Pilates Method Alliance
11th Annual Meeting
Research Platform Presentations
Chair: Sherri R. Betz, PT, GCS, PMA®-CPT
Saturday November 5, 2011
1:30-2:30pm
Palm Desert, CA

1. **Diedre Manns, DPT, PMA®-CPT**
   Monarch Wellness Group, Los Angeles, CA
2. **Lise Stolze, MPT, DSc, CSCS, PMA®-CPT**
   Stolze Therapies, Denver, CO
3. **Karyn Staples, PT, PhD, OCS, PMA®-CPT**
   ProHealth Physical Therapy & Pilates, Atlanta, GA
4. **Jennifer Wells McCauley, DPT, PMA®-CPT**
   Harbor City Kaiser Permanente, Wilmington, CA
5. **Suzanne Martin, PT, DPT, PMA®-CPT**
   Pilates Therapeutics LLC, Alameda, CA
6. **Heidi Wildy, MS**
   Arizona State University, Tempe, AZ

1. CASE REPORT: UTILIZING PILATES AS THE PRIMARY INTERVENTION TO FACILITATE BALANCE INTEGRATION AND POSTURAL CONTROL IN AN ELDERLY PATIENT WITH SENSORY PERIPHERAL NEUROPATHY

AUTHOR: Manns,Diedra, DPT; *Monarch Wellness Group, Los Angeles, CA*
drdiedramannspt@gmail.com

PURPOSE: Provide a functional exercise regimen utilizing standing Pilates exercises to facilitate postural control and improve balance strategies in an older adult with peripheral sensory-motor deficits.

FOUNDATION: The Center of Disease Control and Prevention has reported that one third of adults aged sixty-five or older will fall at least once in a year. Of these falls, 30%-60% will result in moderate to severe injuries that impact the person's independence and increase their chances of early death. Additional studies have reported the cost of falls in adults aged 65 and older exceeded 19 billion dollars in 2000, with expectations of costs to exceed 55 billion by 2020. Fall prevention programs have been an area of active research over the last decade. The evidence indicates that programs with a multi-dimensional approach including exercises targeting balance, strength and endurance to be most effective in preventing falls.

DESCRIPTION: The patient is a 67 y/o male with a 2 year history of idiopathic mixed sensory-motor peripheral neuropathy. Upon evaluation he subjectively reported frequent falls, occurring once monthly on average. The patient participated in thirteen physical therapy sessions (10 weeks) whose primary interventions included standing Pilates Cadillac and Reformer exercises whose intended purpose, by the examiner, was to challenge his limits of stability (LOS) thereby impacting his postural control and LOS.
In order to provide challenges to his sensory-motor and postural control systems, neuromuscular re-education and motor learning strategies were used to facilitate sensory integration. Adjustments to his internal and external environments, external feedback schedules, levels of assistance and resistance provided by the physical therapist and equipment where modified as his performance improved. The outcome measures used in this study were the modified Timed Get Up and Go (TGUG), Functional Reach Test (FRT), tandem walking and static Rhomberg stance.

OBSERVATIONS: The patient demonstrated significant improvements in all balance outcome measures including; the modified TGUG, FRT, tandem walking and static Rhomberg stance. When these outcomes were compared to the normal aged matched values, the patients' scores indicated that he was a minimal to no fall risk. These same outcome measures were performed during one and eight month follow-up sessions, where test measures indicated that he remained a minimal to no fall risk. Additionally the patient had no subjective reports of falls at these one and eight month follow up sessions.

CONCLUSION: Standing Pilates exercises can be utilized as an effective tool to regain balance and postural control in community dwelling elderly adults. A case series or an investigational study with larger sample sizes of aged matched individuals who have been identified as high fall risks could provide greater statistical significance to these current findings.

2. DERIVATION OF A CLINICAL PREDICTION RULE FOR IDENTIFYING A SUB-GROUP OF PATIENTS WITH LOW BACK PAIN LIKELY TO BENEFIT FROM PILATES EXERCISE

AUTHORS:

- Lise R. Stolze, MPT, DSc. Physical Therapist, Steadman Hawkins Clinic Denver, Greenwood Village, Colorado and Affiliate Faculty Member, Regis University, Denver, Colorado.
- Stephen C. Allison, PT, PhD. Professor, Rocky Mountain University of Health Professions, Provo, UT, and Associate Professor, Baylor University, Waco, TX.
- John D. Childs PT, PhD, MBA. Associate Professor and Director of Research, US Army-Baylor University Doctoral Program in Physical Therapy, San Antonio, Texas.

PRESENTER: Lise Stolze, MPT, DSc; Stolze Therapies, Denver, CO lise@stolzetherapies.com

STUDY DESIGN: Prospective cohort study of subjects with non-specific low back pain (LBP)

OBJECTIVE: The purpose of this study was to derive a preliminary clinical prediction rule for identifying a sub-group of patients with LBP likely to benefit from Pilates exercise therapy.

BACKGROUND: Pilates has been shown to be effective for patients with LBP, however no work has previously been done to characterize patient attributes for those most likely to have a successful outcome from treatment.

METHODS: Treatment response was categorized based on changes in the Oswestry Disability Questionnaire Scores (ODQ) after 8 weeks. An improvement of 50% or greater was categorized as achieving a successful outcome. Thirty seven variables measured at baseline were analyzed with univariate and multivariate methods to derive a clinical prediction rule for successful outcome with Pilates exercise. Accuracy statistics, ROC curves and regression analyses were used to determine the association between standardized examination variables and treatment response status.

RESULTS: 96 subjects participated; 95 completed the study. 51 subjects (53.7%) achieved a successful outcome. A preliminary clinical prediction rule with 5 variables was identified: total trunk flexion ROM < 70 degrees, duration of current symptoms < 6 months, no leg symptoms in the last week, BMI > 25, and left or right hip average rotation < 25 degrees. If any 3 of the 5 attributes were present (positive likelihood ratio 10.64), the probability of experiencing a successful outcome increased from 54% to 93%.

Conclusion: These data provide preliminary evidence to suggest that the response to Pilates exercise therapy in patients with LBP can be predicted from variables collected from the clinical examination. If subsequently validated in a randomized clinical trial, this prediction rule may be useful to improve clinical decision-making in determining which patients are most likely to benefit from Pilates exercise therapy.

PUBLISHED: Stolze LR et al. (2012) Derivation of a Preliminary Clinical Prediction Rule for Identifying a Subgroup of Patients With Low Back Pain Likely to Benefit from Pilates-Based Exercise. *J Ortho Sport Phys Ther*. May; 42(5):425-36.

3. EFFECT OF PERFORMING THE STANDING PILATES REPERTOIRE ON BALANCE IN AN AGING FEMALE POPULATION

AUTHOR: Karyn Staples, PT, PhD, OCS; ProHealth Physical Therapy & Pilates, Peachtree City, GA kstaples@phrehab.com

STUDY DESIGN: Single, blinded randomized control trial

OBJECTIVE: To determine if performing the Standing Pilates repertoire would significantly improve balance as determined by the Timed Up and Go (TUG) and Berg Balance Scale (BBS) for women aged 65-85 years

BACKGROUND: The ability to balance directly affects an individual's capacity to function independently or with confidence. As an individual ages, balance is of particular concern for the individual as well as for family members as it impacts that individual's freedom and independence. Poor balance can lead to injury, which may further compromise independence, making balance not just an immediate safety concern, but a broader quality of life issue.

