CEWM
CLINICAL ELECTROPHYSIOLOGY & WOUND MANAGEMENT

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# President's Message

It is a great honor to be elected president of the Section on Clinical Electrophysiology and Wound Management and I thank you for giving me this chance to help us advance our Section. First and foremost I want to thank Pam Unger for the great job she did in leading the Section for over five years of remarkable growth. At a 1,000 members we are becoming a larger voice in our profession. It is my hope to nurture that growth while increasing member benefit and value.

The Section leadership, as directed by the Strategic Plan of 2007, has investigated the use of a professional organization to help manage the business of the Section. We have decided to contract with the APTA's component management services for the next three years. Members should soon see an improvement in the Section's ability in communications, and hopefully an increase in educational and Section sponsored course offerings.

There has been recent discussion of the perceived need for a Journal to publish peer reviewed articles related to our Section's wide array of specialties. Again, this was an item that our Strategic Plan charged us to investigate. You will soon be seeing a short survey in your email from the Section, on Survey Monkey, asking your opinion on the value of an, "on-line" or print journal. And, if you value the idea of a journal, what is your willingness to either work on its production or contribute articles for content?

With the help of our new executive director, I am hoping to work with Harriett Loehne and the Wound Management SIG to move forward on clinical specialization in wound management. We need to file an official request to pursue specialization with ABPTS and then we will be assigned a liaison from ABPTS to work with us through the process of specialization.

Our specialty arms are busy working on updated curriculum guidelines in EMG/NCV and in electrotherapy. We are planning a pre-conference course at CSM in 2011 on *EMG/NCV for Educators and Other Critical Thinkers*. (The title is a work in progress) All Section members need to be thinking about future Pre-Conference courses and other educational offerings that we could, or should be, offering as a Section.

And finally, let me issue a call to members for help. We are a growing Section with many new members. Anyone who wishes to get more involved in any aspect of our Section from clinical practice to governance please call or email me directly and I will help you get involved. We need new people and new ideas to constantly re-invigorate and focus the Section as we move forward.

Robert A. Sellin, PT, DSc, ECS
*President*

Newsletter of the CEWMS of the American Physical Therapy Association

## In this Issue

## Section Challenge to Support PT-PAC

At the Section Clinical Electrophysiology and Wound Management Business meeting at the Combined Sections Meeting in San Diego, Andrew Robinson, former Section President, challenged all Section members to each contribute to PT-PAC a minimum of $10. If all section members contributed that would be almost $10,000 to PT-PAC for this important election year to benefit friends of physical therapy in Congress.

Last year 22.1% of Section members contributed to PT-PAC. Currently only, 5.7% of Section members have donated. Please help PT-PAC's voice be heard on Capitol Hill by providing the financial support to PT-PAC that allows opportunities for APTA members and staff to talk to Members of Congress about issues that impact the profession. You may make a contribution to PT-PAC on its website at www.ptpac.org or mail a contribution to PT-PAC, 1111 North Fairfax Street, Alexandria, VA 22314.

Please help us reach our goal of every Section member contributing to PT-PAC this year. Our profession and patients need our help!

**Clinical Electrophysiology and Wound Management Section**
Michael Parker, Editor

**Editorial and Advertising Office**
**MICHAEL PARKER**
University of Mary
7500 University Drive, Bismarck, ND 58504
mparker@umary.edu

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# WMSIG Update

**Harriett B. Loehne, PT, DPT, CWS, FACCWS**
President, hloehne@earthlink.net

We had a great WMSIG meeting in San Diego on February 20, 2010, at CSM. Early risers enjoyed a delicious sit-down breakfast sponsored by KCI, for which we again offer our sincere thanks. Officers and committee chairs were introduced and gave their annual reports, and a new Nomination Committee member was elected. Members who had earned DPT degrees, CWS certifications (and re-certifications!), published, presented, and won awards were recognized. A non-inclusive list of wound management conferences in 2010 was included in the agenda.

Discussions centered around updates and additions for our website, including the possibility of a list serve; opportunities for volunteerism for Haiti for victims of the devastating earthquake; and APTA certification for wound management. We have been given permission by APTA to begin the quest for certification. As your President, I have received the application and will file it with the American Board of PT Specialties, to begin the long process. We are looking at a three to five year task. More information to come.

Several people have asked to know more about just what is the WMSIG – the Wound Management Special Interest Group. It is the only SIG of the Section on Clinical Electrophysiology and Wound Management (SCE&WM), and was created "to provide a forum where individuals having a common interest in Physical Therapy for wound management may meet, confer, and promote patient care through education, clinical practice and research, as well as multi-disciplinary dissemination of PT-based knowledge" (from our Bylaws).

Our objectives (also from Bylaws) are to:

- Foster physical therapy management of wounds based upon a scientific foundation
- Provide standards for entry-level physical therapy programs regarding the management of wounds
- Encourage and foster clinical and laboratory research
- Provide a forum for discussion of the management of wound healing among physical therapists and physical therapy assistants from the various Association sections
- Establish standards for wound assessment protocols as well as terminology relative to wound management
- Provide a framework for interaction with other health care professionals who treat wounds
- Provide a network for enhancing communication between clinicians, academicians, and researchers in the physical therapy community interested in wound management
- Submit annual and other requested reports to the Section's Executive Committee
- Adhere to Section Bylaws and Association Bylaws
- Establish a national certification examination/ Residency/Fellowship Program for a Wound Management Clinical Specialty

Membership is open to any member in good standing of the SCE&WM. There are no dues or other costs associated with membership. We welcome new members, and indeed, will be able to accomplish much more with a strong, cohesive group – especially with practice and reimbursement issues. We need and want new members! *Anyone who would like to join should contact our Membership Chair, Sharon Lucich, at slucich@clarian.org.*

Our annual meeting takes place at CSM, where elections (for three year terms) also are held. Officers are President, Vice President, and Secretary-Treasurer. Standing Committees are Nominating (members are elected), and Practice, Education, Research, and Membership. Committee members and chairs other than Nominating are appointed by the Executive Council (the officers and Committee Chairs). *Please let me know if you are interested in being on a committee – hloehne@earthlink.net.*

Email blasts are sent periodically throughout the year as events and news occur. Questions anytime can be directed to the appropriate Committee or resource.

Probably one of the best aspects of the WMSIG is getting together at CSM, seeing old friends and colleagues, and meeting new ones. CSM provides formal education, but the WMSIG informal education through exchange of ideas and networking is a real bonus. Please join us for CSM 2011 in New Orleans February 9-13!

## Combined Sections Meetings San Diego, California
## Clinical Electrophysiology and Wound Management Section
# Executive Committee Meeting Minutes

February 18, 2010
Recorded by Kathy Galloway, Secretary

**I. Vendor support**
- a. Empi is interested in supporting section
  - i. Interested in supporting research and education
  - ii. Need to designate person to talk to exhibitors as a formal role for executive committee- functioning as a vendor or commercial liaison, new business for business meeting
  - iii. Modalities IL and WA bit getting reimbursed fir electrotherapy
- b. Wound management SIG
- c. Wound international conference provided vendor funding for the section 2009

**II. Reimbursement Chair for SCEWM**
- a. Need to find someone interested, Pam Unger has been designated to do this in past
- b. May need to update web site to add FAQ

**III. APTA Contract for administrative services**
Need professional management service
- i. Email blast
- b. Incoming president will meet with APTA today – Hilton Lobby 3:00
- c. Section growing larger rapidly

**IV. Programming - Program chairs**
- a. Attendance larger than last year
- b. Acute care has programming scheduled with wound care opposite our wound care programming

**V. MA chapter would like a motion for** amendment for EMG want to change HOD policy to add diagnostic term to EMG
- a. Some concern for opening practice act
- b. May need to contact Justin Elliott regarding this issue
- c. Will this effect guide for practice and changes to normative model
- d. Resistance from educational community?

**VI. Practice committees**
- a. Normative model
- b. Changes to guide for EMG have not been implemented yet
- c. There is a change in guide to ICF language, try to transition to electronic version
- d. Need to make website changes PT portal from PTJ to develop ability to have a more dynamic guide to PT
  - i. Make it open to consumer and to professionals
- e. Consultant is looking at Guide to practice to make changes to make it more robust
- f. Pace of progress for guide changes is slower than originally anticipated
- g. Mary Fran is the contact person for guide to practice

**VII. Practice chair-EMG**
- a. Reviewed guide for wording edits, input from SACE
- b. Concern about EMG wording and position statement for education programs
- c. Develop list of persons who are willing to support EMG education for entry level programs
- d. Develop on line programs for entry level education
- e. Training the trainer for EMG as a pre-conference course
- f. Consider resource guide for EMG at entry level instruction with objectives for instruction
- g. Can use learning management system for CEUs. Can provide program on line contact Marilyn Phillips, need to have program together
- h. Educational guidelines for EMG-have edited
  - i. Foundational information i.e. anatomy and physiology, focused on format specific to EMG
- i. TX- workers comp chair found AANEM guidelines to find out that only MDs can do EMG
  - i. We need a statement that says PTs can do this
  - ii. Combine with ACE and SCE to establish this statement

**VIII. Wound chair SIG**
- a. Consider pre-conference in sharp debridement; CWS information, teaching debridement and reimbursement issues
- b. AAWM, CWS board- wants a board just for PTs. Is APTA able to provide wound care specialist?
- c. WM SIG will submit by-law change to job title for education chair/and VP

**IX. Presidents meeting**
- a. Moving forward magazine- practice tips
- b. Contact sections, some may not have been appropriate
- c. Appointed pool process to get on a committee i.e. Self-nominating. Need to go online to nominate by January on website APTA members appointed positions, need to renew every year
- d. Committee and task force appointments in March get input from staff and board to fill committee.
- e. Sometimes have shorter projects- looking or project teams- going forward to develop task force for liaisons to look for recommendations to decide who can work on task force
- f. Student representative – want to send student to federal advocacy forum- consider sending student who is a member of SCEWM
- g. Conference in April in DC/Alexandria

## Combined Sections Meeting, San Diego, California
## Section on Clinical Electrophysiology and Wound Management Section

# Annual Business Meeting Minutes

February 19, 2010
Recorded by Kathy Galloway, Secretary

**I. Welcome**
**II. Approval of Agenda**
**III. APTA PAC Presentation**
**IV. Secretary's Report**
- a. Approval of Minutes from 2009 Annual Meeting

