The Effects of Massage on Quality of Life and Foot Drop for a Person with Multiple Sclerosis: A Case Study

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Abstract

Multiple Sclerosis (MS) is a chronic, inflammatory disease in which the immune system causes demyelination of nerves within the central nervous system. According to the World Health Organization (WHO) and Statistics Canada, Canada has one of the highest rates of MS in the world: 2.9% of the population are affected (Gilmour, 2018). Fatigue, pain, weakness, spasticity, and paresthesia are common symptoms associated with MS (Rattray, 2005). Studies have shown that massage therapy is a safe and beneficial intervention to manage symptoms of pain and fatigue and improve quality of life for people living with MS. (Backus, 2016; Fjeldstad, 2014) Building existing massage therapy models that address core concerns affecting activities of daily life, this research includes treatments to address drop foot.

The patient's primary concerns were fatigue and drop foot. Diagnosed with MS in 2000, the patient remained largely asymptomatic until 2011 following a fall. Symptoms, including drop foot, developed at that time. Management techniques have progressed, and include, 'wall walking', use of a cane/walking poles, an Ankle and Foot Orthotic (AFO), and a walker. The patient employs multiple interventions: diet, supplements, and remedial exercise programs to manage symptoms. This research is meant to complement existing practices.

The intervention used was a standardized massage therapy treatment approximately once a week for 12 treatments. The patient was assessed using the Multiple Sclerosis Quality of Life Inventory (MSQLI) (for the quality of life issues such as fatigue and pain) and measurement of dorsiflexion (as an indication of the degree of severity of drop foot). The results show improved overall mental and physical health with a significant reduction of fatigue and improvement in perceived deficits. The patient's ability to dorsiflex her right ankle improved significantly.

The results of this case study are consistent with previous results indicating massage therapy has positive benefits on a patient's levels of fatigue and quality of life. The study also indicates a positive impact on a patient's ability to manage drop foot. For ambulatory patients, this may mean the difference between tripping and not tripping. Further research, specifically focused on a treatment protocol for drop foot, with a larger sample set, will determine the efficacy of this approach.

Keywords: multiple sclerosis, therapeutic massage, fatigue, gait, foot drop, symptom management

Introduction

Multiple sclerosis (MS) is a neuromuscular degenerative disorder that results from inflammation and demyelination within the central nervous system (CNS). Research suggests the cause of MS may be an immune response to a protein in the CNS. The lesions or scleroses that result from this activity often occur on the optic nerve, periventricular white matter, brain stem, cerebellum, and spinal cord white matter (Hannon, 1312). Symptoms include optic neuritis, paresthesia, spasticity, pain, abnormal gait, and fatigue.

Fatigue is one of the most common complaints for people living with MS (Hannon 1313). The current study was completed to determine if massage therapy is an appropriate complementary modality to treat symptoms, including fatigue, in patients with MS. Earlier studies linked self-efficacy - the belief that one can successfully cope with challenges and attain certain goals - to the improvement of physical activity and quality of life (Fjeldstat). Subsequent pilot studies have reported that a standardized massage therapy routine is a safe and beneficial treatment for individuals living with MS that produces a positive impact on fatigue, pain, the perception of health and quality of life (Backus, Bisht). No research has been completed to determine if a targeted intervention can address a specific symptom.

The case study, based on previous research, suggests that massage therapy can improve symptoms of fatigue, quality of life, and self-efficacy. The goal will be to determine if the addition of a focused treatment protocol will result in a positive outcome for symptoms of drop foot.

Methods

Patient Information

The patient is a 46-year old female. She was first diagnosed with multiple sclerosis following an episode of optic neuritis in 2000. She was primarily asymptomatic although had experienced headaches and migraines since the age of fifteen, sometimes once a day for weeks followed by a period of relief for some weeks. In 2008, she experienced a compression fracture in her thoracic spine and a bilateral rib fracture. Her first balance attack occurred in 2011 and drop foot symptoms followed. In 2012, she began physiotherapy but was unable to sustain a prescribed exercise program due to the demands of daily life. In 2014, the MS Clinic in Kingston confirmed her diagnosis of 2nd stage progressive MS. An occupational therapist suggested the use of a cane. Since that time, she has also used an Ankle Foot Orthotic (AFO), walking poles, and a walker. At the time of intake (November 2017), the patient had abandoned the use of the AFO, employed a cane when outside the house and used the walls for stability while at home. Recent developments, in the few months before intake, included bilateral paresthesia and intermittent pain on palpation distal to the knee and spasticity both distal to right hip and bilateral calves. The patient indicated that her primary concern was fatigue and her secondary concern was drop foot and its impact on gait. Her goal is to walk without a cane.