METHODS: Fifty-two community dwelling women were assessed using the Modified Falls Efficacy Scale (MFES), TUG and BBS and then randomly assigned to either the Standing Pilates group (intervention group) or the exercise group (standard group). All participants attended three 45 minute exercise sessions each week for a 4-week time period (12 sessions total).

RESULTS: Forty-one women completed a minimum of 10 exercise sessions and participated in the post-assessment. The MFES tool showed no difference pre and post-assessment and no difference between groups. Statistical significance ($p < 0.05$) was found on the pre- and post-assessment for all participants independent of group assignment on the TUG and BBS. There was no difference between groups on the TUG and BBS. Statistical significance ($p < 0.05$) was found pre- and post-assessment as well as between groups on the abdominal circumference measurement.

CONCLUSIONS: Both groups improved significantly on the TUG and BBS from the pre-assessment to the post-assessment. The Standing Pilates repertoire, however, was no more effective at improving balance scores than the standard group.

KEY WORDS: Pilates, Balance, Female, Aging

4. THE EFFECT OF A REFORMER-BASED PILATES PROGRAM ON STRESS URINARY INCONTINENCE

AUTHORS: McCauley J, Donnelly CF, Horn L, Ninness S, Campa J, Chorolec L, Lowe D; Mount St. Mary's College Los Angeles, CA USA

PRESENTER: Jennifer Wells McCauley, DPT, Harbor City Kaiser Permanente, Willmington, CA, jenniferwellsdpt@yahoo.com

STUDY DESIGN: A Single-Subject AB Research Design was chosen to determine the effect of Pilates treatment on SUI. The AB design includes a baseline phase (A) followed by an intervention phase (B).

OBJECTIVES: To establish the potential for Pilates reformer exercises as a treatment for SUI and begin the development of a Pilates exercise protocol for the rehabilitation of SUI.

BACKGROUND: Stress Urinary Incontinence (SUI) is a socially and physically limiting condition, which affects 15-25 million Americans, women more than men. There are several conservative treatment options for SUI that vary in clinical efficacy. It is important to develop additional treatment options to address the unmet needs of this population.

METHODS: Subjects were obtained through a convenience sample and included 3 women age 35-60 with a medical diagnosis of SUI. Each subject participated in 4-week baseline phase followed by an 8-week intervention phase. The dependent variables measured during the baseline and intervention phases were the Urogential Distress Inventory (UDI), bladder diary, cough test, bilateral adductor length and strength, gluteus maximus strength, Laycock manual muscle test (MMT), biofeedback resting tone, average work phase, and maximum contraction. During the intervention phase subjects received a Pilates reformer-based exercise program.

RESULTS: Baseline and intervention phase data were graphed and visually inspected for changes in stability and trend between phases. Two out of 3 participants displayed a downward trend for the UDI-6 indicating decreased leakage during physical activity, coughing, or sneezing. All three subjects displayed a downward trend on the bladder diary indicating a decrease in leakage throughout the intervention. Improvement on pelvic floor muscle endurance and coordination also occurred as indicated by the Laycock MMT. Biofeedback indicated improvement in resting pelvic floor muscle tone. There were no significant changes in adductor length as measured by goniometry or adductor and gluteus maximus strength as measured by MMT.

CONCLUSION: This study found that the reformer-based Pilates method has good potential as a conservative treatment option in the management of SUI. Further research should include larger sample sizes, a more diverse subject population, and long-term follow-up.

5. CASE REPORT: USING THE PILATES METHOD ENVIRONMENT IN A CASE OF AN ADOLESCENT MALE RECEIVING ONGOING TREATMENT FOR PECTUS EXCURVATUM UTILIZING A SUB-STERNAL 'NUSS' BAR.

AUTHOR: Suzanne Martin, PT, DPT; Pilates Therapeutics LLC, Alameda, CA, USA
Smartin2@pacbell.net

PURPOSE: Pectus excurvatum, or 'funnel chest' is a congenital abnormal development of the ribcage, where the sternum sinks, and causes the ribs to depress on one side. Often accompanied by scoliosis, its presentation is fairly common, affecting mostly white males in an occurrence of 1 in every 300-400 births, and accounting for 90% of chest wall deformities. The condition is not merely cosmetic. It can impact the functioning of the heart and lungs. One procedure used in the adolescent population to lessen the impact of the deformity is the Nuss procedure which involves inserting a bar substernally. The bar provides pressure out against the sternum. The goal is to leave the bar in place for a number of years to encourage musculoskeletal re-shaping. This case report documents the use of the Pilates Method apparatus in the first few months of Nuss bar insertion in a 14 year-old with minor scoliosis and a profound pectus excurvatum. No standard physical therapy is recorded for this population. The purpose of this case is to highlight the ability of the Pilates Method to be safely used in conjunction with skilled intervention for posture and motor control re-education, as well as muscle balancing during a delicate process. The case encourages further investigation in order to help other adolescents being treated for this condition.

BACKGROUND: The foundation of the case rests upon prior success of conservative treatments involving posture and motor control re-education and muscle balancing found within BioMed Central and in SOSORT (Society of Scoliosis Rehabilitation and Treatment) websites.

DESCRIPTION: The case describes the adolescent's condition pre-Nuss-procedure, and documents three months after Nuss bar insertion. Specific stages of involvement in terms of complications, pain control, function and physical progression are detailed.

OBSERVATIONS: Observations indicate a positive progression toward increased physical tolerance in the Pilates environment, increased coping skills and function management.

CONCLUSIONS: Treatment within the Pilates environment along with skilled intervention holds promise for adolescents undergoing a Nuss procedure to address pectus excurvatum.

FUNDING SOURCE: The author is self-funded and has no outside funding source.

REFERENCES:

1. http://my.clevelandclinic.org/disorders/pectus_excavatum/hic_pectus_excavatum.aspx
2. Fonkalsrud, EW. Current management of pectus excavatum. World Journal of Surgery, May 2003. 27(5):502-8.
3. http://www.biomedcentral.com/ and http://www.sosort-lyon.net/

6. THE EFFECTS OF A PILATES EXERCISE INTERVENTION ON LOW BACK PAIN AND DISABILITY

AUTHOR: Heidi Wildy, MS, Arizona State University, Tempe, AZ, U.S.A., balancefitness@q.com

PURPOSE: The purpose of this study was to examine the effects of a Pilates exercise intervention that incorporates spinal segmental stabilization (SSS) on self-reported low back pain (LBP) and disability.

SUBJECTS: Eighteen participants with chronic recurrent LBP were randomly assigned to a Pilates exercise intervention that included SSS or a control group (traditional methods of care).

METHODS AND MATERIALS: The McGill Pain Questionnaire (short form) and the Oswestry Disability Questionnaire were administered before and after the 8-week intervention period in order to measure changes in self-reported LBP and disability respectively.