**V. Treasurer's Report**
- a. Approval of Treasurer's report - see attached

**VI. President's Report**
- a. Administrative services contract will continue process with incoming president
- b. Section reimbursement challenges may be emerging in wound care with debridement and electrotherapy for wound healing
- c. EMG issues in TX with workers compensation

**VII. Program Chairs Report**
- a. Call for abstracts and proposals will be open in the coming months
- b. New program chair- Stephanie Wollfel
- c. KCI (1000.00), Kalypto medical (1500), Nethealth (500), Empi (1500) sponsored our programming this year
- d. 2011 programming, submit through scholar one. The presenter needs to submit the programming, deadline April 1 for proposals and June 1 for platforms

**VIII. Publications Chair Report**
- a. Newsletter issues
  - i. Proposal that there be a call in newsletter to submit to PAC
  - ii. Mike Skurja recommends consideration of restarting journal of clinical electrophysiology
  - iii. Sonny Mills proposes on line journal combined with ACE
  - iv. Member proposal to attach journal to PT journal on a periodic basis
  - v. April issue is hard copy – with abstracts published
  - vi. August and Dec is electronic copy
  - vii. Sending electronic copies in smaller batches to avoid spam blocker
  - viii. Needs timely articles and submissions
  - ix. Advertising- needs to increase and focuses on dependability so that articles are to be submitted by deadlines as posted on website and are published in the April issue
  - x. President asked to write a letter to editor of PT journal to request possible special issue for our section per board liaison

**IX. Committee Reports**
- a. Membership
  - i. Went to student conclave and redesigned display board
  - ii. Posted pictures of students. Needs new pictures from EMG and electrotherapy groups
  - iii. Booth also at annual conference
  - iv. Triangle highlighters presented
  - v. Consideration of member only section on website
  - vi. Send updates to Karen Gibbs
  - vii. Pictures from CSM, National conference and student conclave submitted
  - viii. Consider list serve to allow members to communicate easily – motion made and approved
  - ix. Great response at student conclave – committee recommends continue taking booth to this meeting - motion made to continue this motion approved for taking both to annual (Boston) and student conclave (Cherry Hill NJ)
  - x. Volunteers requested for booth support at annual and
  - xi. Section Polo's are still available $30.00
  - xii. Suggestion to consider list serve just for students in the section
- b. Nominating
  - i. Election results
    1. President Bob Sellin
    2. Pub chair Mike Parker
    3. Program chair Stephanie Wollfel
  - ii. New bylaws were approved
    1. Changes- article to solicit nominations in August
    2. November issue will publish slate of candidates
    3. Ballots either electronic or by mail
    4. Elections are on cycles
       - a. Cycle II is upcoming year – elect VP, treasurer and secretary and 2 nominating positions
       - b. Nominations
         - i. Can send by email to nominating committee
       - c. Research chair
         - i. Platform and poster sessions were well presented
         - ii. Few submissions

**X. Practice Committee Reports**
- a. Electrotherapy
  - i. Many questions regarding re-imbursement and legal issues regarding electrotherapy

*Continued on page 6*

**CEWM Minutes**

*Continued from page 5*

ii. Forum on Saturday with agenda to update guidelines
iii. Develop pool of white papers
iv. Need to collect evidence and promote more critical research

b. Electrophysiologic
i. AJ Robinson-
1. EMG panel completed review of guide to pt practice to make editorial changes to the guide
2. Will not support MA HOD motion to add diagnostics to our HOD description to practice
3. Updated educational guidelines as a basis for making changes to normative model
4. Future planning pre-conference course for training the trainer EMG course
5. Develop roster of EMG resource teachers to present EMG content in entry level programs

ii. Justin Elliot
1. No legislation introduced this year to prohibit PT EMG practice
2. AANEM may pursue different options by prohibiting payment unless clinic follows AANEM guidelines

c. WMSIG
i. Harriet Loehne
ii. Wound management programming increased at national conference
iii. Would like to update website and adding answers for frequent questions and communication
iv. Will try to add list serve
v. Has been sending out e-blasts
vi. Home health league some conflicts with program scheduling with our section

XI. Old Business
XII. New Business
a. Newly elected officers presented to membership- asked to agree to serve
b. Outgoing president presented award for appreciation – many thanks
c. Member – John Halle- Suggest awards for students and members for appreciation
d. New policy- members of more than one section, will credit all sections equally so will increase revenues for our section
e. Will negotiate for administrative support to help with support through the APTA- may need to generate more revenue to pay for this service. Hopefully will improve ability to provide service and education for members
f. Pam Unger will continue to serve for reimbursement chair, but is open to sharing the role. Contact Pam if interested
g. Manufacturers liaison to assist with sponsorship from vendors
h. Administrative support can put together a marketing packet

X. Adjourn

# Meryl Roth Gersh, PT, PhD and Pamela Unger, PT, CWS to Receive the Lucy Blair Service Award in 2010

**By Robert A. Sellin, PT, DSc, ECS**
President, Section on Clinical Electrophysiology and Wound Management

The *Lucy Blair Service Award* was established in 1969 to honor the contributions of Lucy Blair, who served the Association in innumerable ways. The purpose of the award is to acknowledge and honor members of the Association whose contributions to the Association as a whole, at both the Association level and the component level, like those of Lucy Blair, have been of exceptional value.

In addition to the information provided in the APTA Board of Directors' Policy on Honors and Awards, Guiding Principles for Honors and Awards, APTA Board policy provides the following criteria for selection for the *Lucy Blair Service Award*:

1. Contributions should be of exceptional value to the Association:

A. May be in the realm of any area(s) of concern to the Association as a whole, or to the Association's components.

B. May be those made through an individual's service on one or more elected or appointed groups, or in one or more elected or appointed positions, and/or in one or more other capacities at the Association level and component level.

C. Will be judged on the basis of the results of an individual's service, and not merely the duration or continuity of that service. Meryl and Pam will be honored with the award at the National Meeting in Boston in June. All Section members are encouraged to attended and join in the celebration of Meryl and Pam's many contributions to the Section and our profession.

# EMG Corner

**By Jeff Slear**
PT ECS

The news on the EMG front is like, most things, both good and not so good. Justin Elliott, associate director of state government relations in **APTA's** Government Affairs Department, recently reported at CSM 2010 in San Diego that he is not aware of any new issues that have arisen since the last newsletter.

He expressed hope that this would continue.

In the area of not so good, section member Greg Ernst PT, PhD, ECS, SCS, ATC and Assistant Professor/Interim Chair, Dept of Physical Therapy at University of Texas Health Science Center, San Antonio provided the following. "The Division of Workers Compensation (DWC) in Texas has noted a problem with the quality of electrophysiologic studies performed by providers in the state. This prompted the DWC Medical Advisor to seek out guidelines for provider qualifications to perform electrophysiologic studies. The only guidelines he was able to find were those published by the American Association of Neuromuscular and Electrodiagnostic Medicine. These guidelines state that the provider should be a physician. A different physician associated with the DWC in Texas has communicated with the DWC Medical Advisor that physical therapists are also highly trained, quality providers of electrophysiologic tests. At this time, we don't believe that that the DWC has changed their Official Disability Guidelines to reflect this change in who can and who cannot provide clinical electrophysiologic studies for workers compensation patients in Texas. Section members in the state of Texas will be working with the DWC to communicate the level of the physical therapist's training and qualifications to perform electrophysiologic studies. Incidents like this highlight the need for the section to publish its own practice guidelines not only on the qualifications of the clinician performing electrophysiologic studies, but also in all areas of the field so that our section can be viewed as an authority and provider of quality recommendations. Section members have already drafted some guidelines that are under review."

As always, if any of the membership has issues in regards to EMG/NCV practice you are urged to contact Justin Elliott at APTA or the Section President, Robert Sellin.

# Welcome New Members

**August 12, 2009 to March 24, 2010**

Dianne Miller
Candace Atwood
Adrienne Mingle
Elysia Smith
Thomas Joseph Foronda
Kristen Vrooman
Katherine Bryan
Eric Marshall
Fabian Tobar
Whitney Main
Vadim Ciobanu
Bridget Flores
Debbie Van Slooten
Gloria Choperena
Megan Rowan
Michella Castrataro
Seth Harper
Al Melendez
Ryan Stahler
Christopher Adkins
Anna Mercante
Deborah Allen
Michaleen Thompson
Celia Herrera
Jose Mejia
Bryan Dietsch
Joy Hewitt
Ashley Greenman
Benjamin Forman
Ashley Wichert
Amanda Sheley
Jerry Franco
Andrew McAbery
Sharon Whitmer
Lindsey Adler
Eloy Garcia
Christopher Sbertoli
Amanda Wingo
Priscilla Mendoza
Bill Janota

# Nominating Committee Report

The torch of leadership for the CEWM Section passed from Pam Unger to Robert Sellin at CSM, according to the Cycle 1 election process in the 2009 Revised By-Laws. In addition, Program responsibilities were passed from Karen Albaugh to Stephanie Woelfel. And Michael Parker continues to serve as Publications Chair. Special thanks to all of you for serving the Section so expertly!!! During Cycle 2 (this year), the following executive positions will be elected in 2010, scheduled to take office in 2011: Vice-President, Secretary, Treasurer, and 2 Nominating Committee positions. The slate will be published in the November newsletter and elections will be held in December.

Anyone interested in serving the Section in one of these positions, or in nominating someone else (with that individual's permission), should send the name and position to Rose Hamm at rhammpt@msn.com. All nominees will be carefully considered by the Nominating Committee and a slate of qualified Section members will be submitted to the Membership in November. Thank you to all who give of their time and expertise to make our Section so outstanding.

Rose Hamm, *Committee Chair*
Sharon Lucich
Lisa Van Loos

# CSM Platform Presentations

## Clinical Electrophysiology and Wound Management Section

San Diego, California
Friday, February 19, 2010

### Platform Presentation #1
**(1:00 to 1:15)**

**TITLE:** Altering the timing of high (HFS) and low frequency (LFS) transcutaneous electric nerve stimulation to skin located contralateral to a nerve injury differentially alters allodynia and dorsal horn neurotransmitter content in rats.

