

understanding of the role of prayer in coping with pain. Providers may consider facilitating an active style of prayer in their religious/spiritual patients with pain.

**(452) Neuropeptide Y as a Potential Neurobiological Mediator of Exercise Benefits for Pain Sensitivity in Patients with Chronic Pain and PTSD**



*E. Salter, M. Bair, R. Hauger, and A. Rasmussen; VA Boston Healthcare System, Boston, MA*

This pilot study assessed the effects of acute exercise challenge testing and progressive exercise training on levels of neuropeptide Y (NPY), an anti-stress and anti-nociceptive neurohormone. We examined relationships between NPY and pain threshold and tolerance measured by the cold pressor test in two groups: trauma-exposed non-veterans and Veterans either a) with (n=5) or b) without comorbid chronic pain and PTSD (n=2). The sample (n=7) was 57.1% male (n=4) and 42.9% female (n=3) with mean age of 38 years. Across all participants, at the endpoint of their exercise training and as assessed by the acute maximum load exercise challenge test, VO<sub>2</sub> peak, an indicator of cardiorespiratory fitness, correlated with baseline NPY levels (r=.75, p=.05) as well as peak NPY levels (r=.61, p=.14). Pain threshold, a physiological indicator of pain sensitivity, correlated with peak NPY levels (r=.60, p=.20), as well as the change in NPY from baseline to its peak (r=.96, p<.001). The change in pain tolerance, a psychological indicator of pain sensitivity, from pre- to post-exercise training, correlated with the pre- to post-training change in baseline NPY levels (r=.61, p=.15) as well as the change in peak NPY levels (r=.64, p=.12). Our work shows a strong relationship between VO<sub>2</sub> peak and plasma NPY levels and these levels correlated with pain sensitivity after exercise. We are continuing this work to determine if increasing fitness, through progressive exercise training, can increase an individual's capacity to release NPY, resulting in significant improvements in pain sensitivity for patients with chronic pain and PTSD.

**(453) Self-reported physical activity is related to less pressure pain sensitivity but not to acute muscle pain**



*S. Merkle and L. Frey Lav; University of Iowa, Iowa City, IA*

Regular physical activity (PA) is often recommended for the treatment of acute and chronic pain conditions. However, PA levels continue to decline in many populations. While research increasingly suggests that PA may reduce pain and facilitate the prevention of chronic pain, preliminary data demonstrated few relationships between self-reported PA and experimental pain. Therefore, the purpose of this study was to investigate, in a large sample, the relationships between self-reported PA and experimental pain. We assessed primary and referred pain (RP) intensity and incidence, pressure pain thresholds (PPTs), and 7-day PA in response to a tibialis anterior intramuscular infusion in 193 (95F, 98M 18-35 years), pain-free adults. Pain was rated using an 11-point verbal pain scale. Primary and RP incidence was defined as pain  $\geq 0.5$  at the infusion site or anterior ankle/foot, respectively. PPTs were assessed at the tibialis anterior and the anterior ankle before and after the infusion. PA was assessed via the International Physical Activity Questionnaire. Due to multiple comparisons, significance was set at  $p \leq 0.01$ . Baseline PPTs were higher at both the tibialis anterior and anterior ankle ( $p \leq 0.01$ ) in those reporting greater leisure activity. Primary and RP intensity, incidence, and change in PPTs were not strongly related to PA type or level ( $p > 0.01$ ). These results suggest that PA is not related to acute experimental muscle pain. However, less baseline pressure pain sensitivity is evident in young, healthy adults who report greater leisure activity. These findings suggest that PA may have differential effects on pain acting through different mechanisms. Future studies are needed to further explore these underlying mechanisms. Supported in part by NIAMS RO3 and the U.S. Army. The opinions or assertions contained herein are the private views of the authors and are not official views of the Army or the DoD.

