CASE STUDIES PACKET

Orthopedic Pain, Injury & Surgery

Neurological Injuries & Diseases

Fitness & Performance

neufit

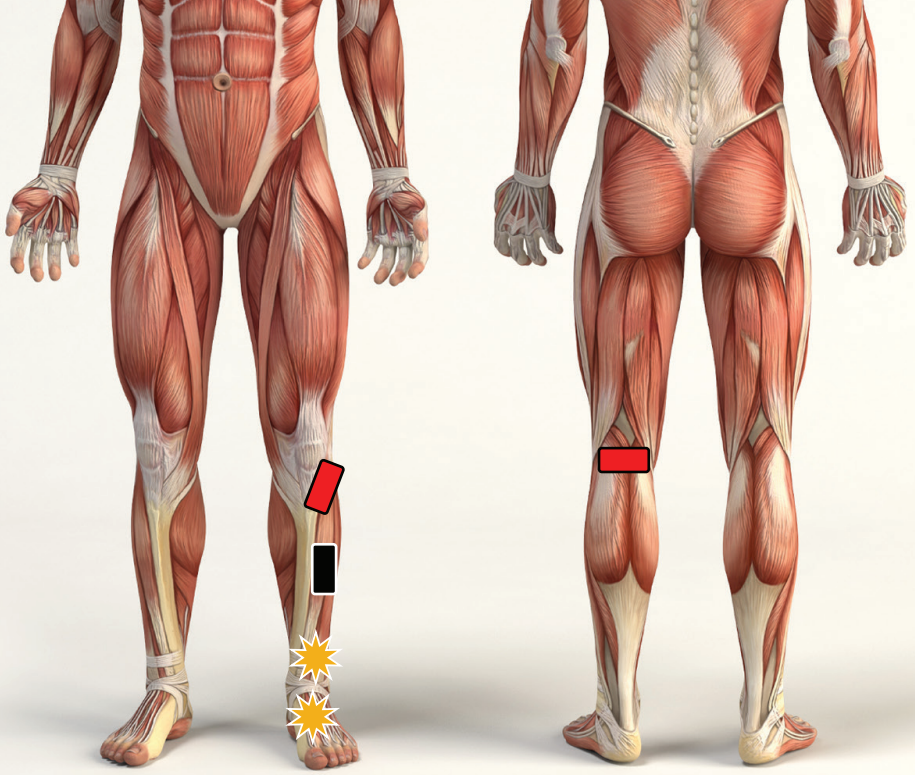
TABLE OF CONTENTS

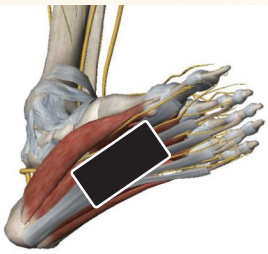
CASE STUDY

32 Year Old Female with Displaced Tri-Malleolar Fracture of Left Ankle and Fracture/Dislocation of Tarsometatarsal Joint s/p ORIF - Treated with the NEUBIE Using Micro-Currents, Manual Physical Therapy and Therapeutic Exercise

PERFORMED AT:
MATRX Health & Fitness;
by Krystina Miller, PT, DPT, ATP;
Macomb, Michigan using
the NeuFit Method.

KEY WORDS:
ankle fracture, ankle pain, ankle/foot edema, muscle activation, neuromuscular re-education





TREATMENT AND OUTCOME

To treat the patient's ankle/foot edema, pain, and weakness following ORIF of the distal tibia, fibula, and first and second metatarsal/ phalange, we used the NEUBIE NMES device with a combination of manual techniques and movement exercises to manage edema, promote healing, and improve range of motion (ROM), strength, and mobility. During each session, manual edema massage was performed with frequency specific micro-currents (FSM); manual muscle activation was performed on weak muscles of the left leg (including tibialis anterior, gastrocnemius, and quadriceps); followed by muscle specific exercises performed concurrent with stimulation from the NEUBIE device (lower leg focused). Patient returned to work after 4 sessions (less than 2 months post-injury) and needed 12 sessions for return to unsupported gait and stair management without pain and with normalization of gait pattern.

PATIENT INFORMATION/DIAGNOSIS

32-year-old female who sustained a closed, displaced tri-malleolar fracture of left ankle and fracture/dislocation of tarsometatarsal joint (also on the left). She presented to physical therapy for evaluation 18 days after an open reduction internal fixation (ORIF) surgery. She presented using bilateral axillary crutches in a bivalve cast on non-weight bearing orders.

Her primary complaints were pain and swelling (L foot and ankle), decreased sensation to touch throughout medial and dorsal aspects of her foot and proximal ankle; and hyper-sensitivity to light touch at the dorsal aspect of all metatarsal phalangeal (MTP) joints. Pain was limiting her daily activities whenever she was in a dependent position longer than one minute. She was on medical leave from her job as an acute care occupational therapist where she is normally standing/walking for 6-8 hours per day.

CLINICAL FINDINGS

PROCESS: Manual Muscle Testing (MMT) & scan, AROM and PROM assessment, edema measurements

FINDINGS:

- **Weaknesses:** unable to complete full ROM in gravity-eliminated positioning for all planes of ankle motion and could not coordinate an ankle circle in either a clockwise or counterclockwise direction, unable to flex or extend lateral three digits, cramping of L hamstrings and gastrocnemius during strength test
- **Scan:** Hot spots found at L proximal gastrocnemius, L plantar arch, L tibialis anterior (proximal and distal)
- **Edema:** approximately 3 cm edema at bi-malleolar and figure 8 measurements, approximately 1 cm edema at metatarsal heads (compared to RLE)

ASSESSMENT: Gross muscle weakness throughout the L lower extremity (foot and ankle as well as quadriceps and hamstrings) were expected, given acute post-surgical weight-bearing restrictions and ROM limitations due to casting. However, findings also indicated post-surgical peroneal and sural nerve dysesthesia. If sensory signals are not being received for feedback during movement, there is an increased risk of further injury during post-surgical rehabilitation. Additionally, cramping was noted in the hamstrings and gastrocnemius during strength testing; both play important roles in lower leg biomechanics during gait as well lower leg stabilization

over the ankle. If these muscles are not functioning properly, ankle stability is compromised, and problems may surface above and below in the biomechanical chain. Limited ankle range of motion is essential for normal loading and push-off during gait. When range is limited following surgical fixation (or continues due to pain) abnormal ankle arthrokinematics eventually create motor pattern substitutions in the proximal biomechanical chain. Maximizing ROM and pain management need to be addressed early to reduce the risk of long-standing gait abnormalities.

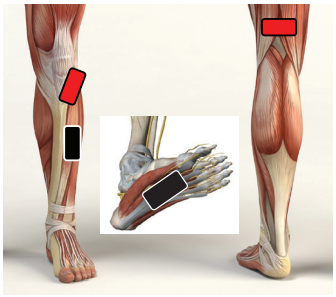
TREATMENT: manual edema massage and muscle activations to weak muscles in the lower leg followed by ankle DF, PF, inversion, and eversion AROM with NEUBIE stimulation at hot spots (proximal gastrocnemius, plantar surface of metatarsal heads, proximal and distal tibialis anterior)

PATIENT REPORT AFTER INITIAL EVALUATION: Patient was shocked at the improvement in her ease of movement with coordination of ankle circles and new movement achieved in the flexion and extension of her third and fourth digits at the end of the session. The following day, she sent a message and video to her therapist demonstrating full ankle circles and states she was able to tolerate 4 hours with her L leg in a dependent position without an increase in pain or swelling.

DETAILED TREATMENT, TIMELINE, AND OUTCOME

FREQUENCY: 1x/ week for 13 weeks (total of 12 sessions, missed one week due to a holiday)

TECHNIQUES USED IN FOLLOW UP SESSIONS: Continued with edema massage using FSM and ended sessions with KT tape for ongoing ankle edema management between sessions. Brief activation work on weak muscle groups at onset of each session. Primary pad placements involved ipsilateral anterior tib (proximal and distal), gastroc/soleus, quadriceps, hamstrings, plantar arch of foot while performing open chain ankle circles, 4-way ankle strengthening, toe yoga, and hamstrings curls. She was cleared for weight bearing and resistive exercise after 4 weeks and we progressed to closed chain strengthening of the same muscle groups, progressive single leg stance, and rocker/BAPS board balance and coordination exercises with the same pad placements (500 Hz for all, and progressed to 250, 160, and then 75 Hz for anterior tib and gastrocnemius strengthening). Also worked on end range isometrics, step ups/overs to progressive step heights, multi-directional lunges, and balance pad standing balance with various electrode pad placements. Patient returned to work after 5 weeks. She was traveling over an hour to our clinic but had committed to an intensive home program to reach treatment progression goals. Proximal LE muscle strengthening, pre-gait strengthening exercises, and self-mobilization were progressed to her home program after week 4.



PAD PLACEMENT

Channel 1: (Red) proximal gastroc
(Black) plantar surface of metatarsal heads
Channel 2: (Red) proximal tibialis anterior
(Black) distal tibialis anterior

RESULTS AFTER ALL TREATMENT COMPLETED: Objectively, she demonstrated improvement in all muscle groups including strength through full ROM. After 2 sessions, her pain and swelling with dependent positioning had reduced, and she was able to return to select standing activities. At her 4-week progress assessment, we measured a 50% reduction in swelling compared to RLE and AROM that had progressed to her normal limits (as compared to RLE). She was able to return to work within 5 weeks (6 weeks earlier than expected by the

SWELLING WITH CAST REMOVAL

1 WEEK LATER (FOLLOWING 1 TREATMENT)

physician), and she resumed all daily activities including childcare, farm animal feeding and care, stair climbing, and gait over unlevel surfaces with an ASO (ankle stabilizing orthosis) within 8 weeks. She was able to resume without a device or brace by 12 weeks. By the end of 12-weeks, her strength within her new ROM was a 4/5, but it was pain-free. She was unable to commit to ongoing sessions to progress strength and reactive balance training due to work and child-care responsibilities. At a 1-month follow-up call, she notes return to all prior activities without restriction or pain, occasional "ankle swelling" with prolonged walking over unlevel surfaces, and ongoing "tightness in the front of the ankle" when descending stairs using a reciprocal gait pattern.

DISCUSSION: Patient's outcomes were positive. Determining the effect of the NEUBIE on muscle strengthening is difficult because the patient was unable to commit to the recommended treatment frequency. She was completing most of her strengthening at home. The prescribed home program and treatment performed was similar to traditional physical therapy progressions after tri-malleolar fracture. However, the length of time needed for progression to full weight-bearing status and prior level of function was significantly reduced.

PATIENT PERSPECTIVE: At her 8-week follow-up with the surgeon, she notes her surgeon noted her progress "in the top 5% of how most people do after just a tri-malleolar fracture, let alone a Lisfranc on top of it". As a therapist, she was aware of how important early rehabilitation was to her function, but she was shocked by the speed of recovery. She was constantly trying to move her toes while casted and was performing available motion at the ankle as soon as she was progressed to a bi-valved cast. However, she was impressed at the almost instantaneous improvement in active motion during her first sessions on the NEUBIE. She reports, "the biggest difference maker for me was the edema and pain management from the NEUBIE. It is really what allowed me to get moving."

CASE STUDY

24-Year-Old NFL Running Back With ACL/MCL Reconstruction And Meniscus Tear Repair

PERFORMED AT:
In-Home, Self-Administered With Virtual Neubie® Instruction From Accelerate ACL Trainers using the NeuFit Method.

DIAGNOSIS:
Rupture of the anterior cruciate ligament (ACL), medial collateral ligament (MCL), and damage to the medial meniscus.