**AUTHORS (LAST NAME, FIRST NAME):** *Somers, David L.*[1]; Clemente, F. Richard[1]

**INSTITUTIONS (ALL):** 1. Physical Therapy, Duquesne University, Pittsburgh, PA, USA.

**Abstract**

**Purpose/Hypothesis :** Using a rat model of neuropathic pain, we previously reported that combining HFS and LFS through delivery on alternate days reduced mechanical allodynia and altered dorsal horn neurotransmitter content. The purpose of the present study was to determine if changing the frequency or onset of this treatment as might be done clinically would alter the stimulation-induced reduction of allodynia and alterations in dorsal horn neurotransmitter content in neuropathic rats.

**Number of Subjects :** 117 rats.

**Materials/Methods :** 97 rats received a chronic constriction injury (CCI) to the right sciatic nerve. On the day of surgery, 23 of these rats received either (determined randomly) HFS or LFS for one hour to skin and acupuncture points, respectively, located contralateral to the nerve injury. On the day after surgery, rats received the treatment they did not receive the previous day. This pattern (alternating HFS/LFS) was repeated for a total of 12 days of treatment (ALT group; data for these rats was previously presented). 11 CCI rats received the same treatment pattern commencing on the day after surgery (DELAY group). 19 CCI rats received daily alternating HFS/LFS interrupted with a day of rest every third day (REST group). 20 CCI rats received HFS and LFS simultaneously everyday commencing on the day of surgery (SIMUL group). The remaining 24 CCI rats were untreated (CCI group) and 20 rats did not receive a CCI or treatment (NAIVE group). Mechanical pain threshold of the right paw was assessed prior to the CCI and again 12 days after CCI or on an analogous day if no CCI occurred. Neurotransmitter content for the right and left dorsal horn was assessed with HPLC and expressed as ug/mg of protein. Mean pain threshold and neurotransmitter content were compared between groups using an ANOVA and post-hoc pair-wise comparisons. Alpha was 0.05 for all statistics.

**Results :** Mean mechanical pain threshold was increased in the ALT and REST group over that seen in the CCI group. There was no difference between right and left dorsal horn content of aspartate (Asp), glutamate (Glu), glycine (Gly) and gamma aminobutyric acid (GABA) in any group examined. When right and left dorsal horn content of neurotransmitters was averaged and the groups compared, mean Asp, Glu and Gly, but not GABA, was increased (41-51%) in the ALT group when compared to the CCI group.

**Conclusions :** While combining contralateral daily HFS or LFS on alternating days reduces mechanical allodynia, delaying the onset of treatment as might occur in the clinic or delivering the two frequencies of stimulation simultaneously reverses the effectiveness of the treatment. Only the most effective treatment produced significant changes in dorsal horn neurotransmitter content.

**Clinical Relevance :** We believe TENS effectiveness may be significantly altered by the onset and timing of treatment.

**KEYWORDS:** TENS, Neuropathic pain, Neuropathy.

### Platform Presentation #2
**(1:15 to 1:30)**

**TITLE:** Interferential and Burst-Modulated Biphasic Pulsed Currents Yield Greater Torque than Russian Current

**AUTHORS (LAST NAME, FIRST NAME):** *Bellew, James W.*[1]; Beiswanger, Zach[1]; Freeman, Erica[1]; Gaerte, Carrie[1]; Trafton, Jane[1]

**INSTITUTIONS (ALL):** 1. Krannert School of Physical Therapy, University of Indianapolis, Indianapolis, IN, USA.

**Abstract**

**Purpose/Hypothesis :** Neuromuscular electrical stimulation (NMES) is commonly used to increase strength. Russian current (i.e. 2500Hz burst modulated alternating current) and biphasic pulsed current (BP) are popular waveforms for NMES. Interferential current (IFC), (i.e. amplitude modulated alternating current) can elicit skeletal muscle contraction and has been used for NMES. Previous data examining torque generating capabilities of Russian, BP, and IFC have reported significantly less torque when using IFC. However, IFC was delivered with a 4000Hz carrier frequency yielding 125usec phase durations and was compared to 200usec phase durations of the Russian and BP currents. Comparison of the torque generating capability of currents of unequal phase duration is precarious and casts doubt on previous data suggesting significantly less torque production when comparing IFC to Russian and BP currents. Therefore, the purpose of this study was to examine the torque generating capability of Russian, BP, and IFC using a common 200usec phase duration.

**Number of Subjects :** Twenty-three young adult men and women (23±1.8 yrs) without orthopedic or neuromuscular compromise were examined.

**Materials/Methods :** Subjects completed a pre-testing familiarization session during which; 1) maximal voluntary isometric torque (MVIT) of the dominant leg knee extensors was measured, 2) optimal electrode location sites were determined, and 3) subjects experienced a maximally elicited contraction with each waveform. The three waveforms were tested in randomized order one week apart and were administered from the same multi-waveform generator with a maximal current output of 100mA. Russian current was a 2500Hz alternating current (200usec phase duration) burst modulated at 50Hz using 10msec burst duration and 10msec interburst interval. BP current was a symmetrical biphasic square wave (200usec phase duration) delivered in bursts at 50Hz. Quadripolar IFC was delivered via four electrodes using alternating currents of 2500 and 2550Hz yielding a 50Hz beat frequency (200usec phase duration). Subjects were placed supine with the knee at 45 degrees of flexion. Three maximally tolerated contractions were recorded at each session. Torque evoked up to 100mA of current was compared to the MVIT to determine the %MVIT for each current. All data met criteria for normality and were analyzed using a one-way repeated measures ANOVA with post-hoc testing.

**Results :** The overall ANOVA showed significance for the main effect of waveform ($F=39.25$, $p<.001$) and an observed effect size of 0.789. The mean %MVIT elicited with IFC (66.1%) and BP (62.5%) were significantly greater ($p<.001$) than that elicited with Russian (35.8%). No difference was noted between IFC or BP currents.

**Conclusions :** Using similar phase duration of 200usec for all currents, IFC and BP elicited significantly greater knee extension torque than Russian current.

**Clinical Relevance :** With 200usec phase duration, IFC may be a viable waveform for NMES providing greater muscle activation than once considered and more torque than Russian current.

**KEYWORDS:** Electrotherapy, Russian, Interferential.

### Platform Presentation #3
**(1:30 to 1:45)**

**TITLE:** Median and Ulnar Neuropathies in U.S. Army Dental Assistants (68E) at the Onset of Training

**AUTHORS (LAST NAME, FIRST NAME):** Greathouse, David G.[1]; Shaffer, Scott W.[1]; Moore, Rebecca[1]; Foo, Shannon[1]; Henry, Nathan E.[1]; *Moore, Josef*

**INSTITUTIONS (ALL):** 1. U.S. Army-Baylor Univ Doctoral Program in Physical Therapy, San Antonio, TX, USA.

**SPONSOR NAME:** David Greathouse

**Student Category:** Not a Student

**Abstract**

*Continued on page 9*

**Abstracts**

*Continued from page 8*

**Purpose/Hypothesis :** Dental personnel including dentists, dental hygienists, and dental assistants have been reported as having a high prevalence of upper-extremity musculoskeletal disorders, including carpal tunnel syndrome (CTS). Previous research has not involved dental assistant students at the onset of dental training. Therefore, the purpose of this study was to determine the presence of median and ulnar neuropathies in U.S. Army dental assistants at the onset of their training.

**Number of Subjects :** Fifty-five U.S. Army soldiers (28 females, 27 males) enrolled in the dental assistant (68E) course, volunteered to participate in the study. The mean age of the dental assistant students was 24 +/- 7.2 years (range 18-41). There were 45 right handed dental assistant students, and the mean length of time in the U.S. Army prior to dental training was 27 months (range 3-180 months).

**Materials/Methods :** Subjects were evaluated during the first week of their 10-week 68E course. Subjects completed a history form, were interviewed, and underwent a physical examination. Electrophysiological status of the median and ulnar nerves of both upper extremities was obtained by performing motor and sensory nerve conduction studies (NCS). Descriptive statistics for subject demographics and nerve conduction study variables were calculated.

**Results :** Six of the 55 subjects (11%) presented with abnormal electrophysiologic values suggestive of median mononeuropathy at or distal to the wrist. Five of the subjects had abnormal electrophysiologic values in both hands. Four of these 6 subjects had clinical examination findings consistent with the electrophysiological findings. The ulnar nerve electrophysiologic assessment was normal in all subjects sampled.

**Conclusions :** The prevalence of median mononeuropathies in this sample of U.S. Army dental assistants at the onset of training is greater than 5% prevalence reported in previous healthy populations and is less than 26% prevalence in previous research examining US Army dental assistants with dental work experience.

**Clinical Relevance :** Median neuropathy at or distal to the wrist has been reported in dental personnel including dentists, dental hygienists, and dental assistants, and is also prevalent in this sample of dental assistants at the onset of training.

**KEYWORDS:** carpal tunnel syndrome, nerve conduction studies, electrodiagnosis.

## Platform Presentation #4 (1:45 to 2:00)

**TITLE:** Neuromuscular electrical stimulation for quadriceps recovery after TKA without an isokinetic dynamometer

**AUTHORS (LAST NAME, FIRST NAME):** *Bell, Karla A.*[1]; Manal, Tara[1]

**INSTITUTIONS (ALL):** 1. Physical Therapy, University of Delaware, Newark, DE, USA.

**Abstract**

**Background & Purpose :** The number of TKA surgeries is rising steadily. One big contributor to long-term functional impairments with this population is quadriceps weakness (Mizner et al, 2005). Neuromuscular electrical stimulation (NMES) has been shown to be beneficial in adjunct to other strengthening interventions for the quadriceps muscle group. NMES dosage for strengthening is usually provided as a percentage of force elicited electrically. Fitzgerald et al demonstrated success with NMES in the ACL population when force output was not monitored. This case describes success in using NMES for quad strengthening after TKA in physical therapy facilities without isokinetic equipment to provide feedback of forces generated.

