



**Research Platform Presentations
18th Annual Meeting Las Vegas, NV
Friday October 26, 2018
9:00-10:30pm**

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INSPIRATORY MUSCLE TRAINING COMBINED WITH PILATES-BASED PHYSICAL THERAPY IN AN OLDER WOMAN WITH HEMI-DIAPHRAGM PARALYSIS: A CASE REPORT

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PURPOSE: Inspiratory Muscle Training (IMT) is an intervention used to improve functional performance, respiratory capacity, and recently as a method to improve low back pain (LBP). This case study reports on the effects of IMT combined with Pilates-based physical therapy (PPT) on an insidious onset right hemi-diaphragm partial paralysis in an older woman with LBP.

CASE DESCRIPTION: The subject was an 81-year old female with a history of chronic bronchitis, chronic LBP, and a prolonged period of hospital bed-rest due to pneumonia and an insidious onset right hemi-diaphragm paralysis. Outpatient PPT with 2 L supplemental oxygen (O₂) was initially provided for 12 weeks which was followed by PPT with IMT utilizing the Threshold inspiratory muscle training device for 16 additional weeks. Maximal Inspiratory Pressure (MIP) and Maximal Expiratory Pressure (MEP) measurements were taken with the MicroMedical Mouth Pressure Manometer upon initiation of IMT and after 7 and 16 weeks of IMT. The IMT protocol commenced at 20% of MIP and was progressed by increments of 5% over the next 5 sessions resulting in a workload reflecting 45% of baseline MIP for 10 minutes daily. IMT was administered after PPT sessions which consisted of PPT exercises with emphasis on core musculature engagement, axial elongation, flexibility, and overall strengthening. Daily IMT as described above was also performed at home between PT sessions.

OUTCOMES: MIP and MEP increased substantially from baseline (50 to 63.3 cm H₂O and 95.3 to 125.3 cm H₂O) which were 9% and 7%, respectively, above her age-predicted values, but LBP symptoms persisted. Palpation and visual observation of right sided bucket-handle motion increased substantially and was better coordinated during PPT with longer inspiratory durations. The subject reported substantially less dyspnea and improved walking ability and no longer required supplemental O₂ after intervention. At baseline the subject was denied spinal surgery because of poor respiratory status, but was cleared for surgery after IMT and PPT due to improved respiratory capacity enabling safe administration of anesthesia.

DISCUSSION: Combined IMT and PPT improved respiratory muscle strength, hemidiaphragm paralysis and dyspnea, and resolved the need for supplemental O₂, but did not affect LBP symptoms. Combined IMT and PPT appear to be important therapeutic interventions for subjects with hemi-diaphragm paralysis. Since IMT was added after 12 weeks of PPT, combined IMT and PPT appear to be responsible for the improvements.

KEYWORDS: Pilates, inspiratory muscle training, hemi-diaphragm.

FUNDING: None

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THE EFFECT OF PILATES ON CORE STRENGTH AND STABILITY OF FEMALE COLLEGIATE ATHLETES

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PURPOSE: The purpose of this study was to determine the effects of Pilates exercise on core strength and stability following twelve sessions of Pilates in female collegiate athletes.

SUBJECTS: Members of the soccer (n=15) and volleyball (n=8) teams were recruited to participate (n=23). Written informed consent and HRPP approval was obtained prior to the study.

METHODS/MATERIALS: Pilates-based mat sessions were designed by a PMA Certified Pilates Teacher to be progressively challenging yet adjusted to the participant's abilities (Isacowitz, 2014). Pilates sessions were held in conjunction with team off-season conditioning and done in collaboration with team coaches. Core strength and core stability were measured both pre and post Pilates interventions. The Straight Leg Lowering Test (SLLT) was used to measure core strength. (Supine with hips flexed to 90 degrees, a blood pressure cuff inflated to 40mmHg is placed under the lumbar spine at the L4-L5 level. The subject is then asked to lower their legs while maintaining a flat back and extended legs.) (Dutton, 1465) When pressure in the cuff decreases the hip angle was measured with a goniometric app (Vohralik, 2015). The Upper Quarter Y Balance Test (YBT-UQ) is a dynamic test where thoracic rotation and core stability are maximally challenged while the subject is maintaining a pushup position. The YBT-UQ uses a testing apparatus that measures maximal reach in three directions for both arms over three trials to generate a composite score (Cook, 19).

ANALYSIS: SPSS 25 was used for all statistical analyses, a priori at $p < .05$.

RESULTS: The findings indicated significant outcomes. The SLLT mean and standard deviation prior to the Pilates sessions was 30.42(19.78) and 18.09 (15.59) following the twelve sessions. A paired samples t-test, $t(22) = 3.01$, $p = .006$ indicates a significant change. The Left YBT-UQ mean and standard deviation prior to the Pilates sessions was 82%(10%) and 92%(7%) following the twelve sessions. A paired samples t-test, $t(22) = 4.998$, $p < .000$ indicates a significant change. The Right YBT-UQ mean and standard deviation prior to the Pilates sessions was 81%(11%) and 91%(8%) following the twelve sessions. A paired samples t-test, $t(21) = 5.367$, $p < .000$ indicates a significant change.

CONCLUSIONS: Results suggest core strength and stability can improve by the use of Pilates in conjunction with off-season conditioning in female athletes. The use of a control group in a future study would further demonstrate the efficacy of Pilates in this population (Kibar, 2016).