KEY WORDS:
ACL Reconstruction, Range Of Motion, Neuromuscular Re-Education

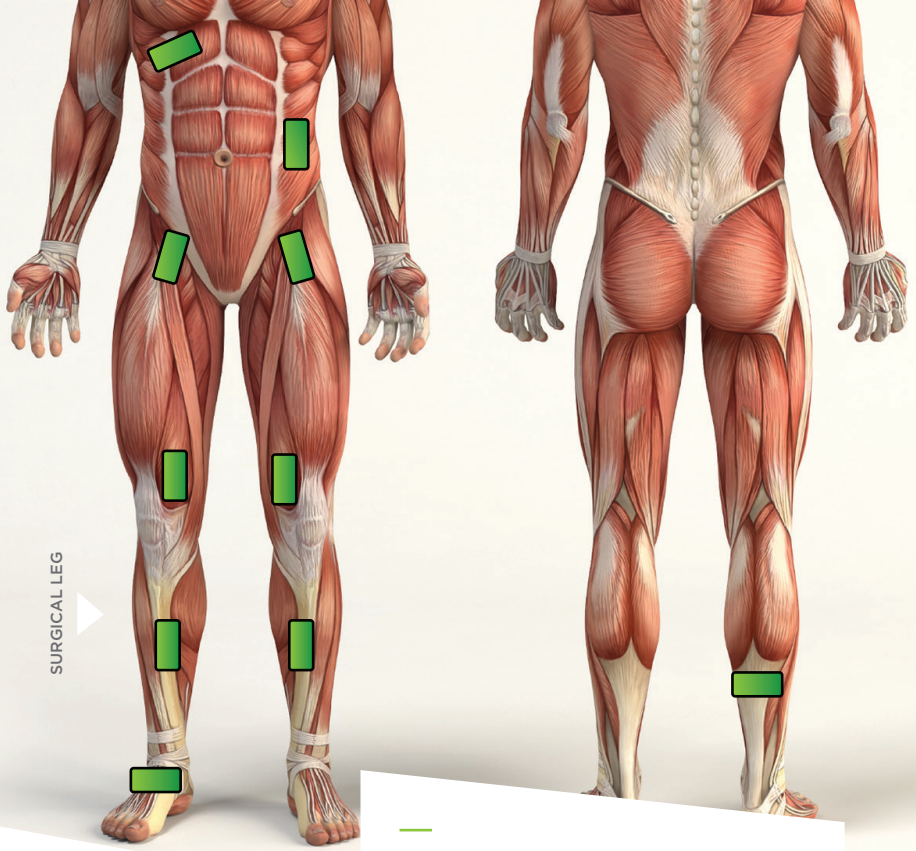


FIGURE 1 – *Mapping is conducted utilizing the Neubie® by moving electricity-conducting pads around on the skin. When the pad is moved over an area that is limiting movement or muscle function, the brain and nervous system try to protect against the signal, which can feel especially intense for the client, similar to a trigger point. The areas identified for this particular client are highlighted above in green.*

OVERVIEW

Dr. Neal ElAttrache is the Head Team Physician for the Los Angeles Dodgers and Los Angeles Rams, and is frequently recognized throughout the United States as a top sports medicine specialist. He is highly sought after by professional athletes for ACL reconstruction surgery, and has performed the surgery on athletes such as Tom Brady, Joe Burrow, and Ronald Acuña Jr.

During recovery from ACL surgery, Dr. ElAttrache utilizes a proprietary assessment to measure progress. The assessment utilizes a series of strength, range of motion, and functional movement tests to determine a player's progress. The results of each test are scored and summed to calculate the patient's total score, and the maximum score is 50.

Seven months after surgery and one week prior to beginning work with Accelerate ACL, the client highlighted in this case study scored a 20/50 on the test, indicating that his recovery wasbehind schedule. The client's training team reported feeling as if they

were doing everything possible to drive an efficient recovery, but that they were starting to feel anxious about the results.

The client performed an initial training session one week later through Accelerate ACL's virtual training platform. Afterwards, he reported feeling more relaxed in the calves and quadriceps. As a result, knee flexion and extension increased significantly and discomfort in the back of the knee decreased from a 6/10 to a 0/10. For the first time since before the injury, the client successfully performed a single leg, 24" box jump without feeling any instability, weakness or hesitation.

After 7 weeks of work with the Accelerate ACL team, the client returned to Dr. ElAttrache for a follow-up assessment. In that short time span, his score on the proprietary assessment had increased from a 20/50 to 46/50 (Figure 2), placing him in the 95th percentile of all patients and putting his recovery back on track for an efficient return to the football field.

As part of the recovery process, frequency specific microcurrent (FSM) protocols were utilized across the surgically repaired knee. FSM is a technique by which low-levels of direct current electrical stimulation are applied to the body in an attempt to improve symptoms.

ACCELERATE ACL PROGRAM & THE NEUBIE®

The most significant challenges with recovery from ACL reconstruction are related to biomechanical and neuromuscular changes that occur after the injury. These changes can cause compensatory movement patterns to develop that lead to long term changes, such as decreased muscle output and increased stiffness.

Therefore, the Accelerate ACL Program combines structured workouts with a powered muscle stimulator called the Neubie® to re-educate muscles and improve biomechanical and neuromuscular deficiencies.

The client highlighted in this case study completed a combination of virtual and in-person training sessions with the Accelerate ACL team 1-2x/week for 4 months in preparation for the upcoming 2021 NFL season. Self-administered training and recovery sessions were recommended daily in conjunction with the virtual and in-person consultation.

Each Accelerate ACL training session began using the Neubie® to conduct the NeuFit® Mapping Process. Mapping is used to identify areas where the nervous system is limiting movement or muscle function, and is conducted by moving electricity-conducting pads around on the skin. When the pad is moved over an area that is limiting movement or muscle function, the brain and nervous system try to protect against the signal, which can feel especially intense for the client, similar to a trigger point[1]. The areas identified for this particular client are highlighted in Figure 1.

The client was then guided through structured workouts while stimulating the areas identified during mapping with the Neubie®. As these areas were stimulated at higher and higher intensities, it became more difficult for

1 – *Salpeter, G 2021, The NeuFit Method: Unleash the Power of the Nervous System for Faster Healing and Optimal Performance, 1st edn, Lioncrest Publishing, pp. 41.*

ACL RECOVERY SCORE IMPROVEMENTS

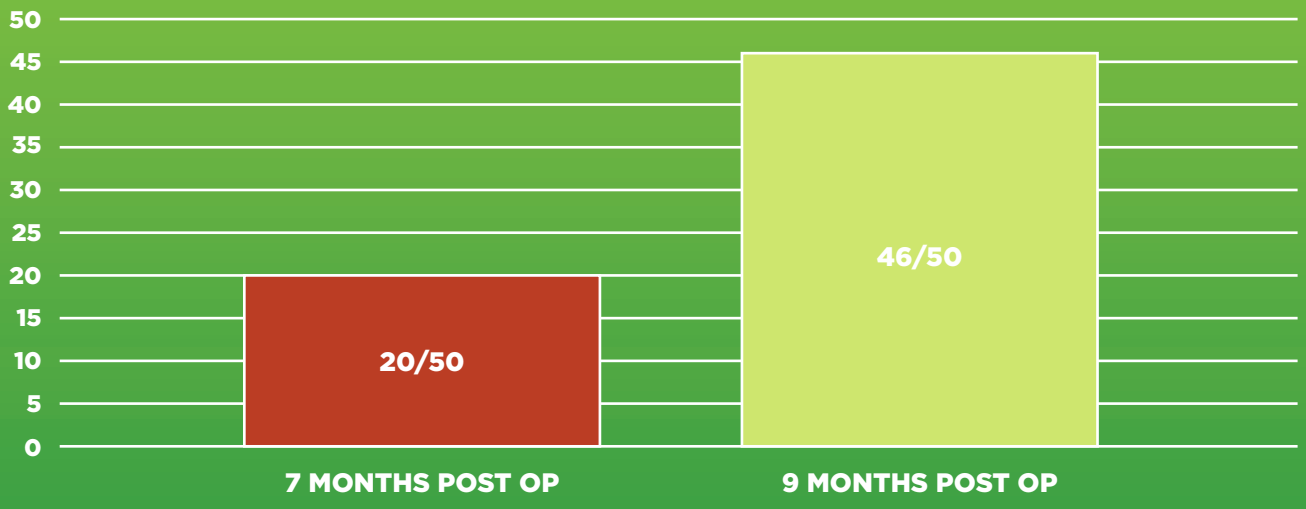


FIGURE 2 – *Data reported by client according to a proprietary assessment used by Dr. Neal ElAttrache. After 7 weeks of work with the Accelerate ACL Program and Neubie, the client's score increased from 20/50 to 46/50, placing him in the 95th percentile of all Dr. ElAttrache's patients.*

the client to perform the exercises with proper form, opening a window to correct compensatory movement patterns and reeducate muscles to perform efficiently through a full range of motion.

The exercises performed during the workout were selected based on a combination of subjective feedback from the client and movement analysis by Accelerate ACL trainers. Focus was placed on exercises that would emphasize the quadriceps, hamstring, calf, glute, and hip.

After each session, the client's subjective feedback was collected regarding knee stiffness and his ability to perform a series of explosive movement tests involving single and double leg jumps. Based on his feedback and visual observation, workouts were continuously adapted to target movement deficiencies, driving an efficient process of neuromuscular re-education.

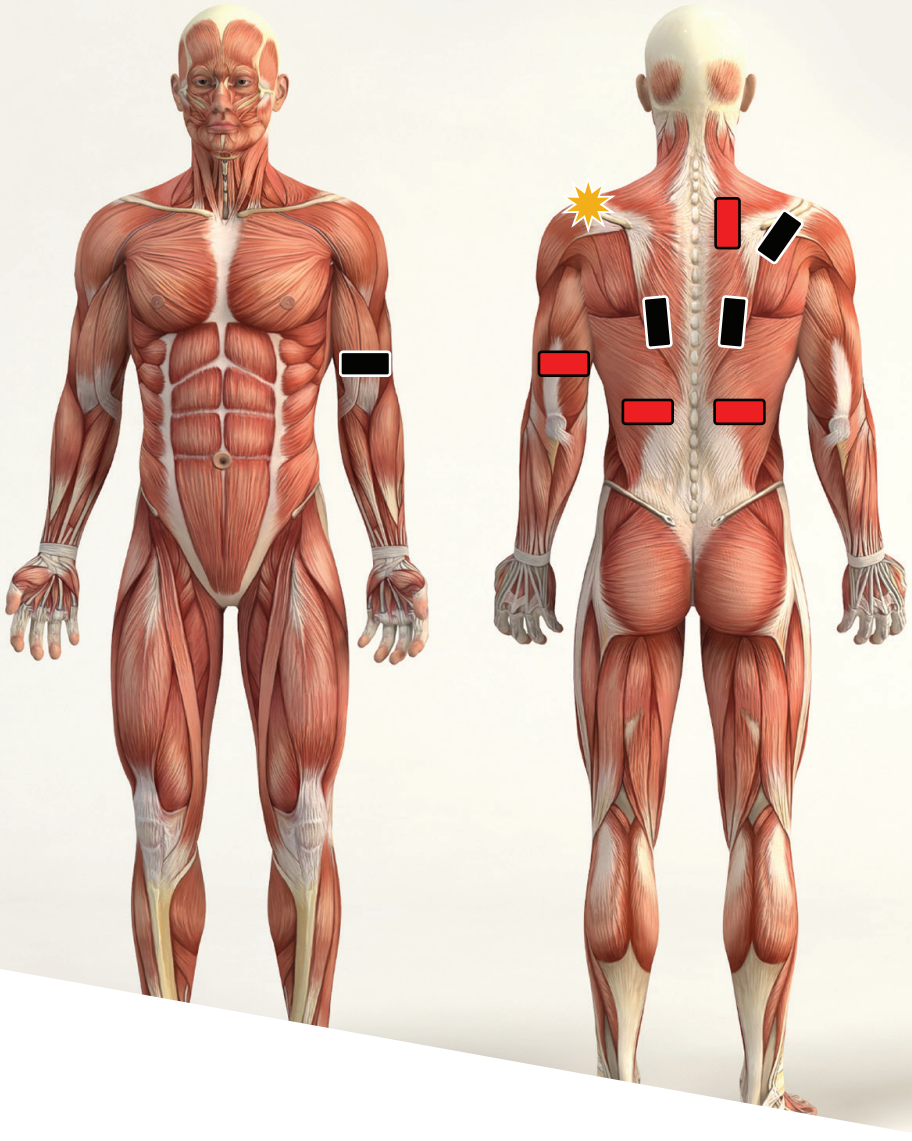
Here is how the described his experience working with Accelerate ACL and the Neubie® device:
"I started using the Neubie 4-5 months [ago]. I was really unable to do too much, just restricted. I lost a lot of muscle, I had a lot of atrophy, and literally the day after I started using the Neubie, I saw my VMO wake up again. I call it my little cheat code because it helps you get activated, and activation is key."