**Case Description :** A 48 y/o financial manager and avid recreational tennis player was evaluated 2 weeks after bilateral (B) total knee arthroplasty. Physical therapy evaluation revealed active/passive range of motion (A/PROM) R knee ext lacking 4°/lacking 2°-flex 91°/95°, L knee ext lacking 5°/lacking 3°-flex 85°/89°. Patellar joint mobility was limited inferiorly and superiorly B, and laterally R. Manual muscle testing revealed B hip musculature (gluteus medius, gluteus maximus, iliopsoas, and adductors) to be 4 to 4+/5. His gait utilizing a walking stick was antalgic with decreased heel strike B, flexed knee posture without use of terminal knee extension, decreased push-off B. He utilized a stepto technique with rail use on stairs. Maximum volitional isometric contraction (MVIC) testing at 75° revealed R 192N, and L 335N. Utilizing this clinic's own database of quad force output data of age-matched subjects, his norms were predicted to be around 1100N. This resulted in a 17% quadriceps index (QI) R, and a 30% QI L. His knee outcome scale (KOS) was 41% and his global rating scale (GRS) was 60%. Physical therapy treatment focused on pain management, P/AROM, patellar mobility, quadriceps strengthening, gait and functional mobility training, and HEP instruction for pain management, ROM, strengthening, and monitoring swelling. NMES to B quads was performed every treatment starting at initial evaluation. He was positioned supine on the mat with B lower extremities belted in 30° of flexion for the first 4 sessions of NMES, then in full extension as tolerated. His MVICs on B quadriceps at rechecks were: visit 12 - R 539N, L 739N; visit 15 - R 735N, L 705N; visit 18- R 925N, L 950N; and visit 19- R 985N, L 950N.

**Outcomes :** His discharge data: A/PROM R knee ext hyper 1°/3°- flex 117°/123°. L knee A/PROM measured ext 0°/hyper 2°-flex 118°/123°. QI utilizing MVICs compared to age-matched normative data were R 92%, and L 86%. His KOS was 77% and GRS 90%. He returned to recreational tennis on a progressive level without flares in pain within 3 months of surgery.

**Discussion :** Although the dosage of the NMES is unknown with force output data, he showed progress in quad strengthening as evidenced by interval MVIC data. This case is an example of success in quad strengthening utilizing NMES when force output data is unavailable.

**KEYWORDS:** quadriceps strengthening, neuromuscular electrical stimulation, total knee arthroplasty.

## Platform Presentation #5 (2:00 to 2:15)

**TITLE:** Improved Healing Rate with Pulsed Shortwave Diathermy in a Patient with Lymphedema and Venous Insufficiency Wounds

**AUTHORS (LAST NAME, FIRST NAME):** *Van Kleunen, Amy C.*[1]; Oman Jegier, Sally[2]; *Kosmala, Anita*[2]

**INSTITUTIONS (ALL):** 1. Physical Therapy, University of the Sciences in Philadelphia, Philadelphia, PA, USA. 2. Rehabilitation, Langhorne Gardens, Langhorne, PA, USA.

**Abstract**

**Background & Purpose :** Trophic changes associated with venous insufficiency result from microvascular ischemia and edema formation due to increased capillary permeability and insufficient lymphatic drainage. Chronic venous insufficiency (CVI) can progress to lymphedema and skin ulcerations as the disease advances. Therefore it is logical that the treatment for these wounds would involve interventions directed at managing the edema which is contributing to inadequate blood supply, tissue anoxia, and cell death. There is evidence for the use of compression for edema management in patients with CVI, and complete decongestive therapy is considered the standard of care for patients with lymphedema. However, some patients fail to respond to these traditional treatments and may benefit from adjunctive modalities. Electromagnetic therapy uses a pulsed magnetic field to induce current in the tissue, thereby changing cell membrane permeability and reducing edema. Although pulsed shortwave diathermy (PSWD) is approved for use with chronic wounds, there is limited evidence for the effectiveness of PSWD with wounds related to CVI and lymphedema. The purpose of this case report is to examine changes in healing rate with sub-thermal PSWD for a chronic wound secondary to venous insufficiency and lymphedema.

**Case Description :** An 83 year old male was admitted to a Skilled Nursing Facility following right hip hemiarthroplasty and kyphoplasty at three vertebral levels. His past medical history included CVI and lymphedema in bilateral lower extremities, and a non-healing stage III wound on lateral left lower leg which had been present for 5 years. Previous wound treatment included various dressings, debridement, and hyperbaric oxygen, with little to no

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improvement.

The patient received traditional wound care and complete decongestive therapy (manual lymphatic drainage, multilayer short-stretch bandages, exercise, and skin care) over a period of 20 weeks. In addition, during weeks 4-10, the patient received 39 sub-thermal PSWD treatments directly over the wound for 30 minutes each (27.12 MHz; pulse duration 65 µsec; pulse rate 400pps). At the conclusion of week 10, diathermy was discontinued due to the formation of excess granulation tissue.

**Outcomes :** Prior to the initiation of PSWD the wound demonstrated heavy drainage, with strikethrough twice per day. During the period when the patient was receiving PSWD, drainage improved with no strikethrough evident. The percent rate of change averaged +12.51% per week during the period that the patient was receiving the PSWD, and -11.93% per week during the period after the PSWD was discharged.

**Discussion :** There is currently limited evidence for the use of PSWD with ulcers related to CVI and lymphedema. This case report provides evidence of accelerated wound healing and improved edema management (as evidenced by decreased drainage) during the period in which PSWD was used. Further studies should examine the outcomes of using PSWD for the treatment of wounds associated with CVI and lymphedema.

**KEYWORDS:** wound, diathermy, lymphedema.

## Platform Presentation #6

**(2:15 to 2:30)**

**TITLE:** Rapid Wound Closure Following Intra-Wound Electrical Stimulation in a Single Patient with Tetraplegia Secondary to Spinal Cord Injury

**AUTHORS (LAST NAME, FIRST NAME):** *Farrell, Elizabeth*[1]; McDonald, John[1]; Becker, Daniel [1]

**INSTITUTIONS (ALL):** 1. International Center for Spinal Cord Injury, Hugo Moser Research Institute, Kennedy Krieger Institute, Baltimore, MD, USA.

**Abstract**

**Background & Purpose :** Electrical stimulation (ES) is used to expedite healing of chronic pressure ulcers in patients with spinal cord injury (SCI). However, the most effective ES treatment paradigm to facilitate wound healing has yet to be established. Additionally, the use of ES as an early intervention to treat acute pressure wounds is not well documented in the literature. The purpose of this report is to describe the use of ES to facilitate wound healing of an acute sacral pressure ulcer in a patient with tetraplegia.

**Case Description :** A 19 year- old man presented five weeks following traumatic SCI for acute rehabilitation with C4 tetraplegia ASIA impairment scale C. He had an acute Stage 2 sacral pressure ulcer, measuring 3.0 cm x 1.0 cm x 0.5 cm. The patient received intra-wound high voltage ES for 45 minutes twice daily each weekday and one time each weekend. ES was applied with positive polarity, frequency of 100 – 120 pulses per second (pps), and intensity of 56 mA.

**Outcomes :** The pressure ulcer healed completely following eight weeks of ES. The ulcer improved from 11 out of 17 on the Pressure Ulcer Scale for Healing (PUSH) Tool to 0 out of 17. This area remained closed at six month follow up.

**Discussion :** This report suggests that the use of intra-wound high voltage ES as an early intervention may expedite healing of acute sacral pressure ulcers.

**KEYWORDS:** Wound Healing, Electrical Stimulation.

## Platform Presentation #7

**(2:30 to 2:45)**

**TITLE:** A Meta-analysis of The Efficacy of Phototherapy in Tissue Repair

**AUTHORS (LAST NAME, FIRST NAME):** *Fulop, Andras*[1]; Dhimmer, Seema[1]; DeLuca, James[1]; Johanson, David[1]; Lenz, Richard[1]; Patel, Keyuri[1]; Douris, Peter[1]; Enwemeka, Chukuka[1]

**INSTITUTIONS (ALL):** 1. Department of Physical Therapy, New York Institute of Technology, Jamaica, NY, USA.

**Abstract**

**Purpose/Hypothesis :** The determine the effect of phototherapy on tissue repair by aggregating the literature and using statistical meta-analysis to analyze pertinent studies published between 2000 and 2007.

**Number of Subjects :** Twenty-three articles met the inclusion criteria proposed in the analysis.

**Materials/Methods :** Related original studies were gathered from every available source. Then, the papers were screened and coded; those meeting pre-established inclusion criterion were subjected to meta-analysis, using Cohen's d. statistic to determine treatment effect size.

**Results :** Seventy effect sizes were computed from the 23 papers that met the inclusion criteria. The overall mean effect size obtained was highly significant, d = +1.94 (95% confidence interval = 0.58 – 2.50). Further analyses revealed a similarly positive effect of phototherapy on tissue repair in experimental animal studies; d = +2.60, and a small to moderately positive effect in human cases of tissue repair, d = + 0.34. The Fail-Safe number associated with the overall effect was 869; i.e., the number of additional studies-in which phototherapy has negative or no effect on wound healing—needed to negate the overall large effect size of +1.94. The corresponding Fail-Safe numbers for experimental animal and human tissue repair studies were 612 and 64, respectively.

**Conclusions :** These findings indicate that phototherapy is a highly effective form of treatment for tissue repair; with stronger supporting evidence resulting from experimental animal studies than human studies.

**Clinical Relevance :** Our findings support the clinical application of phototherapy for wound care.

**KEYWORDS:** Wound Healing, Tissue Repair, Laser Phototherapy.

## Platform Presentation #8

**(2:45 to 3:00)**

**TITLE:** A Meta-analysis of the Efficacy of Phototherapy on Pain Relief

**AUTHORS (LAST NAME, FIRST NAME):** *Fulop, Andras*[1]; Dhimmer, Seema[1]; DeLuca, James[1]; Johanson, David[1]; Lenz, Richard[1]; Patel, Keyuri[1]; Douris, Peter[1]; Enwemeka, Chukuka[1]

**INSTITUTIONS (ALL):** 1. Department of Physical Therapy, New York Institute of Technology, Old Westbury, NY, USA.

Abstract

**Purpose/Hypothesis :** To test the null hypothesis that contemporary treatments with phototherapy have no significant positive effect on pain relief.

**Number of Subjects :** Twenty-two articles met the inclusion/exclusion criteria for this meta-analysis.

**Materials/Methods :** To ascertain the overall effect of phototherapy on pain, we aggregated the literature and subjected the studies to statistical meta-analysis. Relevant original studies were gathered from every available source and coded. Papers that met pre-established inclusion criteria were subjected to meta-analysis, using Cohen's d statistic to determine treatment effect sizes.