Concerning conventional health care, the patient has expressed frustration, distrust of healthcare providers, and indicated that, at times, she felt 'hopeless.' Participation in focus groups and baseline assessment studies, however, have provided benefits such as a feeling of community, increased positive attitude, and improved body awareness. Additionally, the patient has participated in a number of complementary medical interventions including naturopathic medicine, mobility-related exercise programs, online MS-focused physiotherapy programs. At the time of intake, her symptom management strategies included diet, supplements (Vitamins D, K, Mg, B complex, B1 (megadose), Q10, curcuminatrix, iron, fish oil), a low dose of naltrexone to help with sleep, and regular exercise. She has expressed that she is able to make her health a priority and describes her primary partner and immediate family as very supportive, although normal family stresses also impact her health.

An initial assessment to determine baseline measurements was completed in November 2017. The patient's gait was altered by the use of a cane in her left hand as an assistive device for drop foot on the right. Right side toe drag and circumduction at the hip were evident. A postural assessment indicated an elevated right shoulder. Palpation indicated no edema at spine, knee, or ankle joints. No paresthesia was reported, however pain was indicated at the right tibialis anterior distal insertion. Passive Range of Motion was completed bilaterally on coxal, tibiofemoral, and talocrural joints. All results were within normal limits. Active Range of Motion was completed bilaterally on coxal, tibiofemoral, and talocrural joints. All movements on the left side were within normal limits. Reduced ROM on the right hand side was observed in: tibiofemoral flexion, internal and external flexion at talocrural joint. There was no observable dorsiflexion at the right talocrural joint. An assessment of the tibialis anterior determined a baseline muscle grading of one (1): evidence of slight contractility but no joint motion (Magee, 39). The initial assessment of dorsiflexion measured 2mm. Myotome testing at tibialis anterior and extensor hallucis indicated possible lesions at L4. Dermatome testing at L4 and L5 was negative.

Assessment Measures (Outcomes)

Based on the patient interview, the primary and secondary outcomes are to decrease fatigue and drop foot. The assessment plan includes both qualitative and quantitative measurements over a five-month period of time. Based on previous research, the Multiple Sclerosis Quality of Life Inventory Manual (MSQLI) will be used (Backus, Rivoto). Orthopaedic testing includes: Active Range of Motion and Passive Range of Motion (Rattray, 696) Muscle Test Grading for Tibialis Anterior (Magee, 39). Active Range of Motion for dorsiflexion is measured directly using gridded paper. Neurological testing includes myotome L4 and testing of dermatomes L4 and L5.

Quality of Life

The MSQLI is a comprehensive questionnaire that has been developed specifically for patients with MS and subdivided to include: health status, fatigue, pain, sexual satisfaction, bladder control, bowel control, visual impairment, perceived deficits, mental health, and social support (Rivoto). This self-administered survey takes approximately 45 minutes to complete. The raw scores of each section of the survey are scored, according to MSQLI instructions, to determine the final representation of data. This case study, based on the patient interview, paid particular attention to:

- Health Status Questionnaire (SF-36): this 36 item questionnaire, modified for MS patients, provides an overall score for physical and mental health components of a patient's health status;
- Modified Fatigue Impact Scale (MFIS): this 21 item questionnaire provides an overall indication of fatigue as well as a breakdown to indicate physical, cognitive, and psychosocial aspects;
- Perceived Deficits Questionnaire (PDQ): this 20 item questionnaire, designed specifically for MS patients, provides a broad view of the patient's perceived cognitive impairment in the areas of attention/concentration, retrospective memory, prospective memory, and planning and organization.