In addition to the methods and workouts described above, other techniques consistent with the NeuFit® Method were employed, including: muscle testing and activation, hypertrophy protocols, and recovery protocols utilizing frequency specific microcurrent.

CASE STUDY

Early Rehabilitation Outcomes Using the NEUBIE Electrical Stimulation Device After Arthroscopic Rotator Cuff

PERFORMED AT:
Club NeuFit by Sara Starc, OTR/L; The Polo, Tennis & Fitness Club in Austin, TX using the NeuFit Method.



TREATMENT AND OUTCOME

The purpose of this case report is to look at post operative rehabilitation outcomes following arthroscopic repair of a rotator cuff tear using safe interventions with the NEUBIE earlier than traditional orthopedic protocols with in conjunction with therapeutic exercise, neuromuscular re-education, and manual therapy techniques. This article presents a case of an adult male with seen for occupational therapy beginning 3 days post-operatively a massive rotator cuff repair that that was managed promptly and safely with excellent outcomes. Results investigated include accelerated strength, ROM and scapular stability gains, pain management, atrophy prevention, and reduced muscular inhibition throughout recovery.

PATIENT INFORMATION/DAGNOSIS

Patient is a healthy and active 51 y/o male who sustained partial-thickness tears at the distal portion of the supraspinatus, the proximal myotendinous junction of the infraspinatus and at the distal portion of the subscapularis. Patient also presented with a

medial dislocation of the proximal long head of the biceps tendon interposed between the torn subscapularis fibers. Past medical history includes mild athritand partial supraspinatus tear of L shoulder w/o intevention. Patient seen for Occupational Therapy services post-op day 3 arthroscopic acromioplasty, distal clavicle resection and rotator cuff repair.
The patient's goals for therapy included decreased pain, restoration of full ROM, the ability to perform all ADLs/IADLs independently and the ability to return to exercise, golf and tennis.

SPECIAL INSTRUCTIONS: Immobilize in R arm sling, PROM only for 6 weeks, therapist assisted mobility (no pulleys), limit external rotation 25-30 degree.

CLINICAL FINDINGS

PROCESS: MMT, Manual Activations and Scan

Upon observation, the patient presented to therapy wearing a shoulder immobilizer and was in a guarded posture noting significant tightness in the upper R trapezius muscle. Bruising on R pec noted. Dressings intact. Palpation revealed several trigger points located in bilateral upper trapezius muscles, right-sided infraspinatus, rhomboids, and lateral scapular border regions. Cervical ROM, elbow flexion/extension/supination/pronation was within normal limits. R shoulder strength deferred secondary to recent surgery.

L PROM:
Flexion: 52 | Extension: 10 | Abduction: 48 | Adduction: — | Internal Rotation (at 90): 50 | External Rotation (at 90): 25

HOT SPOTS: (deltoid and part of shoulder avoided upon eval 2/2 dressings) Upper trap, rhomboids, tricep, mid-lat

TREATMENT:
Manual activations to repaired musculature and trigger points, All PROM performed with patient in supine, pillow to support R shoulder, 15 times in each direction followed by Neubie stimulation to: Cervical spine, upper trap, pec with electric glove prior to passive Codman's pendulums R Bicep/Tricep, infraspinatus/rhomboids (*immobilizer donned) on/off cycle 500 pps performing grip squeezes with red ball, elbow flexion/extension, elbow supination/pronation, scap mobilizations in all planes with good posturing.

Spine erectors and core on 500/160/100 pps performing modified static dead bug progressions in supine coupled with R grip activations, standing deadlift hinges holding PVC with immobilizer donned

Patient report After Initial Evaluation: Reports feeling 0/10 pain after session with less discomfort and tightness in R neck/trap region. Instructed the patient in-home exercise program to initiate that consisted of pendulums, scapular mobilizations, and controlled passive motion.

CLINICAL FINDINGS:
Patient demonstrated minimal atrophy of the deltoid, biceps, triceps, upper trapezius and RC muscles. Subjective pain levels remained below 3/10 using the Visual Analog Scale with progression of exercises and no reliance on medications during and after sessions AROM on the surgical arm equated that of his non-involved extremity 9 weeks post-op with minimal to no substitution patterns (with exception of IR/ER ratio (AROM IR= 62, AROM ER= 75). Strength at minimum 4-/5 in all planes after 10 weeks post-op. Patient cleared to safely begin structured "Return to Tennis" Program prescribed by physician 8 weeks post-op as well as clearance to chip and putt on golf course.

DETAILED TREATMENT, TIMELINE, AND OUTCOME

FREQUENCY: 2-3x/week for 10 weeks

TECHNIQUES USED IN FOLLOW UP SESSIONS:
Continued with brief activation work on involved and surrounding musculature coupled with Graston Technique and the electric glove. Pad placements varied throughout protocol working on ROM, scapular control, and strengthening exercises obeying all restrictions. Neuromuscular electrical stimulation was integrated into all exercises using the Neubie. Progressed isometrics in all planes quickly with excellent progression to AAROM, closed chain scapulothoracic stability, doorjam series, pulleys, scaption, and wand exercises. Tolerated active bicep curls/tricep extensions with progression to light T band resistance and ERAs with 55-100pps. Focused on shoulder grip connection using weighted ball and pad placements on right infraspinatus, suprapinatus, serratus and rhomboid. At week 9-10, patient safely initiated IR with towel behind back, prone shoulder extension I's, push up plus on knees, scaption to 90 degrees, sidelying adduction.

In addition to maximizing safe strength/ROM gains of affected shoulder, therapy focused heavily on global lat, lower back and core strengthening using the Neubie to address both shoulder weakness and core dysfunction simultaneously. Trunk musculature also becomes active during glenohumeral movements and the client was instructed to perform an abdominal bracing maneuver with each exercise when electrical stimulation was utilized. Integrated moderate cardiovascular conditioning after week 1 to further promote healing on incline treadmill (Pad placements on core and spine erectors (55pps) for 10 min.

RESULTS AFTER ALL TREATMENT COMPLETED (or current results if still being treated)

Objectively, the patient demonstrated minimal inhibition of the rotator cuff after repair and excellent return of ROM and strength with respect to the integrity of the repair throughout each recovery phase. Patient's surgeon and physical therapist he began seeing 1x/week at 6 weeks post-op both reported that the patient had excellent progress with ROM goals and was approximately 2-3 weeks ahead of the recovery schedule. At 10 weeks post-op, patient demonstrated symmetrical scapular mechanics with AROM in all planes pain-free. Client reported he was able to return to recreational golf and tennis with no pain or limitations by 3 ½ months post-op with surgeon clearance. Patient adhered to specific programming to minimize risk of re-tear and progressed demonstrating proper execution of introduced exercises during sessions.

DISCUSSION

The patient responded very positively to treatments achieved full recovery and the ability to return to recreational sports earlier than expected using safe therapeutic approach and milestones to achieve full function while allowing appropriate tissue healing. NMES using the Neubie may be used safely in each rehabilitation phase of rotator cuff repair to promote healing, reduce inflammation, minimize inhibition of involved musculature, reduce pain, enhance force production, and normalize movement patterning. It can be used concomitantly during standard rehab exercises as well as during manual and stabilization techniques to improve functional gains while safely respecting the integrity of the repair itself. It's also worth investigating early use of NMES and it's effects post-operatively on preventing atrophy quantitatively. The patient traumatically tore his opposite rotator cuff which had previous partial tears prior to injury and has pursued early therapeutic treatment following surgery using the Neubie with a similar protocol approved by his physician. His right shoulder remains fully functional without pain or restriction.

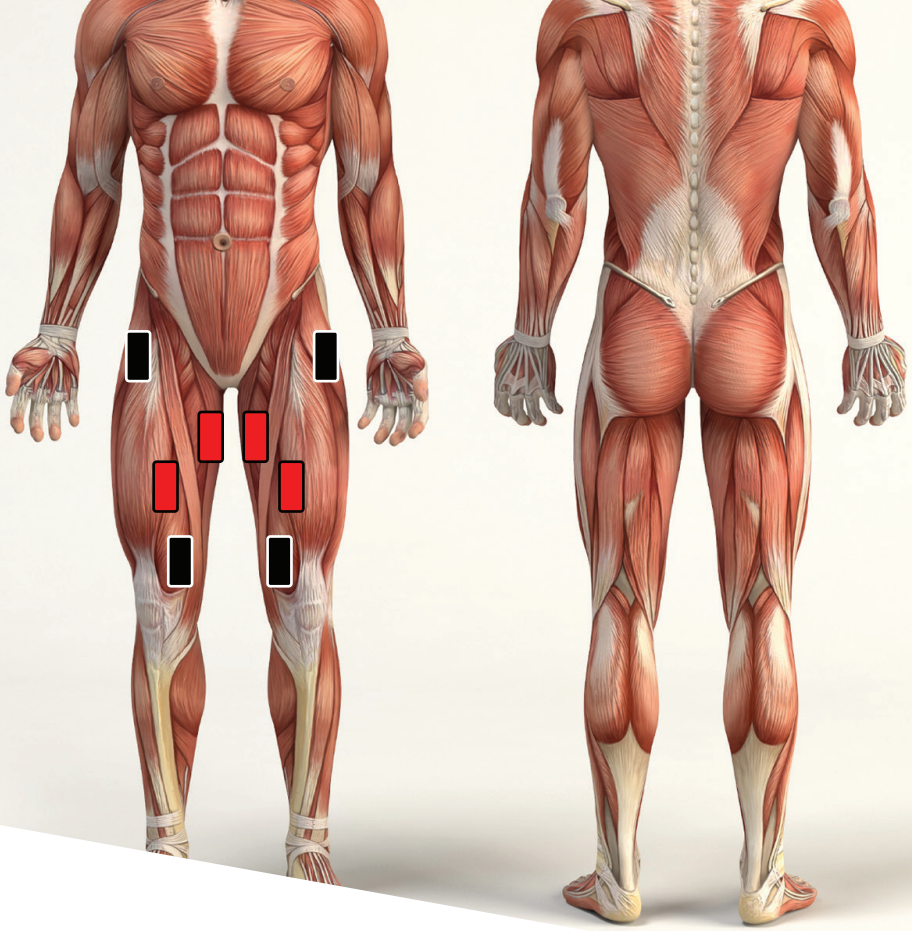
PATIENT PERSPECTIVE

Patient Perspective: I am a very active, healthy 51 year old. Learning that I was required to have surgery on my right rotator cuff was a bit surprising. In conducting my own research, I learned in many cases a long recovery period was involved. Most sources stated six weeks for mobility and possibly six months for full recovery. As an avid golfer, I was very motivated to beat these odds. Around the time of diagnosis, I was introduced to Sara and the Neufit technology. After a consultation, Sara and I formed a plan to include both pre-hab and rehab sessions...I was excited about the possibilities. For pre-hab, Sara strategically utilized the technology to build muscles in my shoulder, for stabilization until my surgery date. Three days post-op we started our rehab schedule and attempted to meet three days weekly. She started with gentle therapy for muscle stimulation away from the surgical areas to minimize atrophy in the large muscles not affected by the surgery. Sessions grew to include stimulation around surgical areas all the while increasing the muscle mass. We kept this schedule until Iwas cleared for traditional physical therapy. At this point, both my surgeon and physical therapist commented I was three weeks ahead of normal recovery. Typical muscle atrophy had been eliminated. Over the next four weeks I utilized Neufit for normal workout routines to fully get fit, using PT for shoulder flexibility and strength. It was at this point I felt comfortable to hit a bucket of balls including my driver. Two weeks later I felt strong enough to play a full round of golf. As a side note, soon after this I felt strong enough to play volleyball using my right arm to hit as I did before the injury. I finished the match without damage to my right shoulder but I tore my left rotator cuff which already had previous damage in it after diving for a ball. Surgery was imminent; I started the process. I am pleased to report we have minimized shoulder muscle atrophy. I am 12 days post-op as I write this and feel as though I'll have similar results in the left shoulder. THANK YOU to Sara and Neufit for helping me beat the traditional recovery time. I am a proponent of Neufit and will gladly recommend the treatment to those in similar situations.

CASE STUDY

Manual Muscle Activation Combined with Physical Therapy Exercise and NEUBIE to Improve Muscle Activation and Low Back Pain in Order to Restore Mobility

PERFORMED AT:
Performance PT and Wellness in Coldwater, OH by Sarah Topp using the NeuFit Method.