**Results :** The 52 effect sizes computed from 22 papers that met the inclusion criteria yielded a highly significant overall mean effect size; d = +0.84 (95% confidence interval = 0.44 to 1.23). The effect size remained significant even when a high outlying d-value was conservatively excluded from the analysis; d = +0.66 (95% confidence interval = 0.46 – 0.86). The Fail-Safe number associated with the overall treatment effect, i.e., the number of additional studies in which phototherapy has negative or no effect on pain needed to negate the overall large effect size of +0.84, was 348.

**Conclusions :** These findings warrant the conclusion that phototherapy effectively relieves pain of various etiologies.

**Clinical Relevance :** The use of phototherapy for the management of pain in the clinical rehabilitation setting is indicated.

**KEYWORDS:** Pain, Phototherapy, Laser Therapy.

San Diego, California
(Posters were presented from 11:00 am to 12:30 pm, on Friday, February 19)

**TITLE:** The Experiences of Persons Who Have Undergone Limb Salvage and Secondary Amputation

# CSM Poster Presentations

## Clinical Electrophysiology and Wound Management

**AUTHORS (LAST NAME, FIRST NAME):** *Mincer, Andi B.*[1]; Balducci Hilton, Lou Ann[1]; Barcio, Rachel [1]; LeSage, Leslie[1]; Thompson, Anne[1]
**INSTITUTIONS (ALL):** 1. Physical Therapy, Armstrong Atlantic State University, Savannah, GA, USA.
**SPONSOR NAME:** Dorothy Gaskin

**Abstract**

**Purpose/Hypothesis :** The purpose of this qualitative study was to describe the physical and emotional experiences of subjects who had undergone limb salvage and secondary amputation.
**Number of Subjects :** We sought subjects with at least one lower extremity amputation unrelated to trauma or cancer who had undergone limb salvage attempts. There were a total of four subjects in this study. Each subject's amputation occurred approximately a year or more prior to participation, and each was a prosthetic user.
**Materials/Methods :** Individual interviews were performed using a set of guiding questions that were created for this study. These questions focused on physical and emotional feelings during limb salvage, decision making processes and responses once amputation was determined to be necessary, and physical and emotional responses after amputation. Subjects were also asked questions about their current level of function, quality of life, family and social life and history of emotional support.
**Results :** The following common themes were identified from the subjects' responses: pain during salvage, emotional roller coaster prior to final amputation, pathway to acceptance of the amputation, gratefulness, support from family and other individuals, good current quality of life, phantom pain and opinions about their prostheses. Although there were many differences between the four subjects, they described similar emotions and experiences about the salvage process and eventual outcome.
**Conclusions :** Although these amputees reported severe pain and disability during the period of limb salvage, none would have chosen primary amputation instead. All reported a wide range of emotions from extreme hope to extreme depression during limb salvage. Some of the findings were surprising. Phantom pain was reported by most subjects though only one reported that their physical therapist addressed it. More than one subject reported a great deal of frustration over the decision making process for amputation.
**Clinical Relevance :** These findings provide a better understanding of the emotions and experiences associated with secondary amputation, which will allow the physical therapist to more effectively address the physical and emotional needs of a patient undergoing either limb salvage or secondary amputation.
**KEYWORDS:** amputation, qualitative, limb salvage.

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**TITLE:** An Investigation of the Development of Tolerance to Transcutaneous Electrical Nerve Stimulation (TENS) in Humans

**AUTHORS (LAST NAME, FIRST NAME):** R. E. Liebano[1]; D. M. Walsh[2]; *C. G. Vance*[3]; B. A. Rakel[3]; K. A. Sluka[3]
**INSTITUTIONS (ALL):** 1. Physical Therapy, UNICID, Sao Paulo, Brazil. 2. Health and Rehabilitation Sciences Research Institute, University of Ulster, Newtownabbey, United Kingdom. 3. The University of Iowa, Iowa, IA, United States.

**Abstract**

**Purpose/Hypothesis :** Transcutaneous electrical nerve stimulation (TENS) is a noninvasive modality that is commonly used by health care professionals to control both acute and chronic pain arising from a variety of conditions. Animal models show that TENS produces its effects through activation of opioid receptors, and that repeated application of TENS produces analgesic tolerance and cross-tolerance at spinal opioid receptors. Although commonly accepted that TENS reduces its efficacy with repeated application, the development of tolerance to TENS has not been investigated and confirmed in human subjects. The purpose of the present investigation is to examine if repeated application of TENS produces analgesia tolerance in human subjects. We hypothesized that repeated daily treatment with TENS, delivered at the same dose over a period of 5 days, will result in loss of its effectiveness.
**Number of Subjects :** 34
**Materials/Methods :** TENS-naive male and female healthy subjects were recruited and randomly assigned to one of two treatment groups: Placebo or Active TENS. The active unit applied TENS at 4Hz frequency, 100μs pulse duration and maximal tolerable intensity for 20 minutes to the non-dominant forearm, daily for 5 days. These TENS parameters, including the amplitude level on day 1, were then kept constant for the rest of the week to ensure the same dose was delivered daily. The placebo unit actively applied the same current for 30 seconds and then ramped off in the next 15 seconds. A second person did the assessments and was blinded to the group assignment. Subjects were seated in an upright position and pressure-pain threshold (PPT) measurements were recorded daily before and after 20 min of TENS using a digital pressure algometer on the non-dominant forearm over the extensor mass. The temporal summation to mechanical stimulation was also recorded on days 1 and 5, before and after TENS, with a custom built device incorporating a pressure transducer and a lever with a movable weight to grade the force delivered. Temporal summation was tested at an 8/20 pain rating on a verbal analog pain scale for 2 minutes with subjects rating their pain every 10 seconds.
**Results :** Active TENS increased PPTs for the first 4 days of application. However by day 5 this increase in PPT did not occur. No change in PPTs was observed in the Placebo TENS group before and after 20 min of placebo on days 1-5. Surprisingly no differences were observed in temporal summation in active and placebo TENS groups.
**Conclusions :** These data suggest that repeated daily application of TENS with the same dose (amplitude, frequency, pulse duration, and time) results in a decrease in its hypoalgesic effect. These data parallel data in animal studies and suggests that the tolerance-like effect to repeated TENS results from tolerance at centrally-located opioid receptors.
**Clinical Relevance :** The results herein reported suggest that a treatment schedule of repeated daily TENS administration, using the same dose, should be avoided to possibly obviate the induction of analgesic tolerance.

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**TITLE:** 10% Burst Modulated AC Augments Force in Healthy Fatigued Quadriceps Femoris: A Single-Case Design

**AUTHORS (LAST NAME, FIRST NAME):** *Parker, Michael G.*[1]; Davis, Matthew J.[1]
**INSTITUTIONS (ALL):** 1. Physical Therapy, University of Mary, Bismarck, ND, USA.

**Abstract**

**Purpose/Hypothesis :** To determine if the catchlike property of skeletal muscle can be produced by burst modulated AC and result in an enhancement of isometric quadriceps force in both non-fatigued and fatigued muscles. We hypothesized that a 10% burst modulated AC (similar to a doublet-frequency train) would produce more force than a 90% burst modulated polyphasic AC in both the non-fatigued and fatigued human quadriceps femoris muscles.
**Number of Subjects :** One healthy male subject (age, 27 years) volunteered for this study.
**Materials/Methods :** After Institutional Review and informed consent was obtained, the subject completed 3 different experimental sessions in 3 consecutive days.Session 1 consisted of assessing the maximal volitional isometric contraction (MVIC)force and delivering both the 10% and 90% burst duty cycles of neuromuscular electrical stimulation(NMES)to the right non-fatigued quadriceps.Fatigue was induced in the quadriceps before NMES in measurement sessions 2 and 3 by completing a maximum isometric right quadriceps contraction until the force declined to at least 50% of its initial value. Within 3 seconds,of the induction of muscle fatigue, a 90% and 10% burst modulated AC was delivered to the muscle during sessions 2 and 3, respectively. The NMES was burst

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modulated (10% or 90%) AC with a sine wave carrier frequency of 2500 Hz and a burst frequency of 50 bursts/s. The NMES was on for 3 seconds and off for 12 seconds with ramp-up and down times of 1 second each (not included in the on-times). The pattern produced 4 electrically induced contractions (EICs) per minute or 12 EICs in the 3-minutes of stimulation. The EIC measurements were converted to electrically induced torques(EITs)(Nm) and were expressed as %MVIC([EIT/MVIC]100). The MVIC and EITs were measured with the subject secured to a modified testing chair. The forces were monitored via a belt secured on one end to the subject's leg,and on the other,an electronic load cell. The analog electrical signal from the load cell was displayed continuously on an oscilloscope, and saved for later analysis. The load cell was calibrated prior to all tests. **Results :** The maximum EITs produced in the non-fatigued quadriceps by the 10% and the 90% burst duty cycles were 67.3% and 49% MVIC, respectively. The maximum EITs produced in the fatigued quadriceps by the 10% and the 90% burst duty cycles were 65.5% and 10% MVIC, respectively. The differences between the maximum EITs produced by the 10% and 90% burst duty cycles in the non-fatigued and fatigued quadriceps muscles were 18.3% and 54.9% MVIC, respectively. **Conclusions :** 10% burst modulated AC produced more force than the 90% burst modulated AC in both the non-fatigued and fatigued quadriceps.The augmentation in muscle force produced by the 10% burst modulation was greater in the fatigued muscles,which indicates the force was optimized by the catchlike property. **Clinical Relevance :** When the production of high muscle forces and/or fatigue resistance is desired, the clinician should consider lower burst duty cycles.

**KEYWORDS:** Neuromuscular Electrical Stimulation.

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**TITLE:** Physical examination combined with electrodiagnostic testing to diagnose and treat Infraspinatus myofascial trigger points and Superficial Radial Sensory nerve myelinopathy with manual therapy: A case report with a four month follow-up.