ANALYSIS: Independent t-tests and repeated measures analysis of variance were used to assess changes in LBP and disability and differences between the Pilates exercise and the control groups.

RESULTS: Both the Pilates exercise group and the control group had significant reductions in self-reported low back pain and disability at the end of the 8-week intervention. No significant differences were found between the groups.

CONCLUSIONS: This study shows that a Pilates exercise intervention is as effective as traditional methods of care in reducing LBP and disability.

FUNDING SOURCE: None

Pilates Method Alliance
12th Annual Meeting
Research Platform Presentations
Thursday November 8, 2012
4:00-6:00pm
Las Vegas, NV

1. **Sherri Betz, PT, GCS, PMA®-CPT**
   Polestar Pilates, Santa Cruz, CA
2. **Risa Sheppard, PMA®-CPT**
   Sheppard Method Pilates, Los Angeles, CA
3. **Karyn Staples, PT, PhD, OCS**
   Polestar Pilates, Atlanta, GA
4. **Anne Bishop, EdM**
   Masters Mind, Brain & Education
5. **Peggy Roller**
   Dawn-Marie Ickes, MPT, PMA®-CPT
   Evolve Integrated Wellness, Rancho Santa Margarita, CA
6. **Brent Anderson, PhD, PT, OCS**
   Polestar Pilates, Miami, FL
7. **Lawrence P. Cahalin PhD, PT, CCS**
   University of Miami, Miami, FL

Research 101 - Interpreting & Developing Pilates Research for the Clinician Interested in Best Practice

Lawrence P. Cahalin PhD, PT, CCS

Research in Pilates is growing and is providing a better understanding of best practice and preferred methods to manage health and disease. The purpose of this presentation is to provide the clinician with a basic to intermediate overview of interpreting research findings using published literature examining the effects of Pilates. Basic to intermediate statistics will be presented to help clinicians understand the growing Pilates literature. A brief overview of research designs will also be provided from which a template to gather data from multiple Pilates centers will be outlined. At the end of the presentation the participant will understand basic to intermediate research designs and statistics and methods to develop future Pilates research.

About: Lawrence P. Cahalin PhD, PT, CCS

Professor of Clinical Physical Therapy, Department of Physical Therapy, Leonard M. Miller School of Medicine, University of Miami, FL.

Dr. Cahalin has more than 30 years of experience in physical therapy practice and education and has held faculty positions at Northeastern University, Boston University, and the Massachusetts General Hospital Institute of Health Professions in Massachusetts. He is a Board-Certified Clinical Specialist in Cardiovascular and Pulmonary Physical Therapy. His research is focused on topics related to integrating the interrelatedness of the cardiovascular, pulmonary, and muscular systems using novel examination and management techniques. He has co-edited 2 textbooks, 28 book chapters, and 72 peer-reviewed manuscripts. He is Associate *Editor of Physiotherapy Theory and Practice,* and serves on the Editorial Board of *Cardiopulmonary Physical Therapy Journal.*
Dr. Cahalin earned his doctoral degree in Gerontology from the University of Massachusetts, Boston; his Master's degree from the University of Iowa; and his Physical therapy degree from Saint Louis University.

THE EFFECTS OF PILATES EXERCISES ON BRAIN INJURY AND ITS REHABILITATION

Risa Sheppard, PMA®-CPT
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STUDY DESIGN: A single-Subject AB Research Design was chosen to determine the effects of Pilates treatment on a young stroke victim.

OBJECTIVE: To establish the criteria and potential for Pilates exercises to help in the treatment for brain injury, and to help renew muscular memory, strength, and movement to the effected areas of the subject.

BACKGROUND: Results from a massive stem cell stroke on a 26-year old victim who was not expected to live or fully recover. 60% of her cerebellum was removed leaving her right side considerably weaker. Subject had to learn to speak, eat, walk, and regain control of her motor skills. Her face was paralyzed and her speech impaired, as well as her vision and hearing.

METHODS: Subject was chosen after three years of intensive physical therapy, which was eventually discontinued. Subject participated in a 6-week intervention phase. Basic Pilates Exercises along with mental imaging of subject envisioning, remembering and concentrating on the correct feeling in her limbs as they perform the Pilates exercise.

ANALYSIS: Repetition of movement with mental and visual exercise cues to rehabilitate the injured areas. Repeated Reformer and Cadillac exercises utilized with hands on cueing to assist the neuronal activity to recall and execute precise movements. Her gradual changes in movement during Basic Pilates Exercises improved over other forms of rehabilitation. Her mental acuity corresponds to her particular physical abilities.

RESULTS: Subject has experienced increased range and stability of motion particularly on her right side, due to specifically targeted Basic Pilates Exercises. Shoulder stability, which was decreased due to atrophy, has greatly increased. Subject had less disability at the end of the 6-week intervention. Motor skills in the right portion of her body were greatly enhanced. She also showed more stability in movement of leg and arm.

CONCLUSIONS: Study shows that the subject of brain injury and stroke benefited from specifically targeted Pilates exercises, as an effective tool for rehabilitation, increasing core strength and alignment.

FUNDING; none

EFFECT OF PERFORMING PILATES WITH CHILDREN DIAGNOSED WITH ADHD AND/OR SENSORY INTEGRATION DISORDER.

Karyn Staples, PT, PhD, OCS, PMA®-CPT; Polestar Pilates Educator
ProHealth Physical Therapy and Pilates Studio, Peachtree City, GA, USA

Background: One theory of why children have sensory processing issues is that they missed a stage in development from birth; from supine to prone to sitting to crawling to standing/walking. In planning a Pilates workout the progression of exercises follows the same order as development. Thus came the idea that perhaps pilates based mat exercises may have a positive impact on children with ADHD and/or sensory integration disorder.

Objective: The aim of the study was to investigate the effect of performing a mat-based Pilates program on infantile reflex habituation in children diagnosed with ADHD and/or sensory integration disorder.

Methods: Thirteen children were recruited through word of mouth and two pediatric outpatient occupational therapy clinics in the suburban area. The children had a confirmed diagnosis of in spectrum ADHD and/or sensory integration disorder from a medical physician. The pre and post testing was performed by the same licensed occupational therapist using the Goddard Reflex Test. The children met for thirty minutes, two times a week for six weeks under the direction of a Pilates instructor using the same sequence and exercise format for each class session.

Results: Average age of the participants was 9 years, average number of sessions attended was 8, and the average change on the Goddard Reflex Test was 4 points.

Conclusion: The mat-based Pilates program was effective to decrease the score on the Goddard Reflex Test pre to post test denoting an improvement in infantile reflex integration.

CONNECTING BRAIN SCIENCE WITH PILATES TEACHING & PRACTICE

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Purpose: The major reason for developing this new program is to fill the knowledge gap of the body brain connection in Pilates education. The new method pushes teachers to think beyond muscular skeletal imbalances and incorporate basic brain science principles and ongoing research so teachers think about clients from a mind, body and brain perspective.

Foundation: The program is based on Mind, Brain and Education (MBE) theory. The MBE approach intertwines research from the disciplines of cognitive science, neuroscience, psychology and human development to improve educational outcomes. The program extends the MBE philosophy to the field of Pilates and other health and wellness professions. It reviews sound research, about how the brain perceives and creates action, and gleans best practices for Pilates and health and wellness professionals.