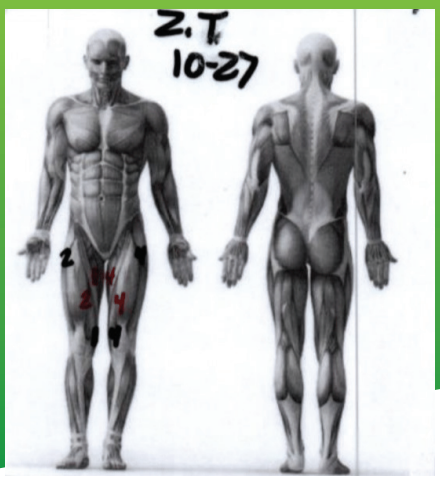


TREATMENT AND OUTCOME

To treat the patient's inability to walk following low back pain and significant right quadricep weakness following a fall and impingement of L5 nerve root and DDD. Each session we performed muscle activation techniques, mapping of low back and RLE for hot spots followed by AROM activities such as lumbar flexion, knee flexion/extension and nerve glides followed by use of NEUBIE for quad strengthening at 55 Hz. Patient required 24 visits to go from wheelchair bound during community ambulation to ambulating without an AD.

PATIENT INFORMATION/DIAGNOSIS

Patient is an 86 year old man who presented with inability to walk due to significant RLE weakness. He was working on his shed at home, tried to lift something heavy, felt a pull in his back and had low back pain. Utilized chiropractic care and his pain subsided. About 3 months after the initial incident, he was power washing his porch and fell off landing on his R hip/back (balance had been altered since initial episode of pain). Utilized chiropractic care again with no relief. Presented to our clinic 9 months after onset of symptoms and was unable to stand without assistance, utilizing a wheelchair for community



distances and FWW for short home distances (5 feet or less). Was unable to fully extend R knee without assistance. Multiple tests done (EMG, X-rays, MRIs)showing DDD of lumbar spine and foraminal stenosis. At time of evaluation, he had gone to Cleveland Clinic for further testing to determine why he was losing LE strength.

CLINICAL FINDINGS

PROCESS: Manual Muscle Testing, AROM, dermatomal testing, reflex testing

FINDINGS:

- **Weaknesses:** significant weakness of right quadriceps 1+/5, 3+/5 strength of hip IR, ER, flexion, extension.
- **Myotomes:** L3: Quadriceps 1+/5 and L5 Gastroc/Hamstring: 3+/5. Dermatomal absent to light touch at L3 and L4. 1+ patellar reflex.
- **ROM:** lumbar flexion to 50 degrees, lumbar extension to 0 degrees.
- **Scan:** hot spots found in the lumbar paraspinals, along the quadriceps muscle belly, adductors and gluteus medius
- **Assessment:** At the evaluation, findings indicated significant nerve dysfunction of L3, L4 an d L5 myotomes and dermatomal changes at L3 and L4. Dysfunctional at these levels caused poor quad activation leading to decrease in strength after 9 months of deteriorating level of mobility. Quadriceps weakness caused the patient to be unable to stand without significant UE assistance or use of AD due to fear of LE buckling and fall. Significant muscle tension and hot spots noted along lumbar paraspinals contributing to impingement symptoms in the lumbar spine causing LE weakness.
- **Treatment:** muscle activations to weak areas followed by Neubie mapping each session and priming at 500 Hz during AROM/AAROM of lumbar spine, hips and knees followed by strengthening at hot spot areas at 55 Hz for 5 minutes (10 sec on/off cycle) followed by pads placed along muscle belly of quadriceps at 55 Hz for 5-10 minutes (10 seconds on/off cycle) Restorative setting utilized for 5-8 minutes after sessions.

DETAILED TREATMENT, TIMELINE & OUTCOME

FREQUENCY: initially 3x/week for 1 hour sessions for 6 weeks followed by 2x/week for 1 hour sessions x 3 weeks until the patient was able to ambulate without AD in the clinic. Patient then utilized PT for maintenance of strength and functional mobility coming between 1-2x/week for 3 months.

TECHNIQUES USED IN FOLLOW UP SESSIONS: muscle activations to weak areas followed by Neubie mapping each session and priming at 500 Hz during AROM/AAROM of lumbar spine, hips and knees followed by strengthening at hot spot areas at 55 Hz for 5 minutes (10 sec on/off cycle) followed by pads placed along muscle belly of quadriceps at 55 Hz for 5-10 minutes (10 seconds on/off cycle) Restorative setting utilized for 5-8 minutes after sessions. Other treatments utilized were mechanical traction for spinal decompression (LEs elevated to facilitate lumbar flexion) as well as foot bath as patient stated legs "felt lighter" after foot baths.

PATIENT REPORT AFTER FIRST TREATMENT:

Patient able to perform multiple sit to stands and weight shifting without UE support, was able to walk around gym with FWW and stand by assistance, patient self reported the walk in thegym was longer than what he was previously able to do at home.

RESULTS AFTER ALL TREATMENT COMPLETED (or current results if still being treated)

Objectively, he was able to demonstrate 4 /5 quad strength (previous was 1+/5) and 4/ 5 hip strength in flexion, extension and IR/ER. His lumbar ROM improved to 90 degrees of flexion. He was able to ambulate without an assistive device and walk up to 1 mile around his home. He was also able to perform stair negotiation with minimal UE assistance, prior to treatment he was unable to complete any stair negotiation without MAX x2 assist. His function improved to a point that he was getting up into tractors again and assisting with planting. However during one tractor ride he got jostled as a hopper wagon got stuck and had an exacerbation of his low back pain. He did not lose LE strength but had an increase in back pain and started utilizing a SPC again for safety.

DISCUSSION

Patient response to treatment was very positive. He did not have to have any further testing with Cleveland Clinic (who ended up discharging him as they told him there was nothing they could do for him). He regained his functional strength and mobility allowing him to perform his activities of daily living and decrease his reliance on his wife. He showed a significant improvement in LE strength, especially of his quadriceps and improved his balance, decreasing his future fall risk. The approach taken allowed us to help him regain strength and mobility that he most likely would not have achieved with traditional physical therapy.

PATIENT PERSPECTIVE

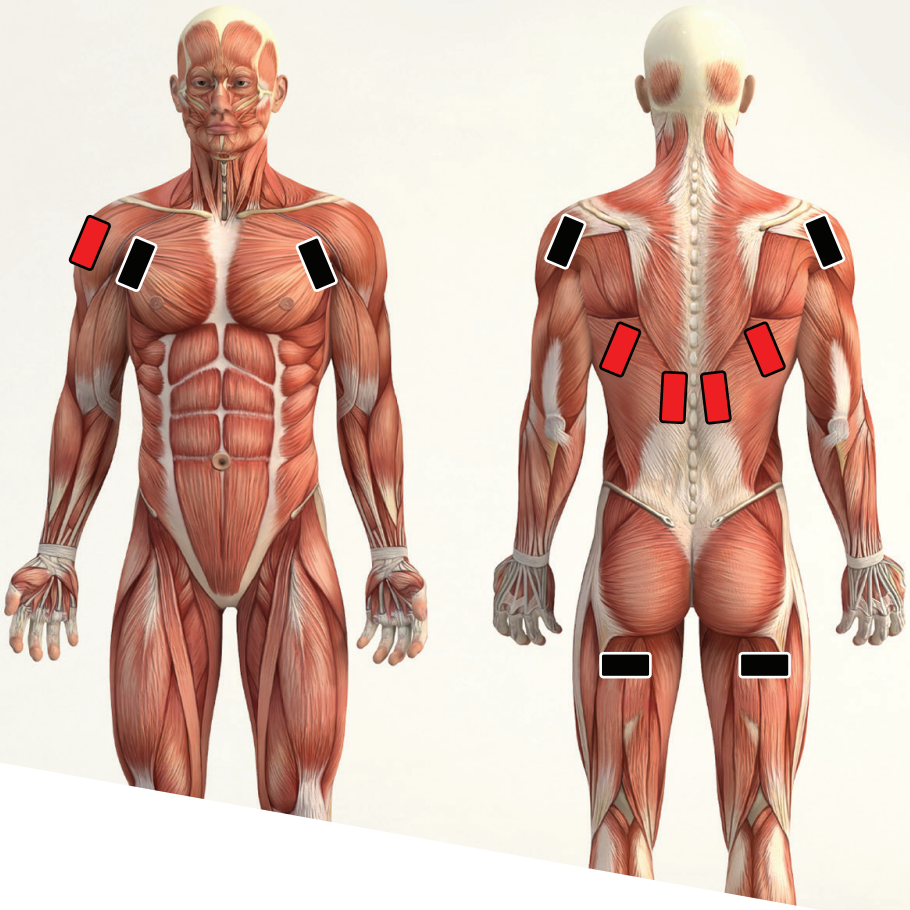
After the first session he was able to walk longer distances with his FWW and perform pre-gait activities without therapist assistance. Over the next 9 weeks he was able to regain most of his quadriceps strength and ambulate without any assistance. He was surprised at how the NEUBIE helped his quad activation and with the machine on, made functional transfers, stair negotiation and walking easier.

CASE STUDY

Manual Physical Therapy and Therapeutic Exercise Using the NEUBIE for Management of Complications Related to Spinal Cord Injury

PERFORMED AT:
MATRX Health & Fitness by Krystina Miller, PT, DPT, ATP in Macomb Michigan using the NeuFit Method.

KEYWORDS:
spinal cord injury, paraplegia, shoulder overuse pain, hetertrophic ossification, frequency specific microcurrents, muscle activation, neuromuscular re-education, functional training



TREATMENT AND OUTCOME

The patient's shoulder pain and range of motion have improved significantly using a various neuromuscular techniques combined with electrical stimulation. The patient's bilateral hip range of motion (ROM) has shown significant improvement allowing for increased independence with floor recovery transfers and functional mobility using manual therapy and frequency specific microcurrents (FSM) with the NEUBIE. He is making regular progress with functional reaching and lifting activities, reactive postural strength, and sitting balance with ongoing sessions twice a week.

PATIENT INFORMATION/DIAGNOSIS

54-year-old male who sustained a T4/5 ASIA A(American Spinal Injury Association) spinal cord injury (complete) in 2014. He underwent spinal fixation and extensive rehabilitation post-injury and he presented to therapy in June 2020 with complete paraplegia; abdominal and back spasms causing daily pain; limitations in hip mobility due to heterotrophic ossification; and bilateral shoulder pain from prolonged wheelchair use and regular adaptive mobility.

CLINICAL FINDINGS

PROCESS: Manual Muscle Testing (MMT) & scan, sensation testing, AROM and PROM assessment, functional mobility assessment, standing tolerance

FINDINGS:

- **Weaknesses:** patient lacks voluntary motor activation and sensation throughout lower trunk (below T8) and in bilateral lower extremities. Weakness was noted throughout rotator cuff, lower and middle trapezius, and latissimus dorsi bilaterally. This upper extremity motor imbalance is contributing to poor scapulothoracic rhythm; that combined with adaptive shortening of the latissimus dorsi contributes to reduced shoulder AROM into flexion and abduction.
- **Scan:** No hot spots were noted in lower extremities but note reactive withdrawal (spasticity) when scanning tibialis anterior and plantar surface of foot bilaterally. Hot spots were identified in bilateral biceps tendon, middle trapezius, upper trapezius, and teres complex.
- **Additional Findings:** Passive movement of lower extremities and transitions short sitting to/from supine result in reactive spasticity in abdominals and lumbar spine. Limitations in hip flexion ROM have limited patient positioning for floor recovery transfers (required moderate assistance to perform). He required moderate assistance to achieve and maintain tall kneeling with BUE support; demonstrates significant anterior pelvic tilt in this position due to limited hip extension ROM. When initiating para-gait training prior to starting with MATRX, the patient required bracing to maintain ankle and knee stability, 2-person assist to maintain hip extension and advance BLE, and BUE support in parallel bars (endurance limited to 10-12 ft).