This survey was administered five times: a few weeks before, at the start, middle, and end, and a few weeks following treatment. The raw scores of each questionnaire are transformed to provide standardized results.

Orthopaedic

Drop foot, in people living with MS, most frequently results from neuromuscular degeneration. In this case study, several neurological and orthopedic tests were performed throughout the course of treatment.

Active Range of Motion (AROM) can indicate the severity of foot drop in the patient and directly measured using a grid. With the grid on the wall, the patient was seated adjacent to the wall with both hip and knee joints at 90 degrees. The patient was instructed to dorsiflex maximally, and the distance marked on the grid. This measurement was taken at the initial visit, at each treatment, and a few weeks following treatment.

Passive Range of Motion (PROM) was completed at the initial and final assessments and

at each session where it was integrated as part of the treatment.

Resisted Range of Motion (RROM) for dorsiflexion was tested at the initial and final assessments. Muscle grading was assessed as follows:

- 5+/Normal: complete ROM against gravity and maximal resistance;
- 4/Good: complete ROM against gravity and some resistance;
- 3+/Fair+: complete ROM against gravity and minimal resistance;
- 3/Fair: complete ROM against gravity;
- 3-/Fair-: some, but not complete ROM against gravity;
- 2+/Poor+: initiates motion against gravity;
- 2/Poor: complete ROM with gravity eliminated;
- 2-/Poor-: initiates motion if gravity is eliminated;
- 1/Trace: evidence of slight contractility but no joint motion;
- 0/Zero: no contraction palpable. (Magee 39)

Neurological

Tibialis anterior is the primary muscle responsible for dorsiflexion at the talocrural joint; it is innervated by the deep peroneal nerve. Myotome L4 was tested at the initial and final assessments by asking the patient to dorsiflex at the talocrural joint. Because this test involves the action potential propagated at the nerve root, it is important that the isometric contraction be held for a period of time greater than 5 seconds.

Dermatome L4 and L5 were tested at the initial and final assessments.

Practitioner Descriptors

Colleen Johnson is a 2nd-year student at Trillium College in Kingston, Ontario. All assessment and treatment took place in the clinic space at Trillium College between November 2017 and May 2018. Assessments and treatments were supervised by Ryan Rutter, a Registered Massage Therapist.

Mr. Rutter graduated from the Canadian College of Massage and Hydrotherapy in 2008 and has been a practicing massage therapist for the past ten years. He is a member in good standing of the College of Massage Therapists of Ontario.

Therapeutic Intervention

The primary and secondary concerns for this patient with MS were fatigue and drop foot respectively. The Backus study concludes that a standardized massage therapy routine produces a positive impact on fatigue and pain, perception of health and quality of life in individuals with multiple sclerosis. However, there was no significant evidence produced to support a reduction, nor an increase, of localized symptoms such as spasticity, with massage. No particular intervention was used to address spasticity and, further, testing was done with a frequency that may not have heeded accurate results. (Backus) The foundation of the intervention used in this case study was built on Backus' model; General Swedish Massage (GSM) techniques were used

to promote relaxation.[1]

To address drop foot specifically, the work of Trevor Wicken, B.Sc (Sports Medicine), M.Sc. (Exercise Physiology), was included in both treatment and remedial exercise. Trevor has 16 years of experience working with athletes at all levels and has created a series of online resources for people living with MS. Some treatment protocols were adapted from the Wicken's series. Additionally, GSM techniques described in Rattray were used to address muscular and proprioceptive issues associated with drop foot specifically.

A neurological impairment may stem from lesions on the central nervous system at L4 and L5 where the peroneal nerve initiates. Stroking and tapotement were used to encourage proprioception in this area and to tibialis anterior specifically. Stripping at the laminar groove promotes flexibility and reduces the possibility of a nerve root impingement.

Muscular involvement presented as expected: a weak tibialis anterior and hypertonic gastrocnemius on the right side. Deeper stripping techniques were used on the posterior leg, and tapotement was used on the tibialis anterior. Additionally, joint mobilization was performed at the talocrural and tarsal joints.