Description: Program methods included literature reviews, master's level education neuroscience courses and researcher interviews culminating in a Mind, Brain, and Education Master's thesis and curriculum developed at Harvard Graduate School of Education in 2011. In 2012, the curriculum was taught internationally to Pilates, Yoga and Physical Therapy practitioners.
The program aligns cues to enhance the neural networks responsible for creating action. Four prominent forms of cueing: visual, imagery, verbal, and touch cues are covered. For example, visual cues tap into the mirror neuron system. The mirror neuron system helps Pilates students imitate teacher demonstrations. However, mirror neurons react better under certain conditions. Specifically, mirror neurons are more robustly activated when the goal of the movement is clear (Gazzaniga, 2009) and when students observe the movement in first-person perspective versus third-person perspective (Jackson et al, 2006).

Observations: Formal assessments and responses received from Pilates, Yoga, and Physical Therapists range from validation of some intuitive cueing techniques to responding they never considered such cue options. Course participants self-reported increased confidence in teaching abilities and cueing adaptability. Students who received cue adaptations anecdotally displayed quicker learning times and greater transfer to contexts outside the studio.

Conclusions: Significance for this work is threefold: greater professionalism in the Pilates industry, incorporation of evidence-based teaching for Pilates, health and wellness education, and better client-learning outcomes. Future work suggestions follow the established MBE philosophy of reciprocal collaboration between research and practice. Connecting Pilates or Physical Therapy practitioners with researchers can help to improve and offer insights into all professions.

Funding Source: There is no outside funding source. Potential material gain is attendance fees to workshops where I teach this method.

References:

Gazzaniga, M., Ivry, R., & Mangun, G. (2009). In Durbin J. (Ed.), *Cognitive neuroscience the biology of the mind* (3rd ed.). New York, NY: W. W. Norton & Company.

Jackson, P. L., Meltzoff, A. N., & Decety, J. (2006). Neural circuits involved in imitations and perspective taking. *NeuroImage, 31*, 429-439.

PILATES-BASED EXERCISE FOR FALL RISK REDUCTION IN OLDER ADULTS: A RANDOMIZED CONTROLLED TRIAL

AUTHORS: Roller, Margaret[1]; Kachingwe, Aimie[1]; Ickes, Dawn-Marie[1]; Cabot, Allyson[2]; Shrier, Gabrielle[2]; Beling, Janna[1]

INSTITUTIONS: 1: California State University, Northridge, CA, Department of Physical Therapy; 2: Core Conditioning, Studio City, CA

PURPOSE: The purpose of this study was to investigate the effects of Pilates-based exercise on measures of fall risk including self-efficacy, balance, mobility, and active range of motion (ROM) in adults age 65 and over who are known fallers or at risk for falls.

SUBJECTS: 72 subjects (41 experimental, 31 control; 51 female, 21 male; mean age 77 years, range 65-95 years).

MATERIALS/METHODS: Inclusion criteria: A self-reported history of two or more falls or one injurious fall in the past year or a Timed Up and Go (TUG) test of $\geq$13.5 seconds suggesting risk for falling, passing scores on the Mini-Mental State Examination (MMSE) and Motor Control Test (MCT) on the NeuroCom Equitest®, and absence of neurologic system pathology. Intervention: Experimental group subjects attended ten 45-minute Pilates-based exercise sessions over 10 weeks in a group class format utilizing the Balanced Body® Pilates Studio Reformer® under the supervision of a physical therapist who is a Gold Certified PMA Pilates Instructor. Control subjects received pre- and post-tests only. Outcome measures: Activities-specific Balance Confidence (ABC) scale, Timed Up-and-Go Test (TUG), Berg Balance Scale (BBS), 10 Meter Walk Test (10MWT), Sensory Organization Test (SOT), Adaptation Test (ADT), and active range of motion (AROM) of ankle dorsiflexion, hip extension and straight-leg raise.

RESULTS: Age, gender, height, cognitive status, and number of falls during the past year did not differ between groups at baseline. The experimental group improved significantly at the $p<0.05$ level on the following outcomes measures. ABC scores significantly improved from 69.3% to 76.3% indicating decreased fall risk and improved balance confidence, TUG times significantly decreased from 12.4 to 10.5 seconds suggesting reduced fall risk and improved dynamic balance, BBS scores significantly increased from 51.2 to 53.4 out of 56 suggesting reduced risk for falls and improved balance, 10MWT time improved from 9 seconds to 8 seconds demonstrating improved gait velocity, ADT scores significantly improved for toes down perturbations suggesting improved stability during changes in surface conditions, and AROM significantly increased in both legs for straight leg raise, hip extension, and ankle dorsiflexion. SOT composite scores increased significantly in both groups by 6.5 points out of 100 suggesting improved postural stability or learning effect. The control group demonstrated significant change on the SOT only.

CONCLUSIONS: Pilates-based exercise performed once per week using the Reformer resulted in significant improvements in balance self-efficacy, measures of static and dynamic balance, gait velocity, functional mobility, sensory organization, active range of motion, and reduced fall risk in adults age 65 over who were known fallers or at risk for falling. The control group demonstrated improved sensory balance function only.

CLINICAL SIGNIFICANCE: This study suggests that rehabilitation focusing on Pilates exercise using the Reformer once per week is an effective intervention to improve balance and mobility and decrease fall risk in older adults.

KEY WORDS: Pilates, fall risk, older adults

PILATES-BASED EXERCISE FOR ADULTS WITH OSTEOPOROSIS: MULTIPLE CASE REPORT

AUTHOR: Betz, Sherri

FUNDING: None

PURPOSE: The purpose of this study was to investigate the effects of non-apparatus Pilates-based group exercise in adults and older adults.

SUBJECTS: 10 subjects (1 Male, 9 Females); mean age 64 years, age range 60-68 years).

MATERIALS/METHODS: Inclusion criteria: Community dwelling adults with the diagnosis of Osteoporosis or Osteopenia, independent with ambulation and transfers to floor. Subjects volunteered to participate in 2x per week 60 minute Pilates-based mat classes for one year taught by a PMA® Certified Pilates Teacher/Polestar Pilates Graduate.

Subjects received the following pre-tests and post-tests at 6 weeks.