ASSESSMENT: Patient presents with complete T8/10 functional paraplegia. His balance and functional mobility are affected by resulting trunk spasticity and concomitant weakness. ROM restriction in B shoulders limits overhead reaching and hip ROM limitations due to heterotrophic ossification were limiting his balance and independence with gait and floor transfers. The scan revealed reactive spasticity in BLE indicating impaired neural pathways interrupted due to the spinal cord injury. It also identified hot spots in his back and scapular muscles indicating faulty firing and coordination of various muscle groups responsible for scapular stabilization and proper arthro-kinematics of the glenohumeral joint. This has led to impingement and is likely responsible for supraspinatus and biceps tendonitis. The resulting limitation in ROM has affected his indepedence with overhead reaching and reduced his tolerance during athletic performance (handcycling and weight-lifting) due to pain. The primary goals of skilled physical therapy include neuro-re-education of scapular motor patterns, spasticity management, trunk flexor/extensor strengthening, manual therapy for UE and LE, and functional training (floor transfers, mat mobility, sitting and standing balance, and gait training.

UPPER EXTREMITIES STRENGTH (MMT) AND ROM (IN DEGREES)

SHOULDER	RIGHT	ROM	LEFT	ROM
Flexion (supine)	3-/5	-6.5”	3-/5	-10”
Abduction (supine)	3-/5	110	3-/5	110
Latissiumus Dorsi	4/5	--	4-/5	
Pectoralis	4/5	--	4/5	
Lower Trapezius	3-/5	--	3-/5	
Supraspinatus	4-/5	--	4-/5	

(measured initially as distance of thumb from table)

LOWER EXTREMITIES STRENGTH (MMT) AND ROM (IN DEGREES)

HIP	RIGHT ROM	LEFT ROM
Flexion	100	90
Extension	10	5
Internal Rotation	10	20
External Rotation	WNL	5

TREATMENT: Manual therapy for release of overactive muscles with "electric fingers" and muscle activations to weak muscles in the UEs, PAILS and RAILS for improvement in shoulder flexion ROM, followed by NEUBIE stimulation at hot spots (teres complex and upper trap) with AROM in supine and prone. AAROM for ankle DF with NEUBIE on hot spots for LE (plantar surface of foot and spinal just below level of injury). Manual joint mobilization/glides with NEUBIE for FSM for hip mobility.

PATIENT REPORT AFTER INITIAL EVALUATION: Patient states he could feel the muscles release during manual therapy with the "electric fingers" technique. He was shocked at home much shoulder range of motion he gained in a single session.

DETAILED TREATMENT, TIMELINE, AND OUTCOME

FREQUENCY:

2x/week for 16 months consistently, except for two 10-day breaks due to illness (treatment ongoing)

TECHNIQUES USED IN FOLLOW UP SESSIONS:

Treatment focuses have shifted as the patient has progressed. Initially, attempts were made to focus on LE strengthening with the NEUBIE for neuro-motor repair, but no progress was made. Due to insurance constraints, sessions shifted to areas of progress. Heavy emphasis was placed on shoulder ROM and pain management. A regular sequence of manual therapy and activations (500 Hz), PAILS/RAILs (500 Hz on antagonist muscle groups with 55 Hz used on agonist muscle groups for shoulder flexion), and AROM with NEUBIE on hot spots (500 Hz) was repeated for several weeks. This progressed to isolated latissimus and lower trapezius strengthening (varied frequencies between 500, 250, 160 Hz continuously as well as 100 and 55 Hz pulsed at 5 sec on/10 sec off) followed by functional carryover during transfers or reaching/lifting activities. When shoulder pain

and mechanics were consistently managed, treatment focus shifted to hip mobility, transfers, and gait training. This involved the use of FSM targeting the pelvis and hips during manual therapy prior to standing tolerance using custom B knee-ankle-foot orthoses (KAFOs) and a gait harness system (GHS). Vestibular training was attempted to aid in management of early orthostatic hypotension and proprioceptive awareness deficits with standing. This did not appear to generate any improvement and was discontinued. Manual trigger point release and spinal joint mobilization was added during FSM toassist with trunk spasticity management and back pain. Postural strengthening was addressed using the NEUBIE for core activation (100 and 160 Hz) during various isolated, functional, and balance-related activities. We have recently increased focus on isolated back extension strengthening at various frequencies (500-250-160 Hz and 55-100-250Hz combinations) followed by a functional application.

PAD PLACEMENT FOR PAILS AND RAILS (A)

Channel 1: 500 Hz
(Red) latissimus dorsi
(Black) pectoralis major and minor

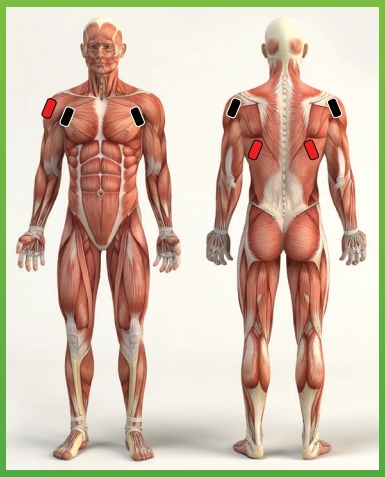
Channel 2: 55 Hz
(Red) lateral deltoid
(Black) posterior deltoid

PAD PLACEMENT FOR FSM (B)

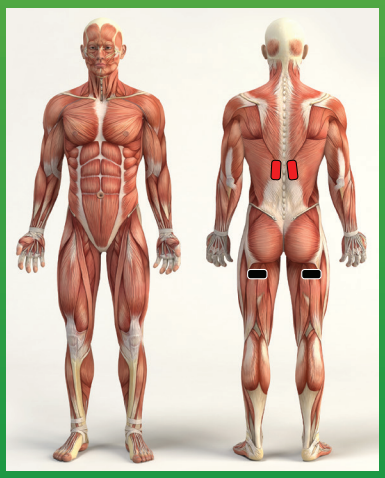
Channel 1: : (Red) Left paraspinals at T10-12
(Black) Right proximal hamstrings

Channel 2: (Red) Right paraspinals at T10-12
(Black) Left proximal hamstrings

(A)



(B)



RESULTS:

Treatment is ongoing. Major milestones noted: ***August 18, 2020,*** patient reports that he experiences 2-3 days of relief from abdominal and back extension spasticity following sessions. ***August 20, 2020,*** patient received custom-molded KAFOs to progress to gait training. He was limited initially by orthostatichypotension. ***In late October 2020*** a progress note revealed several significant improvements: he had progressed to para-gait x 9 ft with a GHS and B KAFOs and minimal assist of only one person. Also in thatmonth, shoulder ROM was measured with goniome try at 100º R (also measured at -3.5" from table in supine) and 105º L (-3" from table in supine); digital dynamometry had been previously initiated for UE strength, and he improved B latissimus dorsi strength by 5 lbs, lower trapezius by 4 lbs on the L, and rhomboids by 10 lbs L and 20 lbs R; hip ROM improved to flexion of 110 º R and 102 º L which allowed us to progress floor transfer training. ***February 19, 2021,*** he achieved shoulder ROM of 155-160 º for flexion and abduction B without pain, and he was able to maintain this range between sessions due to improvement in strength in this new range. ***On June 11, 2021,*** patient had progressed to 50 ft bouts during gait training using GHS and B KAFOs with only incidental assist to steer GHS. ***October 26, 2021,*** he was able to maintain tall kneeling using BUE without assistance due to improvements in his hip extension ROM. ***On December 1, 2021,*** he was able to complete a floor recovery transfer with standby assist due to further improvements in hip flexion ROM, shoulder pain management (no longer experiences with functional mobility), and latissimus dorsi strength.

Left: *Early treatment: tall kneeling and standing were limited due to UE fatigue. The patient used his arms excessively for support because he was unable to achieve adequate hip extension to utilize ligamentus support to maintain extension. He presents with significant anterior pelvic tilt and excessive lumbar lordosis.*
Middle: *With improvements in hip extension, he was able to progress to upright standing and began working on stability and balance over his pelvis for progression with gait. You can see the reduction in his anterior pelvic tilt and lumbar lordosis.*
Right: *He has progressed from requiring two people to assist with gait in the parallel bars, to gait over 50 ft with minimal assistance of one person due, in large part, to increases in hip ROM, balance, core strength, and UE strength.*

Left: Shoulder flexion ROM improved from less than 100º to near normal range.
Right: Comparison of hip flexion ROM improved from 100º R and 90º L to functional range necessary for floor recovery transfer positioning.

DISCUSSION

Patient's recent course of treatment began several years after his spinal cord injury. Prior to starting with our clinic, he received regular neurologic physical therapy (2x/week) since his hospital discharge in 2015. He had been treated by his current physical therapist in the past, including out patient in 2017 specifically for assistance addressing hip mobility and floor recovery transfers. During that time, no progress was made with respect to hip flexion ROM, and patient was unable to achieve positioning for floor to wheelchair transfers without moderate assistance. Since working with the NEUBIE, the patient began making improvements in range and resulting strides with transfer independence. Similarly, FSM and manual therapy have helped to unlock hip extension ROM. Within months of focused treatment to the hips, the patient was able to achieve positional and functional goals that he had been unable to make progress with during previous therapy. He made consistent progress with shoulder ROM, and each new range milestone resulted in end range weakness. Strengthening with the NEUBIE and improvements in shoulder kinematics have contributed significantly to the carry over seen with this progress as well as the translation to improvement in functional reach and lifting. The patients previous therapy experience provides a good comparison to demonstrate to power of the NEUBIE to unlock potential that traditional therapy has been unable to tap. The treatment methods used had been applied to this patient in the past, but the addition of the NEUBIE allowed for rapid progress in function.

PATIENT PERSPECTIVE

The patient continues to express fascination with “the ability of the machine to find the tight muscles and painful spots” when we use the NEUBIE for manual release techniques and activations. He enjoys capturing videos and pictures for comparison to the same activities at his previous therapy clinic. During his most recent progress assessment, he was shocked that he was able to complete a floor transfer, directly from the floor, without assistance, and with significant ease and efficiency. He immediately said, “It’s the strengthening!”

LINKS TO VIDEOS:

Floor transfer: https://fb.watch/9F8cW2F0HI/

Standing activity, gait training, and overhead lifting:

https://instagram.com/p/CXAEN8iJLZk/

CASE STUDY

Relapsing Remitting Multiple Sclerosis in a 35 Year Old Female

PERFORMED AT:
Centura Health at Home
by Courtney L. Ellerbusch
in Highlands Ranch, CO
using the NeuFit Method.

TREATMENT & OUTCOME

On 9/19/21 a 34 year old female presented to home health skilled PT with a recent multiple sclerosis diagnosis in May 2021. She experienced an exacerbation versus pseudoexacerbation at the end of August 2021 treated with steroids and solumedrol with side effect of steroid induced myopathy and significant decline in left lower extremity strength, new weakness right upper extremity and slightly further weakness in left upper extremity as well as increased symptoms of neuropathy left arm and leg. At initial visit she demonstrates median nerve most impacted in neuropathy with hypersensitivity through phalanges 1-3 and numbness in ulnar nerve with limited light touch in phalanges 4-5. Per the August 2021 CT scan of Cervical and Thoracic spine she had no active lesions in MS. Per notes from Littleton Adventist Hospital and Encompass Rehab she had deficits in left lower extremity strength, ataxia severely limiting gait and causing her to depend on a rollator walker, and highly fatigueable left extremities with neuropathy.

Sarah began home health physical therapy on 9/19/21 and introduced to the NeuBie method of mapping with identified potential treatment locations.

Based on mapping and ataxic symptom reduction goal placed electrodes:

1. L greater trochanter (black) <> L proximal rec fem (red)
2. L proximal biceps femoris (black) <> L distal semitendinosis (red)
3. L tibialis anterior tendon (black) <> L peroneal nerve motor point (red)
4. L plantar foot (black) <> L soleus (red)

To relieve neuropathy in left upper extremity and left lower extremity, the following hand and foot bath protocol used the following protocols. Foot bath and hand bath for sensory inputs and to decrease soleus and gastrocnemius stiffness 500Hz continuous.

Electrode set up for hand bath:

1. L olecranon fossa (red) <> carbon fiber lead floating (black)
2. L across deltoid/AC joint (red) <> carbon fiber lead floating (black)

In position of pronated wrist phalanx flexion <> extension x10
In position of pronated wrist patient instructed in full range opposition x2 sets
In position of supinated wrist phalanx flexion <> extension x10
In position of supinated wrist opposition x2 sets of 5
To support wrist and hand movements provided manual activations for pronation and supination with emphasis on forearm interosseous space and radial glides along with locations of infraspinatus and supraspinatus, biceps tendon, grade 2-3 cervical posterior to anterior pressure along with scalene release and manual stretch of upper trapezius with improvements in current tolerated with manual therapy.