**(454) Dose-dependent effect of walking exercise on pressure pain in humans**



*A. Polaskim, M. Kostek, K. Szucs, and B. Kolber; Duquesne University, Pittsburgh, PA*

Chronic pain is a serious problem in the U.S. affecting 116 million adults. Chronic pain presents itself as both an isolated condition, as well as a comorbidity with other conditions, such as cancer and

obesity. Although numerous pharmacological interventions exist to treat chronic pain, few have proven to be effective. Exercise has been frequently touted as an effective treatment in reducing chronic pain. However, the most efficacious dose of exercise has yet to be established. The purpose of this study is to determine the most optimal dose of exercise required to reduce acute pain in healthy human participants with the goal of translating these results to clinical populations. After screening, healthy participants were randomized into 1 of 4 groups: control (no exercise), low dose exercise (3x/wk), moderate dose exercise (5x/wk) and high dose exercise (10x/wk). Over a 7-day period, participants performed 30 minutes of moderate intensity walking on a treadmill during assigned exercise days. Sensitivity thresholds to painful thermal stimulation and painful pressure stimulation were examined at baseline and post-exercise intervention. Participants also rated the intensity and unpleasantness of both thermal and pressure stimuli. Significant results have been found in both the moderate and high dose exercise groups, with both groups demonstrating reduced sensitivity to pressure intensity and unpleasantness. The moderate dose group had the greatest reduction in ratings of pain. This suggests that our lowest dose of exercise is not enough to reduce pain and that the moderate dose of exercise may be optimal to translate to the clinic. Overall, the results of this study will have important implications for prescribing exercise to chronic pain patients.

**(455) The clinical efficacy of repeat magnetic resonance imaging in patients with chronic spine pain**



*T. Vu, H. Al-Grain, A. Liu, and R. Grim; Wellspan Interventional Pain Center, York, PA*

The appropriate use of diagnostic imaging can improve the care of patients with chronic low back and neck pain; in stark contrast, the inappropriate use can increase harm to patients and healthcare costs. The rate of lumbar magnetic resonance imaging (MRI) has increased at an alarming rate without evidence of concomitant improvements in patient outcomes. In examining interval changes in MRIs of patients with chronic back and neck pain, this study strove to quantitate the efficacy of repeat imaging. Data on 89 consecutive patients with multiple lumbar and cervical MRI was collected from June 2015 to August 2015. Data assessed included gender, age, weight, BMI, diagnosis, MRI results, and surgical treatment post-imaging. Radiologic changes were defined as increases in severity of abnormality at a particular disk level by the radiologists of record. There were 58 (65.2%) females and 31 (34.8%) males of mean age 59.1 years, BMI 31.2. Out of 192 MRIs, 130 (67%) were lumbar and 62 (32.3%) cervical. 79 (60.8%) lumbar MRIs and 47 (75.8%) cervical MRIs did not show interval changes. Of MRIs with changes, 17 (34.6%) lumbar and 5 (33.4%) cervical with severe changes. The mean time in years between recent and previous MRI was 2.9 for severe changes and 2.0 for no changes on cervical MRI ( $p=0.215$ ) and 2.6 for severe changes and 1.7 for no changes on lumbar MRI ( $p=0.018$ ). 7 (11.5%) patients had surgery after cervical MRI and none after lumbar MRI. Significant number of repeat MRIs did not show interval changes or resulted in surgical treatment post-imaging. (Flynn et al., Journal of Orthopaedic & Sport Physical Therapy, 2011; Tetsuo et al., J. Spinal Disorder Tech, 2005)

**(456) Efficacy of Transcranial Direct Current Stimulation on Clinical Pain Severity in Older Adults with Knee Osteoarthritis Pain: A Double-Blind, Randomized, Sham-Controlled Pilot Clinical Study**



*H. Ahn, A. Woods, E. Choi, N. Padhye, and R. Fillingim; The University of Texas Health Science Center at Houston, Houston, TX*

