field-Fote, 2009). These secondary conditions can further affect function and quality of life.

Conventional rehabilitation management of SCI includes splinting, flexibility exercises, strengthening exercises, balance training, task specific mobility training, upper extremity ergometry, functional electrical stimulation (FES), and FES cycling. While many conventional methods of SCI rehabilitation have been found to result in positive outcomes (Harvey et al., 2009; Gorassini et al., 2009; Ashe et al., 2010), they may not necessarily address all the biopsychosocial needs of an individual or the ongoing health maintenance training that is essential for prevention of secondary complications. Potentially, yoga addresses the limitations of the traditional therapy model that lacks the mind-body component (Bauer-Wu, 2006).

The sequence of Hatha yoga follows a series of static postures (*asanas*) and dynamic movements. The *asanas* are held anywhere from 1—2 s to 10 min or longer with a variable flow among sequences to accommodate the needs of the individual. The physical *asanas* are just one component of yoga therapy, since yoga also builds upon the foundation of breath work through diaphragmatic breathing, meditation, and mindful awareness of the body. The formal practice of controlling the breath (*pranayama*) actually lies at the heart of yoga practice resulting in muscular relaxation, and reduction of sympathetic nervous system arousal (Selvamurthy et al., 1998).

Most of the literature on yoga therapy has focused on orthopedic conditions. These studies have found increases in spinal mobility (Tekur et al., 2012), flexibility (Cowen and Adams, 2005), dynamic muscle strength (Cowen and Adams, 2005), health perception (Cowen and Adams, 2005), and quality of life (Michalsen et al., 2012). Yoga therapy reduces pain (Tekur et al., 2012; Michalsen et al., 2012), use of pain medication (Sherman et al., 2005), and disability (Michalsen et al., 2012). In the older adult population, yoga therapy has been shown to increase flexibility (Schmid et al., 2010), strength (Tatum et al., 2011), balance (Schmid et al., 2010; Tatum et al., 2011; Hakim et al., 2010; Tiedemann et al., 2013), and mobility (Tiedemann et al., 2013), as well as decrease fear of falling (Schmid et al., 2010). The literature in those with neurological conditions is limited though there are studies investigating the effects of yoga in those with stroke (Bastille and Gill-Body, 2004), multiple sclerosis (Oken et al., 2004), and Parkinson disease (Moriello et al., 2013). The results of these studies show that yoga practice can improve flexibility (Moriello et al., 2013), strength (Moriello et al., 2013), balance (Bastille and Gill-Body, 2004; Moriello et al., 2013), quality of life (Moriello et al., 2013) and fatigue (Oken et al., 2004).

There is no known research available addressing the effects of yoga in those with SCI, yet yoga has the potential to address many of the limitations commonly seen in those with SCI. The introduction of passive and assisted yoga poses can potentially improve balance, flexibility, and strength as well as reduce tone, pain and fatigue, which may positively influence execution of everyday activities and quality of life. It also has the potential to become an activity that can be continued following discharge from traditional rehabilitation. This is important since the recovery process can take years and activity is important to stimulate plasticity in the neurological system (Raineteau and Schwab, 2001).

The first objective of this prospective case report was to design a yoga program for individuals with SCI. The second objective was to document outcomes of a yoga program in someone with an incomplete SCI.

Methods

The participant was a fifty-nine-year-old male who sustained a C3—C6 ASIA D SCI in a central cord pattern 32 months prior to the program. His past medical history included a right total hip replacement the year before the accident, cervical osteoarthritis, lumbar spinal stenosis and right shoulder adhesive capsulitis following the accident. Human subject's approval was obtained from The Sage College's Institutional Review Board and he gave written consent to participate.

Examination

The participant was 6 foot tall and weighed 192 pounds. Cognition, memory, and communication skills were intact. Sharp/dull sensation was intact throughout except in the right S1 and S2 dermatomes. Proprioception was also intact. He was unable to stand greater than 10 min due to low back pain. Global limitations in muscle strength were noted, with deficits greater on the right side. A slight increase in muscle tone was noted, manifested by minimal resistance at the end range of motion in bilateral gluteal, hip adductor, quadricep, and plantarflexor muscles. Clonus was absent at rest, though it was occasionally elicited when fatigued while walking.

At initial evaluation, the participant scored a 39/56 on the Berg Balance Scale (BBS), indicating he was at high risk for falls. He ambulated with a gait velocity of 77.2 cm/s using a wheeled walker and was able to walk 229.5 m during the Six Minute Walk Test (6 MWT). He was only able to reach −4.3 cm during the Sit and Reach Test and during Apley's Back Scratch Test, his middle fingers were separated by 15.0 inches with the right upper extremity reaching overhead and 13.9 inches with the left upper extremity reaching overhead. Hamstring muscle length was 65° bilaterally. While standing, he exhibited increased weight bearing on the left lower extremity, external rotation of the right leg, rounded shoulders, a moderately forward head position that was shifted toward the left, and increased cervical lordosis, thoracic kyphosis, and lumbar lordosis.

He was independent in bed mobility and sit to stand transfers from standard surfaces. He was able to ambulate community distances with a wheeled walker though he often used a power wheelchair outdoors. He could ambulate with Lofstrand crutches independently indoors for