Foot Bath

1. central lumbar spine vertical electrode (red) <> carbon fiber lead floating (black)
2. L mid adductor muscle belly (red) <> carbon fiber lead floating (black)
3. L popliteal fossa (red) <> carbon fiber lead floating (black)
4. L quad tendon (red) <> carbon fiber lead floating (black)

Foot bath treatment provided with talocrural grade 3-4 glides, mid foot mobilizations of all 5 rays, AROM into dorsiflexion and plantarflexion, dorsiflexion combined with eversion, and ankle inversion to eversion with graded increases in amplitude. Rest given with each movement with report of fatigue. Treatment time of 15 to 20 min well tolerated.

Provided progressive training with NeuBie electrical stimulation combined with exercises in supine, side-lying. prone, quadruped, tall kneeling, half kneeling, seated and standing positions in nerve glides, flexibility especially for soleus and psoas, weight bearing supported by added 5lb weight at ankle joint to control ataxia and functional training in sit to stand and gait. The patient initially made excellent progress and able to wean off of walker in 4 visits emphasizing NeuFit method and physical therapy, however on visit 5 Pt had relapse of ataxic symptoms. Assessed possible causes of over-fatigue and changed approach to a foot and hand bath approach. After 2 visits with foot and hand bath (as outline above) approach, the patient reports experiencing significant pain relief and decreased ataxia with gait in ankle after treatments lasting

for several hours after visit. After 4 visits emphasizing foot and hand bath patient reports upper extremity pain down to 1/10 and lower extremity pain down to 1-2/10.

The patient reports her normal baseline level of fatigue much improved and tolerating home health therapy visit, meal preparation, caring for her 6 and 4 year old daughters without the same level of exhaustion. She reports ability to walk with rollator walker through local playground with her daughters with improved tolerance.

The patient had a long term goal stated at the initial assessment on 9/19/21 of being able to return to walking her elementary age daughter to school, a total of 1 mile. With progressive treatments from Neubie and exercise P table to tolerate walking to and from school on 11/4/21 with a combination of cane use, then with fatigue walker use and multiple seated rests throughout the trip. Pt has significant fatigue and requires 2 days to recover but able to make this distance and reports feeling satisfied with achieving this goal. Recommended future shorter distances ambulation goals to slowly progress and improve tolerance and recovery time.

PATIENT INFORMATION/DIAGNOSIS

A 35 year old female with multiple sclerosis diagnosis made in May 2021 with chief complaint of left leg weakness and ataxia limiting walking, left arm weakness and extremity pain diagnosed as neuropathy in both. The patient had left hip labral repair on 10/5/2020 and episode of severe popliteal fossa pain on 10/17/2020. Pt had elevated symptoms of neurpathic pain in area of hip labrum and rectus femoris, gluteus medius and tensor fascia latae at initial 9/17/21 visit with this provider.

CLINICAL FINDINGS

9/17/21 INITIAL ASSESSMENT:

Timed up and Go = 15 seconds requiring four wheeled walker throughout for stability

25 foot walk test = 6.74 second (average between 2 trials) requiring four wheeled walker throughout for stability

MODIFIED ASHWORTH SPASTICITY ASSESSMENT OF LEFT LEG:

Hip flexion 0/4

Hip extension 0/4

Hip external rotation 1/4

Hip abduction 0/4

Hip adduction 0/4

Knee flexion 0/4
Knee extension 1/4
Ankle dorsiflexion 0/4
Ankle plantarflexion 2/4

MANUAL MUSCLE TESTING FOR LEFT LEG:

- Left rectus femoris 1+/5 with signs of ataxia and spasticity with attempt to lift leg
- Left illiopsoas 2/5
- Left adductor 3/5
- Left gluteus medius 2/5
- Left glut max 2+/5
- Left vastus medialis and vastus lateralis 3/5
- Left semitendinosis and semimembranosis 2+/5
- Left tibialis anterior 3/5
- Left gastrocnemius/soleus complex 2-/5
- Left tibialis posterior 3/5
- Left fibularis longus 4/5

Patient initially unable to tolerate gait without walker in home and significant L foot drop with heavy use of BUE on walker with all standing due to weakness and moderate neuropathic pain in LLE limiting standing.

RESULTS AFTER ALL TREATMENT COMPLETED (or current results if still being treated)

11/10/21 REASSESSMENT:

TUG: 8 seconds without assistive device

25 foot walk test: 6.53 seconds without assistive device

MAS TEST:

- Hip flexion 0/4
- Hip extension 0/4
- Hip external rotation 0/4
- Hip abduction 0/4
- Hip adduction 0/4
- Knee flexion 0/4
- Knee extension 0/4
- Ankle dorsiflexion 0/4
- Ankle plantarflexion 1+/4

MMT:

- Left rectus femoris 2/5 with signs of ataxia and spasticity with attempt to lift leg but improved strength noted
- Left illiopsoas 3/5
- Left adductor 3/5
- Left gluteus medius 3+/5
- Left glut max 2+/5 with reduced ataxia from prone lift test
- Left vastus medialis and vastus lateralis 4/5
- Left semitendinosis and semimembranosis 3+/5
- L biceps femoris (prone with knee in extension position during lift) 2+/5
- Left tibialis anterior 4/5
- Left gastrocnemius/soleus complex 2/5 (from standing on LLE without UE support able to partially lift L heel two times prior to fatigue)
- Left tibialis posterior 4+/5
- Left fibularis longus 4+/5

Patient demo gait in home with single point cane without foot drop LLE for 100-300 feet depending on time of day and ability to prevent knee buckling standing activity. Patient tolerates standing for 8-10 minutes with ADL participation in support of her young daughters and self care. These results appear possible due to significant improvement in spasticity reduction, significant improvement in LLE strength and neuropathic pain reported to be reduced to 1-2/10 discomfort rather than the 5-7/10 discomfort reported at the initial assessment.

DISCUSSION

The limitation identified are that in relapsing remitting multiple sclerosis with a flare or pseudoflare the normal pathophysiological process includes oligodenrocyte CNS activity to remyelinate the axonal damage done and in order to understand the effectiveness of NeuBie treatments we need to further understand expected pace of recovery from this pathophysiological proccess. The results seen for this client appear to have benefit from Neubie treatments in reduction of neuropathy so significantly and rapidly which is not a typical course over a 2 month period. The client also demonstrates reduction in spasticity and gains in agonist strength over a 2 month period that are more rapid than traditional physical therapy interventions.

PATIENT PERSPECTIVE

The patient reports feeling grateful for the significant reduction in pain, improved ability to participate in activities with her young daughters and despite the 2 day recovery after her 1 mile walk on 11/4 feeling so glad she proved to herself that she was able. She is motivated at the home health discharge to continue with her physical therapy in the outpatient setting and likely to seek out a local NeuFit outpatient provider to continue her good results.

With Thanksgiving coming up and family visiting she reports feeling more able to host them and thankful to begin to see her life starting to return.

CASE STUDY

Neubie Direct Current Foot Bath for the Treatment of Peripheral Neuropathy

PERFORMED AT:
Center for Healing and Regenerative Medicine by Michele Zink Harris in Austin, TX using the NeuFit Method.

TREATMENT AND OUTCOME

Patient is a healthy active 81 year old male who is suffering with 3-4/10 constant pain and numbness through bilateral feet. He is also struggling with progressive balance deficits and more frequent LOB and falls.

We took a combination approach of neuromuscular re-education through Neurac weak link testing and kinetic chain restoration, DC scan and functional exercise under 500hz applied to areas identified as threatened by load, balance challenges under vestibulo-cochlear DC stimulation, and focal treatment addressing distal bilateral peripheral neuropathy with a combination of Class IV Laser therapy and DC foot bath with guided intrinsic strengthening and dissociative motion.

Following 7 visits patient's subjective report of foot pain and numbness decreased from a constant 3-4/10 discomfort to "virtually zero". His balance deficits have yet to be positively impacted. Plan is to continue interventions to address more more centrally mediated balance deficits and neuromuscular imbalances.

PATIENT INFORMATION/DIAGNOSIS

- Peripheral Neuropathy
- History of Mild Ischemic Stroke

CLINICAL FINDINGS

- Poor balance
- Difficulty standing with feet together
- Poor single leg stance stabilization even momentarily without UE support
- Right side list
- Frequent LOB and falls
- Numbness and tingling with 3-4/10 level of constant discomfort keeping patient awake at night.

RESULTS AFTER ALL TREATMENT COMPLETED **(or current results if still being treated)**

11/11/21

DC Foot Bath with intrinsic strengthening and dissociation. 500Hz x 15 minutes

First felt at 21mA, 48mA intensity = 5/10

12/2/21

DC Foot Bath with intrinsic strengthening and dissociation. 500Hz x 15 minutes

First felt at 11mA today, 24mA intensity = 5/10 intensity.

Noting significant increased sensation following 6 sessions.

Pt also reporting decreased numbness and pain. Exhibiting improvement in toe dissociative movement apart from compensatory dorsiflexion.

DISCUSSION

We are still treating this patient. He is pleased with the positive changes in his peripheral neuropathy pain. We have done only two treatments thus far using vestibulo-cochlear nerve stimulation with guided abs variable balance challenges.

We also plan to continue and gently progress closed chain multi-segmental control challenges in the Neurac including use of the reciprocal axis for increased instability and reciprocal/rotational input.

PATIENT PERSPECTIVE

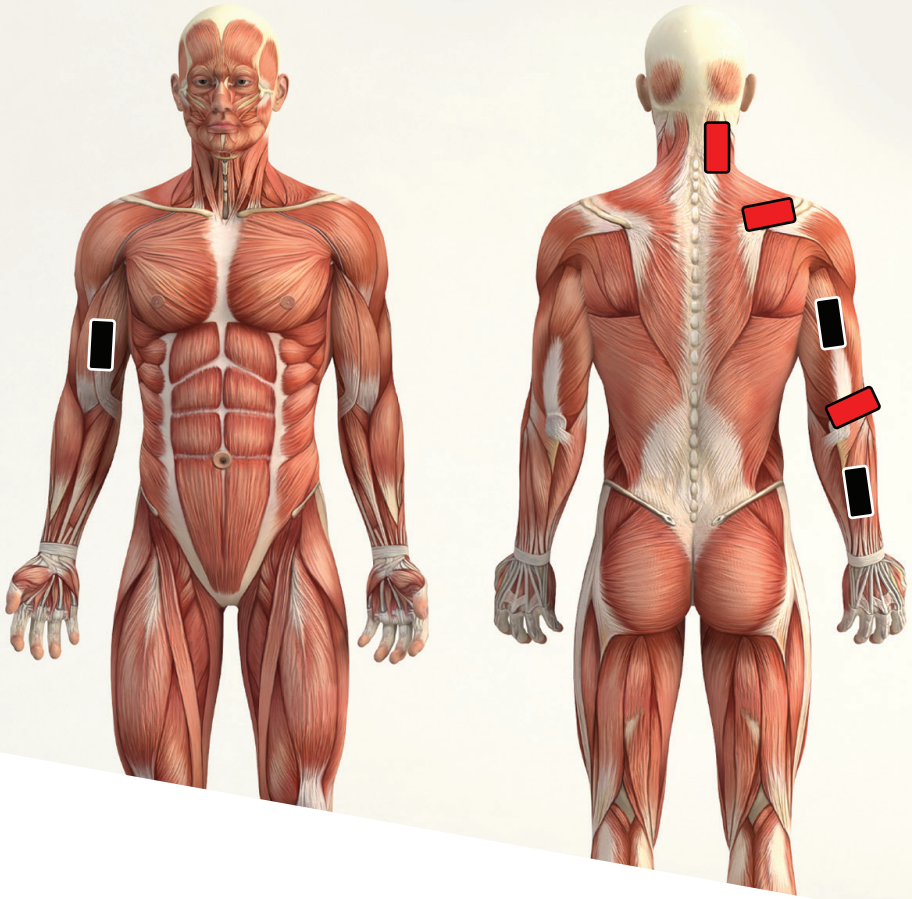
Patient is thrilled with his positive result in addressing his peripheral neuropathy including. decreased pain / numbness and tingling, increased dissociative right foot mobility.

He is frustrated though in light of these improvements that he is not get seeing measurable improvement in his balance, single leg stance stabilization.