Posture and Functional Tests:
Flexicurve Kyphosis Angle
Occiput-to-Wall Distance
Rib to Pelvis Distance
TUG (Timed Up and Go Test)
Single Leg Stance Test (30 sec)
Chair Rise Test (30 sec)
Heel Raise Test (25 reps)
Full Squat
Half Squat
Marriage Proposal Lunge
Hip Extension Test

AROM:
Horiz Shoulder Abduction
Hip Flexion (Seated)
Hip Extension (Prone)
Hip Abduction (Sidelying)
Knee Flexion (Supine)
Knee Extension (Supine)
Ankle Plantar Flexion (Supine)
Ankle Dorsi Flexion (Supine)

MMT:
Ankle Dorsi Flexion (Seated)
Knee Extension (Seated)
Hip Flexion (Seated)
Hp Abduction (Sidelying)
Hip Extension (Prone)
Knee Flexion (Prone)
Spine Extension (Prone)
Core Strength (Supine)

RESULTS: 8 of 10 subjects completed the entire class series. Post-tests at 6 weeks showed improvements in the following areas: Flexicurve Kyphosis Angle improved by 2 points, Occiput-to-Wall Distance and Rib to Pelvis improved by one finger, TUG (Timed Up and Go Test) improved by 1.52 seconds, Single Leg Stance Test (30 sec) significantly improved by 6.43 seconds, Chair Rise Test (30 sec) improved by 1.43 repetitions, Heel Raise Test (25 reps) improved by 4.43 repetitions, Full Squat improved by 2.69 inches, Half Squat improved by 2.46 inches, Marriage Proposal Lunge improved by 5.10 inches and Hip Extension Test improved by .71 MMT Score. AROM and MMT Scores did not change significantly. The most significant changes were seen in balance and leg strength at 6 weeks.

CONCLUSIONS: Modified Pilates group exercise two times per week appears to improve balance, posture, leg strength, and functional skills. Pilates-based classes targeting posture, balance and leg strength may be a viable low-cost long-term intervention for older adults to maintain their independence. The program will continue for 1 year with periodic tests and measures at 6 months and one-year. Randomized controlled trials are recommended to compare Pilates-based exercise to other types of exercise and to a control group that does not exercise to further investigate the efficacy of this type of program.

KEY WORDS: Pilates-based exercise, Modified Pilates, osteoporosis, balance, older adults

TREATING CHRONIC LOW BACK PAIN WITH PILATES AND MANUAL THERAPY

AUTHORS: Christine Borges, SPT, Julia Jones, SPT, Lory Montealegre, SPT, Guillermo Di Novi, SPT

SUPERVISING FACULTY: Brent Anderson, PT, PhD, OCS, PMA®-CPT, Lourdes Perez, MSPT

INSTITUTIONS: University of Miami and Polestar Pilates Education

BACKGROUND AND PURPOSE: Low back pain is one of the most prevalent diagnoses affecting individuals today and it will affect approximately 80% of people in their lifetime. Although there is evidence supporting manual therapy as well as Pilates in the treatment of back pathology, there is little research to support the use of these treatments in combination. The purpose of this case study is to examine the effects of manual therapy in combination with Pilates-based rehabilitation for the treatment of chronic low back pain.

CASE DESCRIPTION: The patient was a 38 year old athletic and active male who presented with a four month history of insidious lumbar pain, lower extremity radiculopathy, and mild foot drop on the right. He was diagnosed with a L4-L5, L5-S1 herniated nucleus pulposus prior to being referred to physical therapy. The patient reported an inability to perform his activities of daily living independently and participate in any physical activities due to pain. Pilates-based rehabilitation and manual therapy were used for treatment. The patient filled out five surveys before the first treatment session, at the 5 week mark, and at the 10 week mark (discharge). The questionnaire's included the Miami Back Index, the Oswestry Low Back Pain Scale, The Functional Self Efficacy scale, the 15 D Health Related Quality of Life Questionnaire (HRQOL), and the Fear Avoidance Beliefs Questionnaire (FABQ).

OUTCOMES: After 10 weeks of treatment, the patient showed marked improvement. Lumbar spine range of motion improvements were noted especially in forward bending, right side bending, and right rotation. Manual muscle testing of ankle dorsiflexion on the right showed increased strength. His back pain decreased from a 4-5/10 to a 1-2/10 and his straight leg raise range of motion increased by over 40 degrees. Improvements were also noted in his core control and strength. The patient indicated decreased sleeping difficulties, improved ability to perform his usual daily activities, and decreased discomfort and radiculopathy. He was able to return to his previous social and recreational life.

DISCUSSION: Pilates exercise and manual therapy appear to be a good option for the treatment of chronic low back pain. Further research is advised to establish treatment effects for a broader patient population.

IMPLEMENTATION OF THE PILATES METHOD IN PHYSICAL THERAPY PRACTICE: A CASE REPORT

AUTHORS: Marjorie Gleason, SDPT, Sari Seid, SDPT, Kat Torre, SDPT

SUPERVISING FACULTY: Anna Katerina Tischenko, PT, PhD, Brent Anderson, PT, PhD, OCS, PMA®-CPT, Lourdes Perez, MSPT

INSTITUTIONS: University of Miami and Polestar Pilates Education

BACKGROUND AND PURPOSE: Pilates has been proven to be a useful tool in rehabilitation. Previous studies provide evidence-based research on Pilates rehabilitation for treating physical therapy diagnoses such as low back pain, Fibromyalgia, total hip/knee arthroplasty, scoliosis, and Parkinson's disease. However, little research has been completed on the effectiveness of Pilates in treating neurological disorders, particularly, spinal cord injuries. The purpose of this case report is to describe the development and outcomes of a Pilates program used in the rehabilitation of a spinal cord injured individual.

CASE DESCRIPTION: The patient is a 21-year-old male who sustained a gun shot wound resulting in complete T5 paraplegia. The patient began traditional physical therapy in the acute care setting and continued with outpatient services. Approximately 2 ½ months after his injury, he began Pilates rehabilitation. Pilates rehabilitation consisted of exercises to improve and increase strength and stability.

OUTCOMES: The patient participated in Pilates twice a week, 2 hours each session, for one year. Pilates exercises enabled the patient to improve his posture, trunk control, balance, endurance, strength of upper extremities/trunk/scapular stabilizers, transfers, posture, range of motion, coordination, control, and flexibility. The patient has become efficient in his movements and is independent with all daily activities.

DISCUSSION: The patient was able to fully able to participate in Pilates. Pilates exercises and positions can be modified to fit the needs of most, if not all, persons. Pilates-based rehabilitation showed many therapeutic benefits in treating this patient with a spinal cord injury. Therapists should consider incorporating Pilates based rehabilitation exercises into their repertoire of rehabilitation techniques.

KEY WORDS: Spinal Cord Injury (SCI), Gun Shot Wound (GSW), Pilates, Rehabilitation, Physical Therapy

THE EFFECT OF A PILATES INTERVENTION ON A PATIENT POST-STROKE: A CASE REPORT

AUTHORS: SUPERVISING FACULTY: Brent Anderson, PT, PhD, OCS, PMA®-CPT, Anna Katerina Tischenko, PT, PhD, Lourdes Perez, MSPT

INSTITUTIONS: University of Miami and Polestar Pilates Education

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PILATES METHOD ALLIANCE

Research Platform Presentations
14th Annual Meeting San Diego, CA
Thursday November 13, 2014
2:30-4:30pm