**AUTHORS (LAST NAME, FIRST NAME):** *Wilson, Eric*[1]

**INSTITUTIONS (ALL):** 1. Physical Therapy Clinic, 19th Medical Operations Squadron, Little Rock AFB, AR, USA.

**Abstract**

**Background & Purpose :** Patients in outpatient physical therapy clinics often present with a referal diagnosis that does not coincide with the therapist's evaluation. In cases where neurologic symptoms are present, the ability to combine an evidence-based examination with immediate electrodiagnostic testing can result in an accurate diagnosis and an immediate impairment-based plan of care. **Case Description:** A 33 year-old male presented with referral from his physician to evaluate and treat right C7 radiculopathy. The patient reported insidious onset of right posterior shoulder, arm, forearm, and dorsal hand pain eleven days prior. He was unable to differentiate which fingers were involved, but neither his distal phalanges nor his neck was symptomatic. Symptoms increased and peripheralized with increased use of his right (dominant) arm. DASH was 25%, Numeric Pain Rating Scale (NPRS) was 4/4/6/2 and seated VAS scores for the shoulder, arm, forearm and hand were recorded. Physical examination revealed hypomobile cervicothoracic PA mobilizations, positive ULTT (Radial) and Myofascial Trigger Points (MTrP) at the infraspinatus. Clinical Prediction Rule for cervical radiculopathy was negative (0 of 4 items positive). Electrodiagnostic testing by the physical therapist demonstrated isolated myelinopathy of the right Superficial Radial Sensory nerve (fingers 1-4). The patient was treated with HVLA to cervicothoracic spine and strain-counterstrain & HEP to infraspinatus MTrP's. Intrasession percent-change scores for regional VAS were: Shoulder 16%, Arm 60%, Forearm 0, and Hand 50%. Patient received six additional visits that combined manual therapy (elbow), myofascial direct technique (infraspinatus) and radial nerve mobilizations. **Outcomes :** Upon discharge 15 days later, the patient's DASH score was 0, NPRS 0, and GROC +7. Four months telephone follow-up revealed no recurrence of symptoms. **Discussion :** Physical therapists are uniquely qualified to combine physical examination findings and electrodiagnostic results into a clear clinical picture and resulting plan of care. Referral to a different subspecialist may have resulted in additional diagnostic testing and a delay in treatment.

**KEYWORDS:** EMG, NCV.

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**TITLE:** Monochromatic Infrared Energy (MIRE): A Randomized Controlled Trial for the Efficacy as Treatment for Peripheral Neuropathy

**AUTHORS (LAST NAME, FIRST NAME):** *Maher, Sara F.*[1]; Alderman, Elizabeth[1]; Bannink, Daniel[1]; Bell, Andrea[1]; DeCarolis, Katherine[1]

**INSTITUTIONS (ALL):** 1. Physical Therapy, Oakland University, Rochester, MI, USA.

**Abstract**

**Purpose/Hypothesis :** The purpose of this double-blinded randomized controlled trial was to determine if MIRE, delivered by the Anodyne Therapy System (ATS), significantly increased sensation, improved balance and decreased falls in patients with lower extremity peripheral neuropathy.

**Number of Subjects:** Thirteen participants with peripheral neuropathy of diabetic or unknown origin, were randomly distributed into a Treatment Group to receive MIRE (n=7) or a Control Group to receive sham treatments (n=6). Mean age of participants was 73.31 years +/- 6.43. **Materials/Methods :** All participants were initially evaluated by a physical therapist utilizing the Tinetti Assessment and the Michigan Neuropathy Screening Instrument (MNSI), with re-assessment occurring monthly. The MNSI contained a "patient questionnaire" which was completed by each patient participant at the initial evaluation and monthly. In addition, all participants completed a sensation and functional abilities questionnaire at each visit, which utilized four Visual Analogue Scales (VAS) and questions specific to function. Treatment for all participants consisted of 60 minutes of physical therapy, followed by 30 minutes of ATS, for up to 24 visits. Physical therapy treatment was based upon impairments identified during the initial evaluation, with every participant receiving some component of cardiovascular training and lower extremity strengthening. During the 30 minutes of ATS, the Treatment Group received MIRE while the Control Group received sham treatments. Data were analyzed using SPSS 17.0. Paired Samples t-Tests were used to compare scores on the daily questionnaire. The Mann-Whitney U Test was used to compare the Tinetti Assessment and the physical therapist version of the MNSI. The Chi-Square and Fisher's Exact Tests were used for the patient version of the MNSI. **Results :** In general, two significant differences were observed in both groups from initial evaluation to end of treatment. Both groups had improved scores on the Tinetti Combined Balance & Gait Score (p=0.04) and the Tinetti Gait Test (p=0.02). Between group comparisons found only one area with significant difference. Participants in the treatment group reported significantly more confidence in their balance then participants in the control group (p=0.04). No other statistical differences were found between the treatment and control groups. **Conclusions :** Evidence supporting the use of MIRE/ATS as treatment for peripheral neuropathy, has lacked rigorous design parameters capable of suggesting direct efficacy of the treatment. Although this design had few subjects (n=13), the study applies an experimental research design that can suggest cause and effect. **Clinical Relevance :** This study finds no significant statistical data to suggest direct improvement in sensation, balance or fall prevention in patients with lower extremity peripheral neuropathy when treated with MIRE delivered by the ATS.

**KEYWORDS:** diabetic peripheral neuropathy, MIRE, Anodyne Therapy System.

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**TITLE:** The Effects of Low-Level Laser Therapy On Delayed Onset Muscle Soreness

**AUTHORS (LAST NAME, FIRST NAME):** Oakley, Elizabeth[1]; Linstromberg, Anna[1]; Babb, Brandon[1]; Spady, Raelynn[1]; Bairagee, Melody[1]; Thomas, Lizbeth[1]; Roberts, Katy[1]

**INSTITUTIONS (ALL):** 1. Andrews

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**Abstracts**

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University, Berrien Springs, MI, USA.

**Abstract**

**Purpose/Hypothesis :** Delayed onset muscle soreness (DOMS) occurs following a bout of unaccustomed eccentric exercise resulting in pain, decreased range of motion, and weakness in the affected muscle/s. Low-level laser is believed to accelerate the acute inflammatory process. The objective of this study was to determine the effects of low-level laser therapy (LLLT) on DOMS following a fatiguing bout of eccentric contractions of the elbow flexors. It was hypothesized that LLLT would be more effective in decreasing the symptoms associated with DOMS than sham LLLT. **Number of Subjects :** A total of 77 subjects, with a mean of 25.6 ± 4.4 years, participated in three separate studies following the same standardized protocol. The subjects were assigned to either a sham treatment group (n=36; 18 M/18 FM) or the LLLT group (n=41; 20 M/21 FM) using a combination of matched and random assignment. Both the subjects and data collectors were blinded to treatment group. **Materials/Methods :** Following informed consent, the following baseline measurements were taken on the upper extremity: girth at the midbelly of the biceps muscle and at the midpoint of the humerus, resting elbow extension, pain, and isometric muscle strength. Eccentric contractions of the non-dominant elbow flexors were performed with a free-weight determined by the subject's 1RM to induce delayed onset muscle soreness. The subjects in the treatment group received laser treatment with a wavelength of 850 nm at 8J/cm2 to the three most painful locations on the biceps muscle as determined by palpation; the sham group received the same protocol with no energy delivered. Measurements were reassessed and treatments were given at 24, 48, 72, and 96 hours. Means and standard deviations for descriptive data and differences within and between groups was analyzed using SPSS 17.0. Repeated measures ANOVA (mixed model) was used to compare subject's responses to treatment. Post hoc tests were done where appropriate. Data was considered significant at the .05 level of probability. **Results :** There was a significant difference over time for both groups in pain levels, circumference measurements, and maximum voluntary isometric contraction (MVIC) force ($P \leq .05$). Pain levels and circumference measures increased and MVIC decreased for all subjects in the first 24 hrs. After 48 hrs. all dependent variables gradually began to return toward baseline values but at 96 hrs. were still not back to baseline. There was no significant difference between any of the dependent variables between the two groups; the response curves were the same for both groups. **Conclusions :** This study found that both groups experienced DOMS but there was no significant difference in the recovery response between the two groups. Thus, LLLT was not effective in decreasing the signs and symptoms of DOMS when compared to a sham treatment. **Clinical Relevance :** The age and small size of the sample limits the generalizability of our results. Nevertheless, this study suggests that LLLT does not appear to be an effective agent for the management of the signs and symptoms of DOMS.

**KEYWORDS:** Low-level laser, DOMS, Light therapy.

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**TITLE:** The Effects of Light Emitting Diode (LED) Therapy On the Superficial Radial Nerve

**AUTHORS (LAST NAME, FIRST NAME):** *Fishburn, Danielle*[1]; Telemeco, Todd A.[1]; Brill, Brandi[1]; Schrank, Edward[1]; Abraham, Karen [1]

**INSTITUTIONS (ALL):** 1. Shenandoah University, Winchester, VA, USA.

**Student Category:** Professional Student-PT, MPT, DPT, etc.

**Abstract**

**Purpose/Hypothesis:** Light emitting diode (LED) therapy is a novel approach for pain relief in the clinical management of musculoskeletal pathologies. The shift from low level laser light therapy to LED necessitates the need for research on the neurophysiological effects of this intervention. The primary purpose of this study was to assess the putative neurophysiological effects of light emitting diode (LED) therapy on the superficial radial nerve and to establish a time course for the purported phenomenon. The null hypothesis of this study was that LED therapy would have no effect on the conduction velocity, latency, and amplitude of the superficial radial nerve. **Number of Subjects :** 30 healthy subjects **Materials/Methods :** A randomized controlled study was conducted by measuring antidromic nerve conduction on the superficial radial nerve of healthy subjects (n=30). One baseline and 6 post-irradiation measurements (2-min interval each) were performed. Recorded parameters included the nerve conduction velocity (NCV), negative peak latency (NPL) and amplitude. Set-up was identical for all subjects . The experimental group (n=15) received an irradiation (6 J/cm2) to two adjacent sites along the superficial radial nerve, for 30 seconds at each location with an LED light therapy device (Dynatronics Solaris Model 708, USA), while the placebo group (n=15) was treated by sham irradiation. Skin temperature was recorded concurrently throughout all electrophysiological recordings. **Results :** Statistical analysis (repeated measures ANOVA) of NCV, NPL and amplitude failed to reveal a significant effect between LED therapy and sham intervention over time ($p<0.05$). **Conclusions :** The results of this study suggest that surface application of LED therapy does not adversely affect the neurophysiological properties of the superficial radial nerve. **Clinical Relevance :** The results of this study suggest that surface application of LED therapy does not adversely affect the neurophysiological properties of the superficial radial nerve.