CASE STUDY

72 y/o Male with Parsonage Turner Syndrome

PERFORMED AT:
Performance PT and Wellness by Maggie Bollenbacher in Coldwater, OH using the NeuFit Method.



TREATMENT AND OUTCOME

Pt is a 72 yo male with a prescription to PT for severe cervical stenosis. Pt was evaluated and started on physical therapy with emphasis placed on use of neurobiological electrical stimulation and FSM for neurological deficits contributing to symptoms.

PATIENT INFORMATION/DIAGNOSIS

Pt is a 72 yo male with referring dx of chronic neck pain/strain and severe cervical stenosis. Pt has recently seen a spine specialist who completed an MRI of the neck showing stenosis and was then referred on to physical therapy. Pt notes gradually worsening neck pain and sudden onset of R arm pain. Pt stated noticing pain starting in his R shoulder about 1 month ago that started getting worse daily and causing difficulty with sleeping very quickly. Pain then started descending down his elbow and into his hand. PCP started him on Prednisone which helped relieve the pain but he still has tingling down his arm and severe difficulty with fine motor skills. Pt is LHD and has not had any sxs into his L arm. Pt had not yet seen a neurologist but at the time of the evaluation, he had an appointment set up in 2 weeks. He has not trialed PT for arm pain/shoulder pain in the past.

CLINICAL FINDINGS

Pt has severe limitations with neck mobility with flexion: WNL, extension 11 deg, B SB ~10 deg, and B rotation 45 - 50 degrees. His Spurling's test and distraction test were both negative for any worsening radicular sxs but he did have positive R ulnar and median nerve tension tests (negative on L). His overall mobility in his neck was firm from upper cervical throughout lower cervical spine. Pt's R elbow ROM was limited to 95 degrees of flexion with 3-/5 flexion strength. His extension and pronation/supination was WNL but supination strength was 3/5 while pronation strength was 5/5, extension 5/5 (pt did have full PROM Of elbow). Pt's wrist ROM was WNL and strength was 4/5 grossly. His grip strength of R hand was 25 lbs and 60 lbs on L (pt is RHD).

Pt's R shoulder strength was grossly 3-/5 with difficulty holding vs. gravity and his AROM was limited to 95 deg offlexion, 40 deg of abduction and extension and limited functional IR to L5, ER to base of occiput. His PROM of shoulder was WNL for all directions, indicating a definite motor planning issue. The overall mobility at the GH joint was stiff in all directions.

Pt had numbness throughout nearly all RUE dermatomes and myotomes were at 3-/5 for C4, C5, C6. Reflexes on the R were 1+ and trace compared to L side. To note, pt with severe compensation with any overhead reaching and very weak peri-scapular musculature including lats, rhomboids.

DETAILED TREATMENT, TIMELINE, AND OUTCOME

Initially we started pt on mechanical traction and manual treatment for cervical spine and nerve glides. The next session (with more time), we used the Neubie to map at 500hz for his RUE and completed loosening with AAROM for shoulder, elbow and wrist as well as CKC exercises to improve pt's proprioceptive input. We also used a hand bath up to the elbow and cervical loosening with the addition of nerve glides with the Neubie was on.

After 1-2 sessions with traction, we decided to d/c traction as no beneficial changes were being made. We then added in the use of FSM for nerve scarring while pt was on the hand bath and strengthening on the Neubie at 55Hz for elbow flexion to allow pt to successfully drink from a glass.

The most interesting thing to happen in the case was that the patient had immediate relief of symptoms while he was on the Neubie and then for at least 3-4 hours after treatment. While in PT, the patient was able to see a neurologist who thought that the patient had Parsonage-Turner Syndrome and recommended he continue PT. He also received an epidural which helped quite a bit with his neck pain.

The patient is still receiving PT at this time but after 8 full treatment visits, he is now able to complete active shoulder flexion to 145 degrees prior to compensation andperform 3 full repetitions of elbow flexion prior to fatigue.

RESULTS AFTER ALL TREATMENT COMPLETED **(or current results if still being treated)**

See past report for improved ROM. At this time the patient is still limited with active elbow flexion report ing that he fatigues the most with bicep curls and is only able to complete 3 in full ROM (however at the

initial evaluation he was unable to actively complete any). We have not yet re-tested his grip strength but he continues to note longer relief of symptoms between therapy sessions and has improved overall strength. His shoulder girdle strength as a whole is still limited as he frequently compensates with his upper traps with attempting to reach overhead and complete functional tasks such as donning/doffing a coat but he has less neck pain and R shoulder pain and less radicular symptoms into his R elbow and hand. He has not had any adverse responses to treatment and is tolerating the sessions very well.

DISCUSSION

Pt is still a patient at this time so we do not yet know the full extent of his recovery and/or any other treatments from neurologist but he has already made great progress and he has had less than 10 visits.

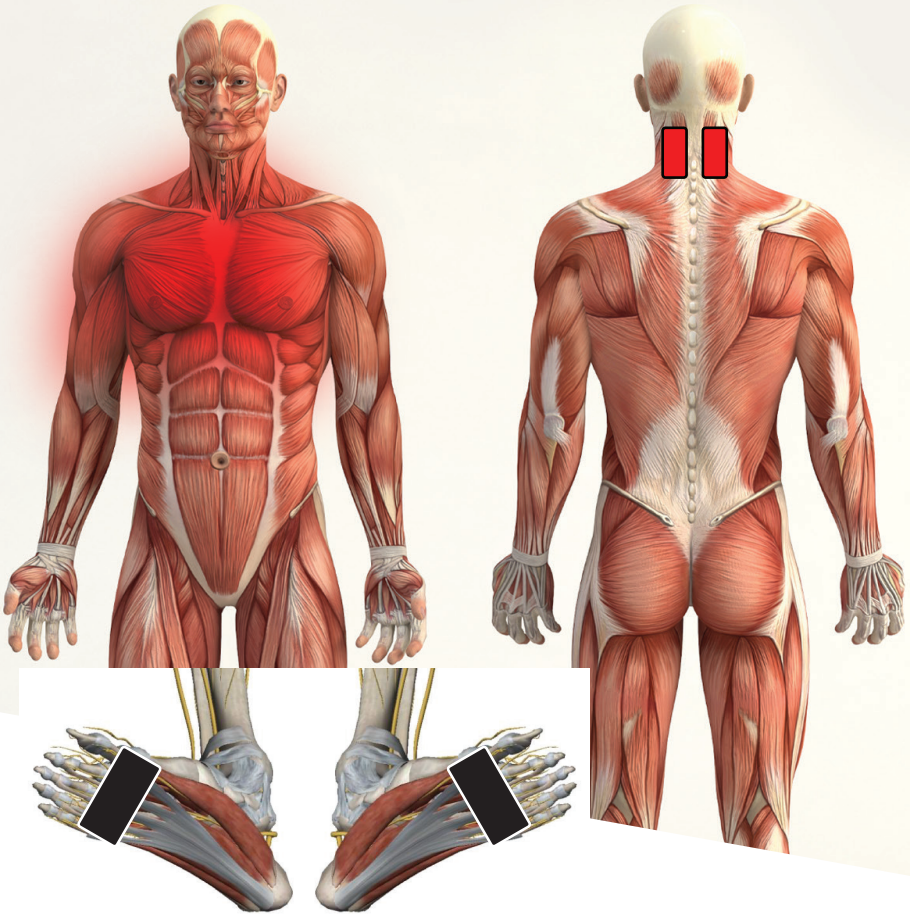
PATIENT PERSPECTIVE

The patient reports that he is so surprised that his symptoms could be relieved almost immediately every time he uses the Neubie. He is happy that his strength is starting to improve and he is optimistic that he will continue to improve and notice gains in strength, ROM and overall function of his R arm.

CASE STUDY

30-Year-Old Male With Post Viral Neuralgia

PERFORMED AT:
Self-Administered, In Home with Help From Premier Neuro Therapy using the Neubie



DIAGNOSIS:

A 30 year old man tested positive for Covid-19 on March 19th, 2020. Months later, symptoms such as fatigue, pain, soreness in the right biceps, and buring of the chest esophagus, and ribs persisted. In September of 2020, the client was diagnosed with post-viral neuralgia before inquiring about help from Premier Neuro Therapy.

SELF-ADMINISTERED TREATMENT & OUTCOME

It has been theorized that long haul Covid-19 may be related to a virus or immune-mdiated disruption of the autonomic nervous system, resulting in orthostatic intolerance syndromes[1]. One commonly used measure of autonomic nervous system function is heart rate variability (HRV). Generally, increased HRV is linked to a more balanced, better functioning, autonomic nervous system.

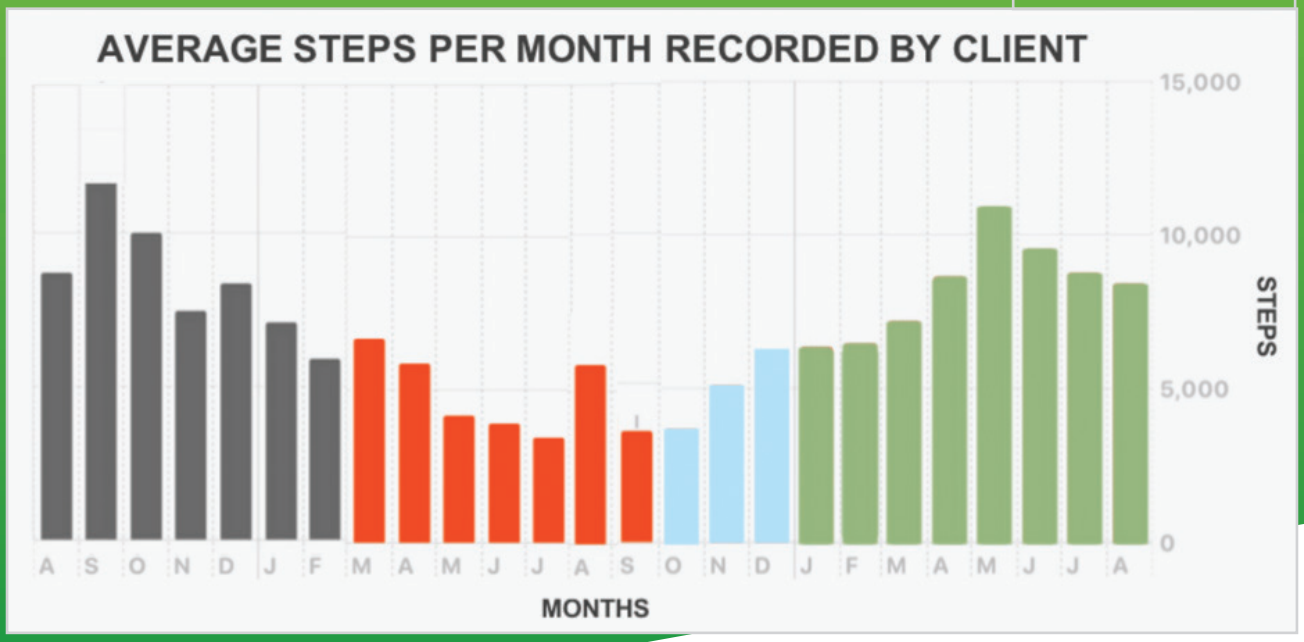
Internal data suggests that direct current electrical stimulation technology can be utilized via a protocol called the “Master Reset” to increase heart variability. Therefore, it was theorized that the Master Reset protocol may improve autonomic nervous system function and symptoms consistent with long haul Covid-19, including fatigue, pain, burning and soreness.

The Master Reset protocal directly directly stimulates the vagus nerve and other neurologically rich areas of the body, like the feet (diagram of electrode placement above). The vagus nerve controls the parasympathetic nervous system, facilitating the body’s relaxation response and affecting the perceptions of threats that lead to pain. While stimulating these areas, the client was instructed to breathe slowly and intentionally in supine position[2].

1 - Dani, M. Dirksen, A, Taraborreli, M, Panagopoulos, D, Sutton, R, Boon Lim, P, Jan 2021, ‘Autonomic dysfunction in ‘long COVID’: rationale, physiology and management strategies’, Clin Med, vol. 18, no. 1, pp.37-40.
2 – Salpeter, G 2021, The NeuFit Method: Unleash the Power of the Nervous System for Faster Healing and Optimal Performance, 1st edn, Lioncrest Publishing, pp. 208-222.