1. **Tom Welsh, BA, MS, MA, PhD**
   Florida State University, Dance Dept., Tallahassee, FL
2. **Kimberly Kuznitz,**
   BENT Pilates Studio, New York, NY
3. **Diedra Manns, DPT, PMA-CPT, COMT**
   Monarch Wellness Group, Los Angeles, CA
4. **Andrea Borgman-Quist, PMA®-CPT**
   Pilates Monterey, Monterey, CA
5. **Felipe Macabeli Menezes**
   Trevisian School of Business, Sao Paulo/SP-Brazil
6. **Craig Ruby, PT, DEd, MPT**
   Wheeling Jesuit University, Wheeling, WV
7. **Francine Picolli, MD**
   Simétrico – Saúde e Movimento, Porto Alegre, RS, Brazil.
8. **Aline Nogueira Haas, PE, PMA®-CPT, PhD**
9. **Sarah Holmes, PhD**
   University of California, Riverside. Riverside, CA
10. **Holly Wallis**
    ReActive, Oakland, CA
11. **Débora da Rocha Werba,**
    Federal University of Rio Grande do Sul, Porto Alegre, Brazil

USING WITHIN-SUBJECT RESEARCH DESIGNS TO ASSESS THE EFFECTS OF PILATES TRAINING: A DANCER TRAINING EXAMPLE

AUTHORS: Deckert, JL, Barry, SM, Welsh, TM; University of Utah, Salt Lake City, UT & Florida State University, Tallahassee, Florida, USA

PRESENTER: Tom Welsh, BA, MS, MA, PhD; University of Utah, Salt Lake City, UT & Florida State University, Tallahassee, Florida, USA

PURPOSE: Group comparison research designs, while state-of-the-art for clinical trials, have limitations that make them challenging to use when assessing the effects of individualized approaches to training like Pilates. This presentation will describe a within-subject experimental analysis of the influence of a multi-component intervention featuring Pilates mat exercises on pelvic alignment in university ballet dancers.

PARTICIPANTS & SETTING: Three female, ballet majors with anterior pelvic tilt exceeding the degree judged acceptable by their dance teachers participated in three weeks of individual tutoring that included nine Pilates mat exercises. Tutoring was conducted one-on-one in a dance studio at the university where the dancers trained.

MATERIALS/METHODS: Pelvic alignment on the sagittal plane was measured repeatedly (twice a week) for 11 weeks for all three dancers, and training was implemented one dancer at a time, for three weeks each.

ANALYSIS: This protocol allowed the results to be displayed graphically with each individual serving as her own control and it allowed the effects of the intervention to be analyzed visually using a multiple-baseline experimental analysis.

RESULTS: Pelvic alignment improved markedly for all three dancers when the training intervention was applied and all three dancers maintained or continued to improve their pelvic alignment once improved. Ratings by the dancers suggested that good pelvic alignment is important to dancers and that the dancers attributed the improvements in alignment to the individual tutoring.

CONCLUSIONS: The results of this study suggest that learning and performing Pilates mat exercises can contribute to improved skeletal alignment in dancers. The features that can make within-subject experimental designs useful in assessing the influences of Pilates training will be highlighted.

FUNDING: None.

PILATES BASED EXERCISE FOR MULTIPLE SCLEROSIS

AUTHOR: Kuznitz, K; BENT Pilates Studio NY, NY USA, kkuznitz@gmail.com

PURPOSE: The purpose of this research was to adapt the Pilates method to clients with Multiple Sclerosis (MS) and create guidelines for Pilates Instructors and Personal Trainers for use in treating clients with MS.

FOUNDATION: Pilates exercises were introduced, and when the subject was unable to elicit a muscle contraction, Muscle Activation Technique and Structural Integration were implemented to facilitate the subject's muscle contraction.

DESCRIPTION:
Subject: One male client 60 years of age with Multiple Sclerosis.
Methods/Materials: Pilates apparatus and Mat work incorporating props, Muscle Activation Technique, Structural Integration.
Modified Pilates exercises were introduced to the client in the initial sessions. Muscle Activation Technique (M.A.T.) was introduced for 6 months and then combined with Pilates. M.A.T. is a specific process for evaluating an individual's ability to produce efficient muscle contraction. Range of motion testing indicated which muscles have decreased contractibility, and precise forces are applied to restore that muscle's efficiency.

Partial sample of M.A.T. Tests:
LOWER LIMB TESTS:

- ROM TEST 1: Straight Leg, Hip Internal Rotation: Left side weak
- ROM TEST 2: Straight Leg, Abduction, Hip Internal Rotation

TRUNK and SPINE TESTS:

- ROM TEST 1: Isometrics & Pelvic Approximation
- ROM TEST 2: 120 degrees of Hip Flexion (sitting up legs straight) Trunk Rotation and Spinal Flexion (Test right and left): TEST A,B,C

After one year, M.A.T was replaced for 6 months with Structural Integration, a massage technique working with fascia to help restore the body's balanced state. When micro-movements were introduced into the subject's workout functional and gait performance significantly improved.

OBSERVATIONS: Standard Pilates exercises were initiated as a point of reference. Incorporating M.A.T. and Structural Integration led to the decision to break down the Pre-Pilates exercises into even smaller micro-movements: isolations of specific weak muscles to contract and strengthen with minimal movements. The subject could feel a difference in the way the muscles were firing, and the subject's walking and functional performance improved as observed in video analysis.

CONCLUSIONS: Breaking down components of gait in the program allowed the subject to 'feel' where the muscle fires and appeared to be an efficient way of working with a client with MS. The subject began to understand how to find the connection of specific muscles within his own body and apply during gait and functional activities. This type of training for subjects with MS may be beneficial for the Pilates practice and may help future Instructors train their clients with MS more efficiently. Research with greater numbers of subjects to improve the power of this type of study are necessary to ascertain the benefits of M.A.T. and Structural Integration combined with Pilates.

FUNDING SOURCE: none.

THE IMPRESSION OF A TEN-MINUTE PILATES EXERCISE SESSION ON THE POSTURAL CONTROL OF A COMMUNITY DWELLING FEMALE IN HER FORTIES: A SINGLE CASE STUDY

AUTHORS: Manns, DR., Plotke, R., Powers, C.; Kaiser Permanente Movement Science Fellowship, Los Angeles, CA, USA. drdiedramannspt@gmail.com

PRESENTER: Deidra Manns, DPT, PMA-CPT, COMT; Monarch Wellness Group, Los Angeles, CA

PURPOSE: The purpose of this study was to investigate the impression of a single standing Pilates exercise session performed in a pre-perturbated position (PPP) on the postural control of a normal community dwelling adult male or female in their forties.

SUBJECT: 1 subject; female aged 48 years old

MATERIALS/METHODS: Inclusion criteria: Community dwelling English speaking adult male or female in their fortieth decade of life; independent in all activities of daily living; able to comprehend and follow verbal, audible, visual directions and cues in English. Exclusion criteria: the subject had to be without lower quarter injury or surgery in the last 6 months; neurological diseases /syndromes, adverse neural tension nor active vestibular dysfunction. The subject volunteered and consented to participate in: (1) all data collection procedures (2) a ten minute standing Pilates exercise session (intervention) taught by a Physical Therapist/PMA® Certified Pilates Teacher. The subject was directed to stand on a two-dimensional force plate under the following conditions: in right and left SLS with eyes closed (EC) for three-ten second trials on each leg. Data collection occurred pre intervention (PI), immediately after intervention (IA) and at three-week follow up (FU). The force plate data collection program captured the path length (PL), and the variance from the center of pressure (COP) of the foot in the frontal plane (COPf) and the sagittal plane (COPs) under the conditions described above.