The following 60-minute, weekly protocol was delivered 12 times. Some weeks were missed because of patient or therapist scheduling issues. The entire course of treatment took place over 15 weeks.

Treatment Protocol

Deep Diaphragmatic Breathing: throughout
L.Back: 7 min
Effleurage (iliac crest to upper trap): 3 passes
Palmer kneading (iliac crest to superior scapula): 3 passes
Finger kneading (A/C jt. to C-spine and levator scap): 3 passes
Alternate Thumb Kneading (slow) Laminar groove: 3 passes
Alternate Thumb Kneading (slow) L5 junction @ iliac crest to lateral QL: 3 passes
Effleurage (iliac crest to upper trap): 1 pass

R.Back: 7 min
Effleurage (iliac crest to upper trap): 3 passes
Palmer kneading (iliac crest to superior scapula): 3 passes
Finger kneading (A/C jt. to C-spine and levator scap): 3 passes
Alternate Thumb Kneading (slow) Laminar groove: 3 passes
Alternate Thumb Kneading (slow) L5 junction @ iliac crest to lateral QL: 3 passes
Effleurage (iliac crest to upper trap): 1 pass

L.Post leg: 10 min
Knuckle kneading glutes: 2 passes
Effleurage (ischial tuberosity to knee): 2 passes

[1] At the time of treatment development, no training in advanced techniques had been delivered.

Knuckle kneading hamstring (O to I): 2 passes
Effleurage (knee to ischial tuberosity): 2 passes
Effleurage (knee to the calcaneal tendon): 2 passes
Palmer kneading gastrocnemius and soleus (O to I): 2 passes
Knuckle stripping peroneals: 2 passes
Effleurage (calcaneal tendon to knee): 2 passes
Stroking (lumbar, greater trochanter, knee, peroneals to ankle): 1 pass

R.Post leg: 15 min
Knuckle kneading glutes: 3 passes
Effleurage (ischial tuberosity to knee): 3 passes
Knuckle kneading hamstring (O to I): 3 passes
Effleurage (knee to ischial tuberosity): 3 passes
Effleurage (knee to the calcaneal tendon): 3 passes
Palmer kneading gastrocnemius and soleus (O to I): 3 passes
Knuckle stripping peroneals: 3 passes
Effleurage (calcaneal tendon to knee): 3 passes
Stroking (lumbar, greater trochanter, knee, peroneals to ankle): 3 passes

R. Ant. leg: 10 min
Compressions (greater trochanter to knee): 1 pass
Effleurage (knee to ankle): 3 passes
Tapotement tibialis anterior: 60 seconds
Passive dorsiflexion of foot: 5 count x 5
Circular movement of the foot at ankle joint: 3 each dir.
Stretch toes into extension: 5 count x 5
Stroking (knee to toes): 3 passes

L. Ant. leg: 5 min
Compressions (greater trochanter to knee): 1 pass
Effleurage (knee to ankle): 3 passes
Tapotement tibialis anterior: 30 seconds
Passive dorsiflexion of foot: 5 count x 2
Circular movement of the foot at ankle joint: 3 each dir.
Stretch toes into extension: 5 count x 2
Stroking (knee to toes): 1 pass

The following remedial exercises (Wicken) were added to the protocol beginning at the halfway point. This addition was made based on the patient's progress to investigate if remedial exercise had any impact on progress.

Tapping Tib Anterior and Dorsiflex foot (min. 9:30 of Drop Foot Pt. 2)

Hold for 2 sec., 10x Heel/toe tap (min 18:14 of Drop Foot Pt. 2) 10x. Hold leg up if needed, only move slightly.

At each treatment session, informed consent and special consent for gluteal work were received.

Results

Table 1 summarizes the change in both physical and mental health status.

Table 1: Multiple Sclerosis Quality of Life Inventory: SF-36 Results

Health Status Questionnaire (SF-36)					
	Prior to Tx	Start of Tx	Midpoint of Tx	End of Tx	Following Tx
	2017-11-30	**2018-01-25**	**2018-03-05**	**2018-05-02**	**2018-05-23**
PHYSICAL COMPONENT SCALE (PCS)	16	15	27	27	26
MENTAL COMPONENT SCALE (MCS)	54	56	65	69	64

Table 2 provides an indication of physical, cognitive, and psychosocial fatigue.