Arthritis is a leading cause of pain, impaired daily activity, and disability in people 45 years and older. Osteoarthritis (OA) is the most common arthritic condition, and the knee is the most commonly affected joint. Because pharmacologic treatments can increase the risk of adverse events among older adults, there is a growing interest in non-pharmacologic interventions targeting central nervous system pain processing for this population. Specifically, noninvasive brain stimulation, such as transcranial direct current stimulation (tDCS), has received significant attention for the treatment of pain in chronic conditions owing to its neuromodulatory effects. Thus, we sought to assess the preliminary efficacy of tDCS on clinical pain severity in adults with knee OA pain. We conducted a double-blind, randomized, sham-controlled pilot clinical study in 40 community-dwelling

participants with knee OA who were 50–70 years old. The participants were randomly assigned to receive either five daily sessions of 2mA tDCS for 20 minutes or sham tDCS. The anode electrode was placed over the primary motor cortex of the hemisphere contralateral to the affected knee, and the cathode electrode was placed over the supraorbital region ipsilateral to the affected knee. Clinical pain severity was measured at baseline and after tDCS via a numeric scale (0 to 100) rating current knee pain. The mean age was 59 years (SD = 8 years), and 53% were female. After five daily sessions, the tDCS group had a greater reduction in knee pain ( $18.50 \pm 3.60$ ) than the sham group ( $6.45 \pm 2.26$ ). The mean difference between groups was 12.05 ( $t=2.83$ ,  $df=38$ ,  $p=.007$ , Cohen's  $d = 0.90$ ). Our preliminary results show that tDCS reduced clinical pain severity in adults with knee OA. Further studies with larger samples and longer-term follow-ups are needed.

**(457) Evaluation of transcutaneous electrical stimulation (tens) in the treatment of an experimental model of neuropathic pain and its implications on functionality**



*M Santos, K Sato, E Santos, G Martins, and J De Santana; University of Sergipe, Aracaju, Sergipe, Brasil*

Neuropathic pain is a type of painful sensation that occurs in one or more parts of the body, and it is associated with diseases that affect the central nervous system. Non-pharmacological therapeutic modalities are increasingly being investigated in animal models of chronic pain. To evaluate the treatment of neuropathic pain in the SNI model through the application of TENS, besides evaluating the effects of this treatment on the functionality return. Wistar rats were divided into 2 experimental groups, SNI with TENS on and TENS off. After 15 days of the surgical procedure, the TENS application protocol was initiated. TENS on or TENS off was administered to the paravertebral muscles between L4 and L6 level of the animals. Secondary mechanical hyperalgesia was measured through von Frey filaments and functional of the tibial nerve evaluation. These measures were performed before and 15 days after surgery and before and after each day of treatment. After the surgical procedure, there was a reduction of the paw withdrawal threshold in both groups. The SNI groups with the TENS on showed a significant increase of the paw withdrawal threshold after the application of TENS on all days. Regarding the gait analysis, a significant difference was observed between the functional parameter collected during the therapy time, when we compared the SNI group with the TENS off with the TENS on group. Improvement in functional index was observed a few days before and after the TENS on. The results of the study demonstrate that the application of TENS was effective to reduce hyperalgesia in an experimental model of neuropathic pain, with improvement in the gait of the animals some days.

**(458) Descriptive and Clinical Characteristics of Patients Prior to Receiving a Spinal Cord Stimulator at Walter Reed National Military Medical Center**



*L Wandner, C Kurihara, N Campos, D Bushey, Y Gordin, S Griffith, R Liu, and C Spevak; Walter Reed National Military Medical Center, Bethesda, MD*

Implantation of spinal cord stimulators (SCS) has been shown to effectively treat chronic pain; however, few studies have examined the demographic or clinical characteristics of patients in the Military Health System (MHS) being considered for an SCS implant. This study examines the characteristics of those patients receiving SCSs in the MHS. The Walter Reed National Military Medical Center (WRNMMC) SCS Cohort is made up of active duty, veterans, and dependents who underwent a SCS implant between 2014-2016. Ninety participants completed a pre-SCS evaluation with a pain management doctor and psychologist, and completed questionnaires created for this project, a SCS trial, and a permanent SCS implant. Patients in the SCS cohort were primarily between the ages of 35-44, male, active duty, Army-affiliated (active duty and/or retired), and were not going through the medical board process. The mean pain intensity at baseline was 6.55/10, the average pain duration 7.29 years, and the patients were primarily experiencing back pain. This project found certain clinical characteristics that predicted significantly higher pre-SCS implant pain intensity ratings. These were a diagnosis of depression, PTSD, having minor or well-controlled behavioral health issues compared to no behavioral health issues (as measured by the Tur-

abi-Wain Scale), and/or higher ratings on the pain disability index. We also found certain demographic and clinical characteristics that predict patients having higher morphine equivalent dosages (MEQ). These included: being a dependent, an officer (vs. enlisted), combat-related pain, and/or having a concurrent benzodiazepine prescription. These findings suggest that WRNMMC pain management providers use SCS implants to treat patients experiencing complex and treatment-refractory chronic pain. The findings also suggest that demographic and clinical characteristics predict patients' pain ratings and their MEQ.