FUNDING SOURCE: None

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CORRELATION OF SENSORIMOTOR AND PSYCHOLOGICAL VARIABLES BETWEEN UNSPECIFIC CHRONIC LOW BACK PAIN AND ASYMPTOMATIC PARTICIPANTS OF A PILATES EXERCISE PROGRAM

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PURPOSE: Chronic low back pain (CLBP) has been described as a multifactorial condition. Several investigations have studied the interaction between biological, psychological and social processes showing that pain and functional capacity are correlated with demographical, structural and psychosocial factors in patients with CLBP. However, there is still lacking understanding about the association between sensorimotor and psychological variables in CLBP patients. The primary aim of this study is to compare the differences of psychological and sensorimotor measures between two physically active populations, one with CLBP and another one asymptomatic.

MATERIALS AND METHODS: A total of 30 CLBP subjects and 30 asymptomatic subjects were selected. Subjects self-reported their sociodemographic data, activity level and four psychological questionnaires. In addition, five sensorimotor tests were assessed.

RESULTS: Significant differences between groups were found for catastrophizing levels ($P = 0.026$) and fear of movement ($P = 0.001$). There were no differences between groups in self-efficacy, likewise no differences were found in any of the sensorimotor variables ($P > 0.05$). Only the association between lumbopelvic stability and kinesiophobia in healthy subjects showed moderate magnitude ($r = 0.524$; $P < 0.01$), other weaker associations were found between PPT and LF-AROM with self-efficacy.

CONCLUSION: No sensorimotor differences have been found between healthy and chronic low back pain patients. However, strong differences were found in the psychological variables of catastrophizing and fear of movement. No large magnitude correlation between sensorimotor and psychological variables have been found except lumbopelvic stability and less fear of movement in healthy subjects.

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A SYSTEMATIC REVIEW OF MAT AND EQUIPMENT PILATES AS AN INTERVENTION FOR NON-SPECIFIC LOW BACK PAIN

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BACKGROUND/PURPOSE: Pilates is a mind and body exercises regimen that is purported to achieve optimal balance, strength, and body alignment. Pilates can be done on a mat or by using one of several pieces of Pilates equipment. Mat Pilates is purported to produce functional and integrated movements. Equipment Pilates can be used to add an external resistance to the exercises or as assistance to guide participants through the movements to create healthy movement patterns. These two forms of Pilates have been utilized in healthy populations as a method of achieving and maintaining wellness and in individuals rehabilitating from physical impairments due to the immense benefits. There is evidence in the literature that individuals with non-specific low back pain can benefit from Pilates. However there are no available published systematic reviews that compares the effects of mat versus equipment Pilates on non-specific low back pain. The purpose of this study was to review the scientific literature to determine the effectiveness of mat versus equipment Pilates on non-specific low back pain.

METHODS: A systematic review of the published literature was carried out using the PEDro scale in order to critically appraise articles found using the electronic databases: SPORTDiscus, Cochrane Library, and MEDLINE. The PRISMA-Equity 2012 checklist was followed to ensure the researchers included all the necessary components to ensure a valid review.

RESULTS: The studies, published between 2013-2018, that met the inclusion criteria were reviewed comparing the effectiveness of mat and equipment Pilates on non-specific low back pain. The studies revealed that the Pilates method has a positive impact reducing low back pain.

CONCLUSION: There is evidence to conclude that Pilates is a valid intervention for reducing low back pain, as the studies show mat and equipment Pilates both have a positive effect. More comparative randomized controlled trials should be conducted to determine which Pilates method is more beneficial to clients with non-specific low back pain.

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A DESCRIPTIVE STUDY OF THE PERCEIVED EFFECTS OF REFORMER TRAINING WITH UNIVERSITY DANCER

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PURPOSE: The purpose of this study was to document self-reported benefits of Pilates Reformer training for university dancers.

PARTICIPANTS: Thirteen dancers who enrolled in a semester-long *Reformer Training for Dancers* course were invited to volunteer for the study. Eleven female and two male dancers volunteered and provided written consent after the study was approved by the university human subjects committee.

METHODS AND MATERIALS: Data were gathered from the regular course activities, and the instructors were blind to which dancers were participating in the study. Dancers met once each week for 15 weeks to learn a progressive series of new exercises. They met a second time each week with a training partner and a peer-coach and a third time each week with only their training partner to practice the exercises on their own. At the end of each 5-week period, the dancers wrote open-ended assessments of their progress and their aspirations for future work. At the beginning of the 2nd and 14th class meetings, each dancer was video-recorded performing a dance phrase designed to challenge abilities commonly addressed through Pilates training. The dancers viewed the videos prior to completing their final self-assessment.

ANALYSIS: One observer, not involved with the course, independently coded the dancers self-reported assessments, identifying common themes.

RESULTS: Dancers reported improvements in alignment, stability, movement efficiency, and body awareness. Dancers observed a connection between Pilates Reformer training and dance and reported improvements in their dancing. On a social validity questionnaire administered at the end of the study dancers rated the training as appropriate, important, and worth the time invested.

CONCLUSIONS: Dancers observed several specific benefits to Pilates Reformer training. This study was not designed to demonstrate causal relationships between dance and Pilates training, but future research might be designed to assess the objective benefits through experimentation and to better understand dancers' experiences through additional qualitative assessment.

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