Table 2: Multiple Sclerosis Quality of Life Inventory: MFIS Results

Modified Fatigue Impact Scale (MFIS)					
	Prior to Tx	Start of Tx	Midpoint of Tx	End of Tx	Following Tx
	2017-11-30	**2018-01-25**	**2018-03-05**	**2018-05-02**	**2018-05-23**
Physical Subscale	32	28	18	17	19
Cognitive Subscale	24	20	11	11	11
Psychosocial Subscale	7	6	3	3	3
Total MFIS Score	**63**	**54**	**32**	**31**	**33**

Table 3 provides the results from the perceived deficits questionnaire.

Table 3: Multiple Sclerosis Quality of Life Inventory: PDQ Results

Perceived Deficits Questionnaire (PDQ)					
	Prior to Tx	Start of Tx	Midpoint of Tx	End of Tx	Following Tx
	2017-11-30	**2018-01-25**	**2018-03-05**	**2018-05-02**	**2018-05-23**
Attention/Concentration Subscale	0	11	6	6	6
Retrospective Memory Subscale	2	7	1	3	0
Prospective Memory Subscale	3	7	1	1	3
Planning/Organization Subscale	5	13	6	6	6
Total	40	38	14	16	15

Figure 1 shows the measurement for dorsiflexion (in mm) on Active Range of Motion. The first and last readings were taken a few weeks before and a few weeks after treatment. Measurements were taken at every treatment and prior to the treatment protocol.

Figure 1: Measured Dorsiflexion in Right Talocrural Joint (mm)