**KEYWORDS:** light emitting diode, nerve conduction velocity, superficial radial nerve.

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**TITLE:** The Use of Foot Care to Reduce Foot Pain in an Underserved Population of People at Risk for Foot Complications

**AUTHORS (LAST NAME, FIRST NAME):** *Michael, Deborah M.*[1]; Alexander, K. E.[1]; Haney, Tiffany[1]; Anderson, Ingrid[1]; Balmes, Jaclyn[1]; Bankston, Lacy[1]; Benton, Katharine J.[1]; Carmichael, Lisa[1]; Hardy, Michelle[1]; Huey, Laura[1]; Nebedum, Adrianna[1]; O'Dell, Casey[1]

**INSTITUTIONS (ALL):** 1. Physical Therapy, Georgia State University, Atlanta, GA, USA.

**Abstract**

**Purpose/Hypothesis :** The prevalence of diseases, such as diabetes, with related foot complications is on the rise. These diseases can lead to an increased risk for foot ulceration and lower extremity amputation. While the positive impact of foot care programs on ulcer management and amputation prevention has been thoroughly documented, the impact of foot care on foot pain is less clear. Foot pain is one of the most common complaints among people who seek treatment for foot problems. Considering challenges to follow-up care both in an underserved population and during tough economic times, it was important to determine whether a reduction in foot pain could be accomplished with one episode of care. The purpose of this study was to determine the prevalence of foot pain in an underserved population with and without diabetes as well as to determine whether one episode of foot care, including both hands on treatment and education, could decrease foot pain in an at-risk population. **Number of Subjects :** Fifty patients of the Good Samaritan Health Center in Atlanta, Georgia, who are at risk for foot complications. **Materials/Methods :** Fifty subjects at risk for foot complications were referred to a monthly foot clinic provided at an urban facility for the underserved. Each subject filled out a questionnaire before treatment on his/her initial visit. Education, including information about self foot care along with selection of appropriate footwear, was provided following the pre-treatment questionnaire. A PowerPoint presentation and visual aids were utilized. Each subject then received a general foot screening which included a visual inspection, testing for protective sensation (10 g monofilament) and vibration sense (128 Hz), and measuring an Ankle-Brachial Index. Toenails and calluses were trimmed and sanded as indicated. Following the treatment, a second questionnaire was completed. **Results :** Twenty-four of the 50 participants reported having pain on the initial

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questionnaire (48%). Eighteen of those (75%) reported their pain decreased following an episode of foot care. Of the 18 who reported reduced pain, 11 had their pain completely eliminated (61.1%). Twenty-six of the 50 participants had a diagnosis of diabetes. Of these 26, 11 reported having foot pain on the initial questionnaire (42.3%). Of those participants with diabetes and foot pain, nine reported reduced pain after treatment (81.8%), with five of those nine subjects reporting no pain post treatment (55.6%). **Conclusions :** This study shows that even one episode of professional foot care can have a significant, clinically relevant impact on foot pain. Proper foot care may decrease pain associated with long toenails, calluses, and deformity in an at-risk population. **Clinical Relevance :** With a growing number of people with diabetes and other diseases which increase their risk for foot complications, it is key to recognize that foot care is not only important for prevention of ulceration and amputation, but also is essential for quality of life.

**KEYWORDS:** foot pain, foot care, prevention.

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**TITLE:** Enhanced healing of diabetic foot ulcers using local dry heat for 30 minutes 3 times per week: a pilot study

**AUTHORS (LAST NAME, FIRST NAME):** *Lawson, Daryl*[1]; Petrofsky, Jerrold S.[2]; Sue, Hye Jin[2]; Berk, Lee[2]

**INSTITUTIONS (ALL):** 1. Physical Therapy, Elon University, Elon, NC, USA. 2. Physical Therapy, Loma Linda University, Loma Linda , CA, USA.

**Abstract**

**Purpose/Hypothesis :** Electrical stimulation (ES) has been used as an adjunct to wound care with questionable results. In previous studies, it has been shown that the use of ES with either global heating of the whole body or local heating of the wound (with an infrared lamp), was effective in healing chronic non healing wounds. Question arose as to the reason for the healing. Is it the heat, ES or both? A few previous studies show that local heating of a wound enhances the healing process but little research has been done with chronic wounds and especially chronic diabetic ulcers. **Number of Subjects :** . In the present investigation, twenty subjects with chronic non healing diabetic foot ulcers participated in a longitudinal randomized study and received local dry heat (10 subjects) or local dry heat plus electrical stimulation (10 subjects) three times a week over a 4 week period. Average age was 48.4 +/- 14.6 years, average height was 173.7+/-8.4 cm, average weight was 91.4+/-28.1 kg, and the average duration of the wounds was 38.9 +/-23.7 months. **Materials/Methods :** A heat lamp was used for 30 minutes to keep the wound warm (37 deg C). For half the subjects, the lamp was used with ES with biphasic sine wave stimulation, a frequency of 30 Hertz, pulse width 250 microseconds, and a current of about 20 mA. Skin blood flow (BF) in and around the wound was measured with a Laser Doppler Flow Imager. **Results :** In the ES group, average wound area significantly decreased by 68.4+/-28.6% ($p<0.05$) and wound volume decreased by 69.3+/-27.1% ($p<0.05$) over the one month period. Blood flow increased from rest 102.3+/-25.3% with local heat to 152.3+/-23.4% with ES plus local dry heat during the average session. For the local dry heat only group, wounds which would not heal for at least 2 months, showed 30.1+/-22.6% healing after 1 month. This healing was significant but was significantly less than the ES group ($p<0.05$). In conclusion, **Conclusions :** ES and local dry heat work well together for the healing of chronic diabetic foot wounds, however, local heat would appear to be a relevant part of the equation since ES results alone showed little healing in previous studies. **Clinical Relevance :** Implementing local heat with electrical stimulation may increase the healing rate in people with diabetes that have chronic, non healing wounds

**KEYWORDS:** electrical stimulation, ulcer, diabetes.

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**TITLE:** Effect of Low Power LASER Treatment on a Traumatized Disc in a Rat Model

**AUTHORS (LAST NAME, FIRST NAME):** *Adah, Felix*[1]; Benghuzzi, Hamed[1]; Regab, Ashraf[1]; Greenwald, Neva F.[1]; Tucci, Michelle [1]

**INSTITUTIONS (ALL):** 1. Physical Therapy, University of Mississippi Medical Center, Jackson, MS, USA.

**SPONSOR NAME:** Lisa Barnes

**Abstract**

**Purpose/Hypothesis :** There are conflicting reports on the possible roles of low power laser treatment (LPLT) on tissue healing. The purpose of this study was to evaluate the effects of LPLT on traumatized disc in a rat model. **Number of Subjects :** Fourteen Sprague Dawley male albino rats weighing (250 – 300) grams each obtained from Harlan Supplier were randomly selected for this study. **Materials/Methods :** The experimental design consisted of 14 rats divided into the following three groups: Animals in group I (n = 5) served as controls with no surgery. Animals in group II (n = 5), the sham group, received a surgically created defect in the disc at L4/L5 level and received no other treatment. Animals in the third group (n = 4) received a similar defect to L4/L5 in similar fashion as described for animals in the sham group (group II) with the exception that they received laser of 830 nm wavelength treatment or irradiation for a period of 4 weeks. The animals were euthanized at 30 days post disc trauma using overdose of isoflurane. The discs were then harvested in addition to the vital organs, the reproductive organs, and sample of the adjacent skeletal muscles. The hard and soft tissues were evaluated histopathologically by following laboratory standard techniques. **Results :** The results of this study indicated that the discs of the laser treated animals healed in a greater magnitude than the sham group. Image analysis revealed that there was more disc formation in the laser irradiated animals than the sham group. **Conclusions :** In conclusion, LPLT accelerated disc healing in a rat model. The restoration of the nuclear pulposus is of a clinical significance as the disc physiological function of shock absorbance is not effective without the nuclear pulposus. Further study is needed to study the effects of low power laser on disc degeneration due to aging. **Clinical Relevance :** If laser can accelerate disc healing, as this study suggests, it is likely going to accelerate the healing of many musculoskeletal problems Physical Therapists deal with on a daily basis. The fact that laser can be used in acute, subacute and chronic phases of healing is clinically relevance for the varying cases Physical Therapy treats.

**KEYWORDS:** Low power laser., Disc healing, Traumatized disc.

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**TITLE:** Impact of electrical stimulation parameters on skeletal muscle fatigue

**AUTHORS (LAST NAME, FIRST NAME):** *Bickel, C Scott*[1]; Gregory, Chris M.[2]

**INSTITUTIONS (ALL):** 1. University of Alabama at Birmingham, Birmingham, AL, USA.
2. University of Florida, Gainesville, FL, USA.

**Abstract**

**Purpose/Hypothesis :** A fundamental barrier to utilizing neuromuscular electrical stimulation (NMES) for functional activities is the high level of muscle fatigue associated with its use; thereby limiting the ability to sustain force levels during repeated contractions. Electrical stimulation parameters are manipulated to influence muscle torque production and they may also influence fatigability during repetitive stimulation. The purpose of this study was to investigate the effect of stimulation frequency, pulse duration and voltage on muscle fatigue during repeated contractions when starting at the same relative torque. We hypothesized that the low frequency protocol would show the least amount of fatigue and result in less soreness compared to protocols that incorporated higher frequency stimulation with reduced pulse durations and voltages. **Number of Subjects :** Thirteen subjects (28.5 ± 4.4 years, 173.6 ± 9.6 cm, 71.2 ± 16.4 kg; 7 females) participated and underwent 3 fatigue protocols (60 contractions: 1 sec on/1 sec off) of the quadriceps muscle group. **Materials/Methods :** Maximum voluntary isometric contraction (MVIC) and the voltage (V50%) to elicit 50% of MVC using 60 Hz and 600 µs stimuli (500 ms train) were determined. Initial starting

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torque for all fatigue protocols was 25% of MVIC. Protocol 1 (lowHz) utilized V50% and 600 µs but frequency was reduced until 25% MVC was achieved. Protocol 2 (lowPD) utilized V50% and 60 Hz but pulse duration (PD) was reduced until 25% MVC was achieved. Protocol 3 (lowV) utilized 60 Hz and 600 µs and the voltage to elicit 25% MVC. Muscle soreness was reported on a visual analog scale 48 hours after each protocol. **Results :** Significant differences were found between the three conditions (p=0.0005). Linear contrasts revealed that the lowHz protocol resulted in significantly less fatigue than the lowPD (p=0.0005) and lowV conditions (p=0.0006, Figure 2). The lowPD and lowV conditions were not significantly different from one another (p=0.8238). The lowHz protocol resulted in significantly less muscle soreness compared to the 60Hz protocols (p=0.006). **Conclusions :** The results of this study indicate that pulse frequency influences muscle fatigue to a greater degree than pulse duration and/or voltage during NMES-induced muscle contractions. We examined levels of muscle fatigue after 3 different protocols that utilized similar initial starting torques. The novel aspect of this study was that initial torque was obtained by three different combinations of NMES parameters. Each protocol had two standard parameters and a third parameter was altered to determine how the modification of each parameter may influence muscle fatigue. We determined that pulse duration and voltage adjustments had no effect on the degree of muscle fatigue during repeat contractions. However, pulse frequency was the primary determinant whether there was high (~50%) or more modest (~25%) force loss. **Clinical Relevance :** Identification of stimulation patterns to maximize muscle performance will allow clinicians to select optimal NMES patterns to reduce the effect of muscle fatigue.