RESULTS: Given the small number of trials the subjects right and left SLS with EC force plate measurements were combined and averaged to compare the results. The subjects average PL minimally improved from PI to IA and further improved at FU. COPs doubled from PI to IA and returned to baseline at the FU. However, the subjects COPf improved IA when compared to PI values and further reduced at the FU trial, where COPf was found to be even less than the PI measures.

CONCLUSIONS: These results suggest that the subject may have acquired a new motor strategy that may have improved her postural control in the frontal plane. Previous studies investigating normal postural control mechanisms have determined that frontal plane stability (COPf) is most challenged while in a narrow base of support or in single limb stance. Although further studies with larger populations to determine external validity and generalizability are indicated, a standing Pilates exercise regimen enhanced by the principles of sensory motor training may be an effective tool to pre-emptively preserve or reduce balance deficits in normal community dwelling adults.

KEYWORDS: Pilates, Janda, balance, postural control, sensory-motor training, adults

FUNDING SOURCE: None

PILATES RESTORATION AND BREAST CANCER

AUTHOR: Andrea Borgman-Quist, PMA®-CPT; Pilates Monterey, Monterey, California USA. abq@redshift.com

PURPOSE: To determine if and how Pilates exercises could improve the range of motion and functionality for a woman who had a mastectomy. Typically, there is no first line of defense against the loss of shoulder range of motion and function after breast surgery. Physical therapy and/or exercise recommendations are rarely offered, and many women are not aware of the potential side effects of chemotherapy, radiation, and lymph gland removal. My assumption was that Pilates methodology and specific post surgical breast care practices from the Breast Cancer Restoration Master Specialization Program would demonstrate verifiable and physical changes in women who have undergone mastectomy.

METHODS: Subject was instructed in Pilates exercises and given education regarding breast surgery and it's physical consequences in order to improve function in activities of daily living, posture, body awareness, and range of motion.

Specific Tests:
Upper Quadrant Assessment/Reassessment
Posture Grid
Apley Scratch Test
Range of Motion
Direction of Ease
Lateral Flexion
Thoracic Mobility
Scapular Stability
Movement in combined planes/joints

REACTIONS, RESPONSES AND RESULTS: The response and results were, the Pilates Methodology did in fact increase the range of motion and overall body functionality as measured by the following tests: Posture Grid, Shoulder ROM, Lateral Flexion and Scapular Postural Position. Six weeks after starting the program the subject had increased range of motion in her affected shoulder and a demonstrable change in the symmetry of her shoulders as measured by the Posture Grid photos. The subject reported an increase in body awareness due to the increased range of motion of the shoulder during functional tasks such as grooming and self-care.

CONCLUSION: It appears that this type of program may provide PMA® Certified Pilates Teachers with a formula and specific tools for post-mastectomy clients that can increase the functionality and the body awareness of their clients, and also the awareness of the Pilates teachers about working safely and effectively with this special population. More research is recommended and warranted in looking at the benefits of Pilates for post-mastectomy clients.

FUNDING: Self-funded/Peninsula Pilates Project supported

RESULTS MANAGEMENT OF THE PILATES METHOD

AUTHOR: Felipe Macabeli Menezes; PMA®-CPT; MBA Trevisian School of Business, Sao Paulo/SP-BRAZIL. felipemacabeli@gmail.com

PURPOSE: Based on the principles of the Pilates method, this study sought to demonstrate the significance in the results management of the individuals that practice the Pilates sessions, regardless of where they are practiced. Through literature and field research, we considered the main motivations for individuals to practice the Pilates method. Additionally, we looked at relative improvement of life quality and health beyond other goals outlined at the beginning of the program.

SUBJECTS: 82 subjects (51 Females, 31 Males); main age 60 years, age range 25-85 years).

MATERIALS/METHODS: Inclusion criteria: practitioners from Sao Paulo, Brazil that were practicing Pilates Mat or Pilates Apparatus one to five times per week in group or private sessions. Subjects answered a subjective questionnaire based on their own feelings and perceptions. The questionnaire contained about seven questions regarding life quality, physical condition and motor capacity.

RESULTS: Every subject answered the questionnaire during one month. 63% of the subjects were female and 43% were male. 60% of the subjects practice Pilates about twice a week. All the subjects reported posture improvement. 91% of the subjects reported breathing improvement. 96% of the subjects reported life quality improvement. Subjects understand that life quality is related to decreased pain, greater willingness, greater welfare, self-esteem improvement and quality of sleep improvement. 60% of the subjects reported concentration improvement. 95% of the subjects reported body awareness improvement. 89% of the subjects reported muscle strength improvement. 97% of the subjects reported flexibility improvement.

CONCLUSIONS: The field research samples concluded that Pilates is growing regarding numbers of practitioners and practitioners maintaining a life-long practice. Beyond the numbers, the results management comes with the feelings and perceptions of the practitioners. The Pilates adaptability is one of the greatest differences of the method from other forms of exercise. Lastly, Pilates appears to deliver a great deal of benefits and more research on these benefits is warranted.

KEY WORDS: Pilates, Assiduity, Life Quality, Management

FUNDING: None.

THE EFFECTIVENESS OF MAT-BASED PILATES CORE STRENGTHENING ON HAMSTRING FLEXIBILITY

AUTHORS: Craig Ruby, PT, DEd, MPT, Romani-Ruby, C, Alley, A, Elliott, M, Grady, I; Wheeling Jesuit University, Wheeling, WV, USA, craigruby@gmail.com

PRESENTER: Craig Ruby, PT, DEd, MPT; *Wheeling Jesuit University, Wheeling, WV*

PURPOSE: The purpose of this study was to examine how a Mat-based Pilates core strengthening program influences hamstring flexibility.

SUBJECTS: Thirty subjects participated in the study (23 females and 7 males) with a mean age of 25.00 ± 2.56 years. The Pilates group consisted of 12 females and 3 males with a mean age of 24.8 ± 2.00 years. The control group consisted of 11 females and 4 males with a mean age of 25.13 ± 3.10 years.

MATERIALS/METHODS: The researchers received IRB approval from Wheeling Jesuit University and informed consent from all participants. The participants were randomly divided into an experimental and a control group. Hamstring flexibility was measured prior to beginning the six-week intervention program and again after the program was completed. The Pilates group met two times per week for six weeks. The Pilates mat program was performed in the following order every time: straight bridge, table top, side plank right, side plank left, leg pull front, and leg pull back. All researchers were present to help guide subjects through each exercise for eight repetitions before moving on to the next, with no rest between positions. The participants in the control group agreed not to change their daily exercise routine.

ANALYSIS: Paired t-tests were calculated using the Statistical Package for Social Science (SPSS) version 20.0, with a significance level set at .05.

RESULTS: In the Pilates group, mean hamstring flexibility increased on the right side, left side, and combined by 14°, 11°, 13° respectively after the six-week intervention ($p < 0.05$). In the control group, no statistically significant increases were seen on the right side, left side, or combined after six weeks of maintaining the current level of activity ($p > 0.05$).