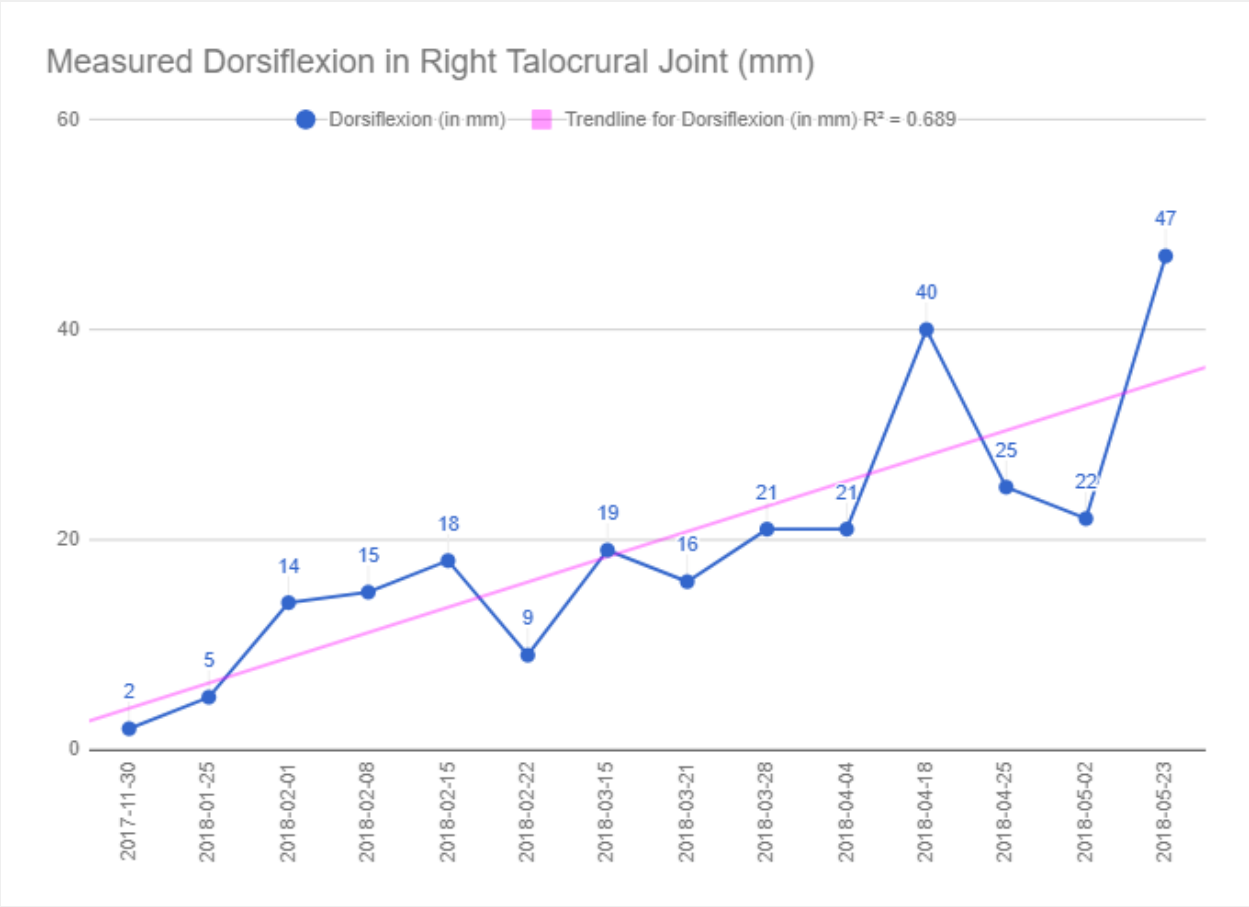

Table 4 provides the results from the perceived deficits questionnaire.

Table 4: Orthopaedic and Neurological Testing Results

Orthopaedic and Neurological Testing at Right Talocrural Joint		
	2017-11-30	**2018-05-23**
PROM	Within normal limits in all directions	Within normal limits in all directions
AROM	Reduced internal, external rotation. No visible dorsiflexion.	All within normal limits except reduced dorsiflexion when compared to left talocrural joint.
RROM	Weak internal and external rotation. No dorsiflexion.	Weak dorsiflexion.
Tibialis Anterior Strength	1/Trace: evidence of slight contractility but no joint motion.	4/Good: complete ROM against gravity and some resistance.
Myotome L4	Positive for neuromuscular impairment.	Negative for neuromuscular impairment.
Dermatome L4, L5	Within normal limits.	Within normal limits.

The patient tolerated the treatment well and expressed an overall positive assessment of the intervention; however, subjective interviews conducted at each treatment suggested both positive and negative results.

Following the 1st and 2nd treatment, the patient indicated feeling more fatigued than usual; at the 7th treatment, she described being ‘levelled’ by the previous week’s treatment. Over the course of the intervention, she described herself as ‘less fatigued’ and ‘able to recover more quickly’ from any episodes of fatigue she did experience.

Over the course of the first six treatments, the patient described a decline in headache episodes and severity from ‘severe, four-day-long, migraine’ in week 2 to ‘mild irritation’ in week 6. No headaches were reported over the course of the last six treatments.

When the intervention began, the patient was using a cane. By the 5th treatment, the patient had adopted the use of a walker. The patient reported walking 6,000 and 8,000 steps respectively, using a walker, on the two days prior to treatment 6.

At treatment 7, the patient reported the “worst spasticity every experienced” for the previous four days. The discomfort fluctuated between “pain” and “annoying” and disturbed sleep patterns. She reported, the following week, which the treatment had “drastically reduced” these symptoms in the first 24 hours and by 48 hours the symptoms had disappeared.

The patient reported intermittent performance of home care exercises throughout the second half of the intervention.

Discussion

As hypothesized, massage therapy improved the overall physical and mental health, decreased fatigue and perceived deficits, and improved drop foot by increasing dorsiflexion.

The improved quality of life for an MS patient treated with massage is consistent with previous findings (Backus, Bisht). Treatment to the back, anterior and posterior lower limbs used GSM techniques that promote relaxation: effleurage and light petrissage techniques such as palmer kneading and stroking. Subjective feedback throughout treatment suggested positive results: an improvement in the physical component of health (16 to 27) and mental component of health (54 to 69). A reduction in the number and frequency of headaches reported may be a tangible measure of this improvement. The patient reported that she was both 'less fatigued' and 'better able to manage and recover from fatigue' which is consistent with the measured Modified Fatigue Impact Scale (63 to 31). These findings complement, and contribute to, a significant reduction in the patient's Perceived Deficits (40 to 16). It is reasonable to suggest that increased relaxation reduces fatigue and improves self-efficacy. Simply put, the patient has more energy to cope with the challenges of daily living and address specific concerns such as drop foot.