The graph below shows steps taken by the client using his "Health" mobile iPhone app before testing positive for Covid-19, after tasting positive for Covid-19, while working with Premier Neuro Therapy (PNT), and after working with PNT, not only did symptoms start to decrease in October 2020, but the client's ability to exert more energy increased without any setbacks.

NOTE: *Prior to starting work with PNT, the client felt determined to record more steps in August 2020. However, he experienced a setback due to the increased exertion, as is evidenced by September 2020 activity levels. After beginning work with PNG the client's syptoms started to decrease in Octover 2020 and he was able to exert more energy without any setbacks.*



As part of the recovery process, frequency specific microcurrent (FSM) protocols were utilized across pectoralis major and minor. FSM is a technique by which low-levels of direct current electrical stimulation are applied to the body in an attempt to relieve symptoms.

The client performed 7 self-administered Master Reset sessions per week over a 12 week period from the comfort of his own home. During the course of the self-administered in-home sessions, the client experienced improved vitality, decreased pain, decreased soreness of the right biceps, and decreased burning in the chest, esophagus, and ribs. Most notably, he reported an ability to increase activity levels without being overwhelmed by fatigue.

DISCUSSION

Prior to contracting Covid-19, the client was an active 30 year old male, avid outdoorsman, devoted husband and father to 3 children. From 2008-2013, he played football at the NCAA Division 1 FCS level.

His life was turned upside down after contracting Covid-19 long haul symptoms. Months after being diagnosed with Covid-19, there were days when small tasks like getting off the couch caused debilitating fatigue. The client reported wondering on many nights if he would make it through the night, and that it was emotinally burdensome to know that he was no longer able to be the same husband and father he once was.

Still, he was determined to find a solution, and quickly exhausted all available options offered by his physicians before contacting Premier Neuro Therapy.

Since working with the direct current stimulation technology and Master Reset protocol, the client has reported that he has been able to resume his normal active lifestyle. He is symptom free and shows no signs of turning back.

PATIENT PERSPECTIVE

Here is how he described his experience working with Premier Neuro Therapy:

"I began working with Evan at Premier Neuro Therapy to help treat side effects of post viral neuralgia. For 6 months, I was unable to engage in physical activity due to debilitating chest pain. Evan set me up with in-home therapy which provided a level of relief that I hadn't experienced in months. After 90 days, my pain levels became manageable and I was able to return to a more comfortable lifestyle. The treatment also allowed me to exercise muscle groups without physical exertion. Evan was extremely knowledgeable and innovative in his approach. He walked me through every step via virtual consultations. I highly recommend reaching out to Evan and the team at Premier Neuro Therapy for pain management support."

CASE STUDY

Using the Neubie - Pulsed DC Current Electrical Stimulation to Facilitate Muscular Strength and Hypertrophy

PERFORMED AT:
Recover Physical Therapy in Twin Falls, ID by Blaine Hawkes, using the NeuFit Method.

KEY WORDS:
trengthening, hypertrophy, muscle motor unit recruitment, electrical stimula

TREATMENT AND OUTCOME

The subject was a healthy individual seeking to improve his strength, muscle endurance, and muscle mass. He completed a 6-weekstrengthening course while using the Neubie machine on several major muscle groups on only the left side of his body, while exercises were the same on both left and right sides of his body. Strength tests and girth measurements were taken before and after interventions. The subject generally showed improved muscle strength, muscular endurance, and hypertrophy in the left side of his body where neubie electrodes were applied, in comparison to the right side where he exercised without the neubie electric stimulation.

SUBJECT INFORMATION

The subject was a healthy, 22 year old male without any known health complications. He had not been consistently exercising for several months at the beginning of the study, but did have a past history of weight lifting, distance running, and playing basketball. He felt like he was “out of shape” due to being heavily involved in his college studies and not having much time to exercise.

The “Neubie” or Neuro-Bioelectric-Stimulator is a form of NMES developed by NeuFit that has in recent years become a more

commonly used modality to facilitate physical rehabilitation in patients and to enhance fitness in athletes. The Neubie machine uses a pulsed DC current and includes a waveform that dissipates heat and charge buildup to allow for high intensity stimulation while avoiding skin irritation.

The Neubie is used for neurological optimization by sending electrical impulses to the nerves and muscles through electrode pads on the skin and stimulating muscles and nerves. It can beused during exercise or rehabilitation to facilitate optimal motor patterns and enhance muscle motor recruitment.

INTERVENTION

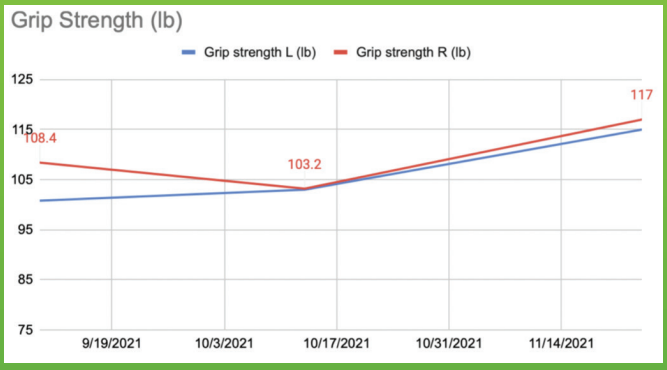
In this case report the Neubie machine was used on a healthy individual who was beginning a new strengthening program. The Neubie machine was used only on the left side of his body, while strengthening exercises were the same for both left and right sides of his body. Strength and muscular endurance tests, as well as girth measurements, were measured in both the left and right sides of his body prior to the intervention, midway through the intervention, and two weeks after conclusion of the strengthening program. The strengthening exercises were completed twice a week for 6 weeks.

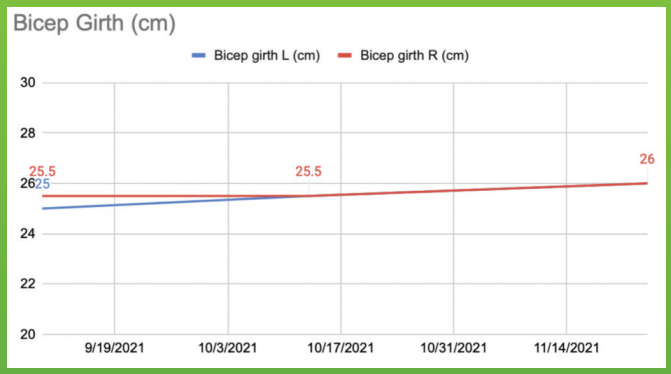
For intervention the subject completed a variety of forearm / grip resistance exercises, bicep and tricep resistance exercises, closed chain thigh strengthening exercises, and calf/ankle resistance exercises. The neubie electrodes were placed over the targeted muscle groups during resistance exercises on the left side only, while exercises were equal on both left and right sides with respect to resistance, repetitions, and technique. A licensed physical therapist guided the exercises and completed the strength and girth measurements for the study. The subject generally completed 3 sets of 10 exercises on both sides of his body. The Neubie electrodes on the left side of his body were set at 500 Hz for the first set, 40 Hz for the 2nd set, and 25 Hz for the 3rd set, with power increased to max tolerance levels.

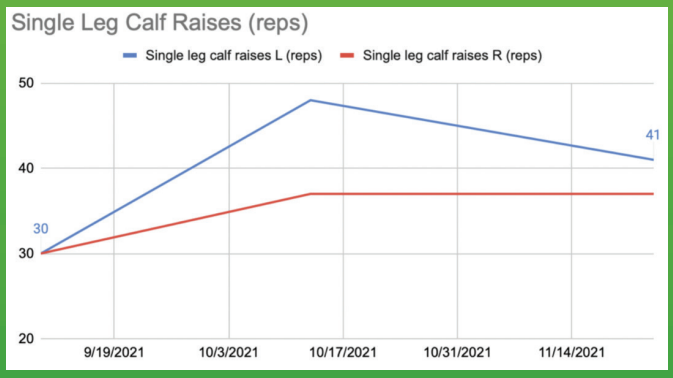
Strength and muscular endurance tests included grip strength using a hand dynamometer, 1-rep max on the Shuttle-MVP leg press machine, single-leg calf raises to max number of reps, and bicep curls with 20 lb. dumbbell to max number of reps. Girth measurements were taken of the biceps and calves.

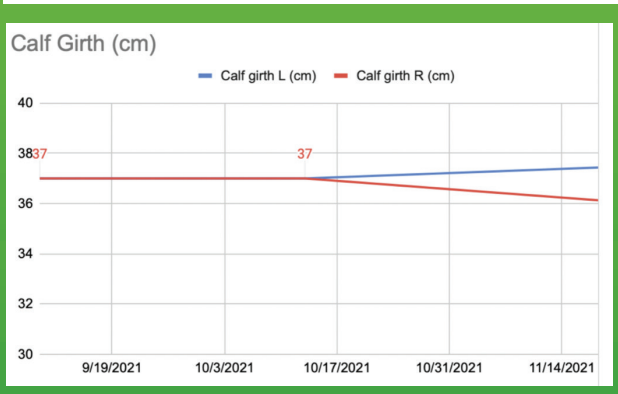
RESULTS

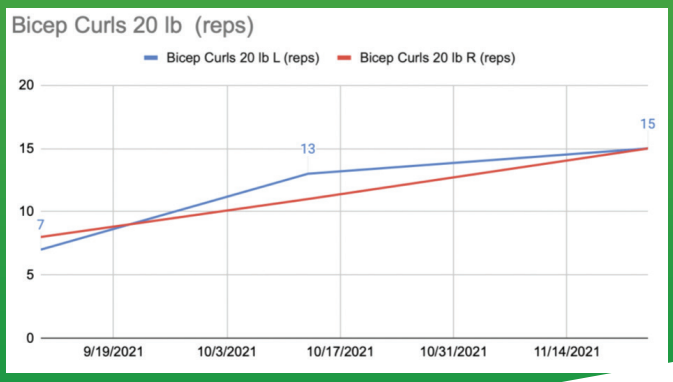
- Grip strength improved in both hands, but more dramatically in the intervention (left side) than the control (right side).
- Calf strength / muscular endurance improved in both sides, but more dramatically in the intervention (left side) than the control (right side).
- 1-rep max single leg press did not change in the control (R side) and decreased 12 lbs in the intervention (left side).
- Bicep strength / muscular endurance improved in both sides, but more dramatically in the intervention (left side) than the control (right side)
- Bicep girth measurements also increased in both sides, but more in the intervention (left side) than the right side.
- Calf girth measurements increased in the intervention (left side), and actually decreased in the control (right side











DISCUSSION

For most of the muscular strength and endurance tests, the subject made more improvement on the left side of his body where the Neubie electrodes were applied than he did on the right side of his body without the Neubie electrodes. It is also noteworthy that the mid-intervention tests showed faster improvements in the left intervention side, suggesting the Neubie may help accelerate neurological adaptations at the beginning phases of strengthening and improve muscle motor unit recruitment. Of note, the subject's post intervention strength and girth tests and measurements were delayed by 10 days because he was ill with the common cold, and he was more sedentary and not exercising for almost 2 weeks from the end of intervention to the final testing. This may have contributed to lack of progress with the 1-rep max on the leg press and the plateau in progress with the single-leg calf raise endurance test, as well as overall progress with all the post-intervention results. Despite being ill for nearly 2 weeks before the final testing he still showed good overall improvement with results

supporting the use of the Neubie e-stim application to accelerate strength gains, neurological adaptations, and muscle hypertrophy over the control side - traditional resistance training without the Neubie. This patient also showed increased girth measurements in his calf and bicep on the left intervention sides more than he did on the control side suggesting the Neubie may accelerate the hypertrophy process. The results of this case report support the use of implementing the Neubie electrical stimulation to enhance strengthening programs. Further research is needed to determine the long-term effects of exercising with the Neubie machine for strength gains and hypertrophy.

PATIENT PERSPECTIVE

"I feel the Neubie really helped to engage the muscles in the left side of my body, and I can feel the girth in my left calf is increased compared to the right side that exercised without the Neubie. Now that this study is concluded I am excited to use the Neubie on both sides of my body and continue strengthening. I really like being able to work out and get the intense muscle fatigue while lifting with lighter weights. I have felt more delayed-onset muscle soreness using the Neubie than I have with any other previous workout. The soreness in the left side of my body the day or two after working out was pretty intense, where I really didn't feel any soreness in the R side of my body, even though the exercises were the same."