**(459) Spinal Cord Stimulators at Walter Reed National Military Medical Center: Clinical Characteristics of Patients at 3-month Follow-up**



*Y Gordin, L Wandner, C Kurihara, N Campos, D Bushey, S Griffith, R Liu, and C Spevak; Walter Reed National Military Medical Center, Bethesda, MD*

Research has shown that those who have served or are serving in the military experience pain at greater rates than the public at large. Spinal Cord Stimulators (SCS) have proven to be effective devices for non-pharmacological pain management, reducing patients' pain intensity ratings and improving their quality of life. However, limited research has examined SCS outcomes in the Military Health System (MHS). The objective of this study is to determine whether there is improvement in clinical markers three-months post-implantation. The Walter Reed National Military Medical Center (WRNMMC) SCS Cohort (N=90) includes patients (active duty, veterans, and dependents) who have successfully completed a SCS trial and received a permanent implant. This project examined a sub-sample of the Cohort (N=50), who received a permanent SCS implant and were evaluated at three-months. The majority of patients were male, active duty, and didn't have pain resulting from combat-related injuries. The mean age was 44.64 years, and the mean satisfaction rating post-implant was 4.13/5. Paired t-test analyses examined the patients' ratings at baseline and three-months post-implant. Pain intensity ratings, as well as the pain disability index ratings, had significantly decreased ( $p \leq .001$ ) at three-months; no significant differences were seen in morphine equivalent, possibly due to post-operative acute pain management with prescription opioids. Likewise, working status was not impacted over the same period, in part because a majority of the patients were working both at baseline and at 3-months post-surgery. These findings suggest that at three-months following implantation, MHS patients are satisfied with their implants, and SCS may be an effective non-pharmacological tool to improve the patients' QOL due to reduction in disability and pain ratings. However, trends need to be monitored at 6-months and two years following implantation.

**(460) Use of Spinal Cord Stimulators in a Sub-Sample of the Veterans Health Administration's Musculoskeletal Disorders Cohort from 2000-2012**



*L Wandner, B Fenton, C Carrol, J Goulet, A Heapy, D Higgins, M Blair, F Sandbrink, and R Kerns; VA Connecticut, West Haven, CT*

Spinal cord stimulator (SCS) implantation is one option for treating chronic pain conditions, including painful musculoskeletal disorders (MSDs). However, there are few large-scale studies examining SCS implants. The Veterans Health Administration (VHA)'s - Musculoskeletal Disorders Cohort study (MSD; N=5.4 million) was used to identify veterans who underwent SCS implantation from 2000-2012. The analytic sample was limited to veterans with at least one of the three diagnoses (post-laminectomy syndrome-lumbar region, thoracic or lumbosacral neuritis/radiculitis, and lumbago) that accounted for more than half of the SCS implants between 2000 and 2012 ( $n=815,475$ ). A total of 1,490 veterans with a SCS implant were identified. Most veterans who received a SCS implant (92.35%) were prescribed opioids during the year prior to implant, that percentage decreased to 86.58% in the year following the post-operative 90-day window. Similarly, the median morphine equivalent dosage per day (MEQ) in the year prior to implantation was 26.48mgs, while during the 90-day post-operative period it was 28.03mgs, dropping to 22.59mgs one-year after the 90 day post-operative period. The difference in MEQ from one-year pre-implant to one-year post-implant was significant ( $p < 0.05$ ). Among veterans receiving a SCS, the mean pain intensity NRS pre-implant was 5.16, increasing to 5.29 90 days post-implant, then returning to 5.11 in the year