GSM techniques that promoted stimulation, relaxation, and proprioception were used to address drop foot. These included: stroking (L4, L5 to the plantar surface of the foot), tapotement on tibialis anterior, circumduction and passive dorsiflexion at talocrural joint, and passive extension tarsometatarsal joints. Palmer kneading on the gastrocnemius and soleus muscles reduced limitations due to hypertonic antagonist muscle groups. Home care included tapping of tibialis anterior, dorsiflexion, and a heel-toe touch. The resulting measures of dorsiflexion yielded improvement and a positive trendline (2mm to 47mm). The patient reports less foot drop and toe drag although expressed that factors such as hip circumduction, clothing, and weather continue to impede progress. She continues to use a walker but expressed 'confidence' that this was the 'first step to improving' and felt that 'improvement was possible.'

The intervention had a strong foundation and an easily measured target: improved dorsiflexion. Twelve interventions performed by a single therapist allowed for assessment over a longer period and consistent delivery of the treatment protocol. There were limitations. The weekly treatment schedule was inconsistent due to patient and therapist scheduling conflicts. The student therapist, at the time of initial treatment, had not received any advanced training so the scope of treatment, for the duration of treatment, was limited to GSM techniques. To isolate a single objective, tibialis anterior was the focus of this treatment protocol. This focus excludes extensor digitorum longus and extensor hallucis longus that both contribute to dorsiflexion. The treatment does not address any knee or hip involvement in the compensating gait associated with drop foot.

This case study suggests that targeted intervention to improve dorsiflexion can make a positive impact on the symptom of drop foot in a patient living with MS. More research should be conducted to examine both the breadth and depth of these findings. A larger pilot study will help determine the reliability of these results. The positive outcomes reported here are a first step to helping patients living with MS cope with challenges of daily life.

References

Backus, D., Manella, C., Bender, A., & Sweatman, M. (2016, 12). Impact of Massage Therapy on Fatigue, Pain, and Spasticity in People with Multiple Sclerosis: A Pilot Study. *International Journal of Therapeutic Massage & Bodywork: Research, Education, & Practice, 9*(4), 4. doi:10.3822/ijtmb.v9i4.327

Bisht, B., Darling, W. G., Grossmann, R. E., Shivapour, E. T., Lutgendorf, S. K., Snetselaar, L. G., Wahls, T. L. (2014, 05). A Multimodal Intervention for Patients with Secondary Progressive Multiple Sclerosis: Feasibility and Effect on Fatigue. *The Journal of Alternative and Complementary Medicine, 20*(5), 347-355. doi:10.1089/acm.2013.0188

Fjeldstad, G. P. (2014). Self-efficacy, Physical Activity and QOL in People with MS. *Journal of Neurology & Neurophysiology, 05*(02). doi:10.4172/2155-9562.1000194

Gilmour, H., Ramage-Morin, P., Wong, S. (2018). Multiple sclerosis: Prevalence and impact. https://www.statcan.gc.ca/pub/82-003-x/2018001/article/54902-eng.htm

Hannon, R., Porth, C. (2017). Porth Pathophysiology: Concepts of Altered Health States (2nd Canadian Edition). Philadelphia, United States: Wolters Kluwer.

Magee, D., (2014). Orthopedic Physical Assessment: 6th 3d.. St. Louis, United States: Saunders.

Rattray, F., Ludwig, L., (2005). Clinical Massage Therapy: Understanding, Assessing and Treating over 70 Conditions. Elora, Canada: Talus Incorporated.

Rivoto, P., Fischer, J., et al. (1997). Multiple Sclerosis Quality of Life Inventory: A User's Manual. New York, United States: National Multiple Sclerosis Society.

Wicken, T. (2017). Mobility Exercises for Managing Foot Drop. https://themsgym.mykajabi.com/p/ms-gym-exercise-guides