**KEYWORDS:** skeletal muscle, muscle fatigue, Neuromuscular Electrical Muscle Stimulation.

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**TITLE:** Establishment of minimal detectable change, inter-rater, and intra-rater reliability of the 5.07 monofilament aesthesiometer.

**AUTHORS (LAST NAME, FIRST NAME):** Schuerman, Sue[1]; Flynn, Kimberely[1]; Hartig, Krista[1]; Moss, Danielle[1]; Pridham, Sarah[1]; *Young, Daniel*[1]; Altenburger, Elizabeth[2]

**INSTITUTIONS (ALL):** 1. Physical Therapy, University of Nevada Las Vegas, Las Vegas, NV, USA.
2. Physical Therapy, Methodist Hospital, Indianapolis, IN, USA.

**Abstract**

**Purpose/Hypothesis :** The purpose of this study was to determine the minimal detectable change (MDC), intra-rater, and inter-rater reliability for the 5.07 monofilament. There are no studies that report inter-rater reliability or MDC values for the 5.07 monofilament. **Number of Subjects :** 28 (20 female and 8 male) subjects between age 50 and 78. **Materials/Methods :** Using the 5.07 monofilament, 3 testers performed sensory testing in random order on 18 different sites (9 per foot). Subjects were tested twice with at least 1 week between tests. Patients lay supine with shoes and socks removed and eyes closed. The monofilament was then touched perpendicular to each test site with enough pressure to bow the monofilament. The patient was instructed to alert the tester when the sensation was felt by saying "yes" to indicate sensation or silence if no sensation was experienced. Because the subjects eyes were closed for the duration of the exam they were blinded to the tester. Testers were blinded to previous test results. **Results :** Intra-rater reliability and minimal detectable change (MDC) were calculated for each individual tester using an intraclass correlation coefficient (ICC). Intra-rater reliability ranged between 0.681 and 0.818, and MDC ranged from 2.381 to 3.182 (Tester 1 ICC = 0.681 (95% CI: 0.418-0.838), MDC = 2.92; Tester 2 ICC = 0.771 (95% CI: 0.563-0.887), MDC = 3.182; and Tester 3 ICC = 0.818 (95% CI: 0.643-0.911), MDC = 2.381). Inter-rater reliability and MDC were calculated using ICC. Inter-rater reliability was 0.783 (95% CI: 0.639-0.884), and MDC was 2.813. **Conclusions :** Inter-rater reliability and intra-rater reliability were good. The results of this study support the use of the 5.07 monofilament as a reliable clinical tool in the assessment of foot sensation. A minimum of 3-4 sites must demonstrate acquisition or loss of sensation for the change to be clinically significant. **Clinical Relevance :** The 5.07 monofilament is a reliable and valid measure for clinicians to assess protective sensation of the feet in their patients. A change in detectable sensation at a minimum of 3-4 test sites must exist to be clinically significant.

**KEYWORDS:** monofilament, sensory testing, reliability.

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**TITLE:** Electromyographical Analysis of Selected Lower Extremity Muscles During a Single-leg Squat on a Declined and Level Surface

**AUTHORS (LAST NAME, FIRST NAME):** *Kollman, Randy L.*[1]; Parker, Michael G.[1]

**INSTITUTIONS (ALL):** 1. Physical Therapy, University of Mary, Bismarck, ND, USA.

**Abstract**

**Purpose/Hypothesis :** To determine which standing surface angle between 0 and 35 degrees from a horizontal plane facilitates the most rectus femoris activation during a single-leg decline squat. We hypothesized that an increase in the decline angle during a single-leg decline squat would result in an increased rectus femoris muscle activation. **Number of Subjects :** Six male college students (age, 18-35 years) with no previous history of knee surgery or pathology in the last 6 months and have the ability to perform a single-leg decline squat. **Materials/Methods :** After Institutional Review and informed consent was obtained, subjects randomly selected 1 out of 50 angle sequences from a bag to be performed. Four Ag-AgCl dual electrodes were placed parallel to the muscle fibers of the left anterior tibialis, gastrocnemius, rectus femoris, and biceps femoris. A reference electrode was also placed inferior to the left medial tibia plateau. Proper placement of the electrodes were verified by analyzing both the evoked and resting EMG signals recorded from each of the 4 muscles. The subjects completed 3 single-leg decline squats at each 5 degree interval from 0 to 35 degrees in a previously selected random order. A metronome of "up-one-pause, down-one-pause" was used to establish a steady decline phase of 2 seconds, a pause of 1 second, and a 2 second rising phase. Subjects were given a 1 minute rest period between each of the 8 squat trials. The saved raw-EMG signal was then full wave rectified and smoothed using a 10 millisecond moving average window. The mean EMG was computed over the full duration of both the lowering and rising phases of the squats. **Results :** The EMG activity of the rectus femoris and gastrocnemius muscles showed an increase in mean muscle EMG activity during the lowering and rising phase across all decline angles (P<.001), while the EMG activity of the biceps femoris and anterior tibialis were variable. The rectus femoris EMG activity was greatest at 30 degrees (94.7±43.9 µV) during the lowering phase and 35 degrees (94.4±31.0 µV) during the rising phase of the single-leg decline squat. **Conclusions :** The results of our study indicated that the mean EMG activity of the rectus femoris, biceps femoris, and gastrocnemius muscles increased as the decline angle increased from 0 to 35 degrees during the lowering and rising phases of a single-leg decline squat. The most rectus femoris muscle activation during a single-leg decline squat was recorded at 30 and 35 degrees. **Clinical Relevance :** Our results showed that the increase in EMG activity during both the eccentric and concentric phases of the squat was equivalent and thus, implies that improvement in muscular performance may occur when using both eccentric and concentric rectus femoris muscle contractions.

**KEYWORDS:** Single-leg decline squat.

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**TITLE:** The Effects of Focused Rigidity Casting and Functional Activities in the Rehabilitation of a Severe Upper Extremity Deformity due to Burn Injury.

**AUTHORS (LAST NAME, FIRST NAME):** *Sabatella, Sabrina*[1]; Hoglund, Lisa T.[2]; Dougherty, Mary E.[1]; Sharp, Patricia A.[1]; Kagan, Richard J.[1]

**INSTITUTIONS (ALL):** 1. Shriners Hospitals for Children- Cincinnati,

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Cincinnati, OH, USA.
2. University of the Sciences in Philadelphia, Philadelphia, PA, USA.
**Student Category:** Professional Student-PT, MPT, DPT, etc.

**Abstract**

**Background & Purpose :** Severe burns cause many long term challenges that impact daily functioning. Burns and fires are the 3rd leading cause of accidental death in the United States. Two million people are burned, while 40,000- 50,000 are hospitalized each year. Twenty-five percent of those hospitalized are under the age of 18 years. Delay in care due to the lack of preventative measures and medical equipment, typical in developing countries, causes severe deformities. In the United States (US), interventions to treat patients with burn injuries often include surgery, pressure management, thermoplastic splinting, positioning, and range of motion (ROM) exercise. This case report shows the effectiveness of functional activities in conjunction with the use of a focused rigidity cast (FRC) splint when rehabilitating a patient with a severe upper extremity (UE) burn. **Case Description :** A 17 year old male from Nigeria sustained a burn injury in 2004 due to a kerosene explosion. The face, chest, and left UE were involved. No formal medical attention was offered at that time. The patient traveled to the United States for medical care 4 years after the injury. Upon arrival, the patient's LUE was found to be fused to his trunk secondary to severe scar formation and contracture. His L elbow was fixed at approximately 120 degrees of flexion, while the wrist was positioned in 90 degrees of flexion. The metacarpophalangeal (MCP) joints of the L hand were subluxed and hyperextended. Active motion of the L hand digits was present; however, no function of the LUE was possible due to the fixed position of the L shoulder, elbow, and wrist joints. Surgical releases, muscle flaps, and skin grafting were performed. Passive shoulder and elbow ROM were performed to increase motion prior to the fabrication of a FRC splint. Functional activities, object manipulation, and strengthening were initiated after application of the FRC. **Outcomes :** Significant improvement was seen in shoulder and elbow ROM following 1 week of FRC use, as the patient had a range of 40-100 degrees of elbow flexion/extension, 0-110 degrees of abduction, and 0-105 degrees of shoulder flexion in the scapular plane. Improvement in function was observed through activities of daily living in 1 month. After an extended hospital stay, the patient was discharged with significantly improved function in feeding, dressing, writing, and playing basketball. He was able to use a built up spoon to eat, write his name with his L hand using a marker, and attempt overhead throws in a game of basketball. **Discussion :** FRC splinting and functional activity intervention show great promise in burn rehabilitation and should be utilized in management of the patient with burn injuries. Further study is needed in a randomized controlled clinical trial to determine the effectiveness of FRC and functional activity for patients with burn injuries.

**KEYWORDS:** burn contracture, low load prolonged stretch, functional rehabilitaton.

**Clinical Electrophysiology & Wound Management Section**
American Physical Therapy Association
1111 North Fairfax Street
Alexandria, VA 22314