CONCLUSION: This study provides evidence that a six-week Pilates mat-based core strengthening intervention was effective at increasing hamstring flexibility. Adding Pilates to a regular exercise routine can not only increase a person's core stability, but also have positive effects on hamstring flexibility. Health care professionals should consider implementing a Pilates program as an intervention for anyone lacking hamstring flexibility.

FUNDING SOURCE: None

THE EFFECTS OF CLASSICAL PILATES TRAINING ON PHYSICAL ACTIVITES ON HEALTHY WOMEN: A CONTROLLED TRIAL.

AUTHORS: Francine Picolli, MD; Simétrico – Saúde e Movimento, Porto Alegre, RS, Brazil. Vargas, CB; Simétrico – Saúde e Movimento, Porto Alegre, RS, Brazil. franpicolli@yahoo.com.br

PRESENTER: Francine Picolli, MD; Simétrico – Saúde e Movimento, Porto Alegre, RS, Brazil.

PURPOSE: To present a comprehensive evaluation of the adaptations of cardiorespiratory parameters, anthropometric and physical fitness provided by the practice of the Classic Pilates Method.

SUBJECTS: Twenty-eight healthy participants, subdivided into Pilates Group (PG = 15) and Control Group (CG = 13), mean age 29 ± _5. All participants had no physical exercise in the last 6 months and were all able to start physical activity.

MATERIALS/METHODS: Healthy participants (PG) who underwent training in the Classical Pilates Method for 12 weeks, 3 times a week were evaluated against healthy controls (CG) who maintained their routine activities. Measurements of VO2 peak, blood pressure, weight, fat percentage, fat mass, lean body mass, range of movement, flexibility, muscular endurance (abdominal, upper and lower limbs) and dynamic balance before and after training for the PG, and before and after 12 weeks for CG were taken. Heart rate was monitored at each training session for the PG.

ANALYSIS: Comparisons of variables between PG and CG were performed by analysis of variance for repeated measures double entry (group and time as factors). A value was considered statistically significant at $p < 0.05$. For the analysis of heart rate during classes, analysis of variance for repeated measures of an entry with multiple comparisons by the Bonferroni test was used between classroom 1,9,18 and 36.

RESULTS: The study showed that the exercises practiced resulted in a reduction in body fat percentage ($p < 0.001$) and increased lean body mass ($p < 0.001$). The range of motion and flexibility in all joints evaluated reported improvement ($p < 0.001$), as well as muscle endurance ($p < 0.001$) and dynamic balance ($p = 0.001$). Moreover, this is the first clinical trial that demonstrates improved functional capacity, assessed by measurement of VO2 peak ($p < 0.001$). Maximum Heart Rate response during class 1, 9, 18, 36 showed $p < 0.005$ for class 18 and $p < 0.049$ for class 36 compared to the first class.

CONCLUSION: The results suggest that sedentary women obtain significant changes in body composition, joint range of movement, flexibility, muscular endurance and dynamic balance from practicing Classical Pilates Method 3 times a week. Furthermore, they increased functional capacity through the VO2 peak.

KEY WORDS: Peak oxygen consumption, flexibility, body composition, balance, muscular endurance.

FUNDING: None

THE PILATES METHOD PIONEERS IN BRAZIL

AUTHORS: Aline Nogueira Haas, PE, PMA®-CPT, PhD**;** Macedo CG, Goellner SV.
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PRESENTER: Aline Nogueira Haas, PE, PMA®-CPT, PhD

PURPOSE: The purpose of this study was to analyze the Pilates Method pioneers in Brazil, identify their training and how and when they introduced the Method in Brazil.

SUBJECTS: 6 subjects, Pilates Method Pioneers in Brazil.

METHODS AND MATERIALS: This study is characterized as field research with qualitative analysis. We used a theoretical and methodological approach to the cultural history and oral history. The interviews were taped in digital media, transcribed, adapted to written format, returned to the interviewees for correction, and published in full. After the data collection, the information was classified, categorized, and interpreted to analyse the content.

RESULTS: The Pilates Method was introduced in Brazil through the pioneers in the 90s. The pioneers completed their training program in United States and came back to Brazil to introduce the Pilates Method. The Pilates Elders that influenced these pioneers were Eve Gentry, Carola Trier and Romana Kryzanowska. These Pilates Elders trained at least 5 pioneers. The prior training of the pioneers was physical education, dance, medicine and physiotherapy. Even with such training, four of the pioneers knew Pilates Method through dance and two through involvement with fitness.

CONCLUSIONS:
The Pilates Method was introduced in Brazil in the 90s, through the pioneers that completed their training program in the USA. The Pilates Method consolidated in Brazil when studios were opened and training programs were offered and when the Method was disclosed by local media and advertising.

KEYWORDS: Pilates Method, Oral History, Pioneers.

FUNDING SOURCE: Coordenação de Aperfeiçoamento de Pessoal do Ensino Superior (CAPES - Brazil).

THE PILATES PELVIS: RACIAL IMPLICATIONS OF PELVIC STABILIZATION

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PURPOSE: This study examines alternative ways we can interpret the exercises of Pilates, for their cultural and racial values and their potential to make and store meaning in the body. These critical perspectives guide an understanding of how cultural and racial legacies are transmitted, perpetuated, revealed, and concealed through the muscle memory, teaching methodology, and Principles of the Pilates practice. By examining the intersections between dance and Pilates history, this study reveals how embodied discourses in Pilates are "white" in nature; situating Pilates as a product of historically constructed social behaviors of dominant Anglo-European culture.

METHODS: The method for this study was the adoption of a "Critical Dance Studies" lens to two specific Pilates exercises. This lens considers the body's participation in its environment through multiple perspectives: class, race, gender, or politics. By utilizing how scholars locate the hips as a site of racial stereotypes, allows analysis of Pilates from a racial perspective. This study examines the treatment of the *cultural and racial* treatment of the pelvis in the Pilates exercises: "Single Leg Stretch" and "Leg Circles" as they are presented in the Peak Pilates and Polestar Pilates Education Manuals. These exercises illuminate how perceived kinesthetic understandings of race in the body may be normalized and privileged.

RESULTS: This study found the teaching practices of the hips commonly explained in Pilates educational manuals, reinforce behaviors of a noble-class and racially "white" aesthetic. This study concluded the embodied behaviors of whiteness are most clearly visible in the disciplining of the hips in exercises like the "Single Leg Stretch" and "Leg Circles" where the hips are immobilized, stabilized, and "quieted."

CONCLUSIONS: Central to this study is the troubling notion of white racial superiority and, specifically, the colonizing, prejudicial, and denigrating mentality found in the superiority of whiteness and its embodied behaviors. This study illustrates that Pilates normalizes the whiteness within its practice, thus further contributing to problematic embodied discourses. Whiteness and power are inextricably linked, and the appearance of and construction of the corporeal reinforces what is or is not deemed a "legitimate social body." The behaviors of "whiteness" and their markings can be seen in the way Pilates immobilizes the pelvis in certain exercises.

KEY WORDS: Single Leg Stretch, Leg Circles, Whiteness, Race, Cultural Studies

FUNDING: None.

THE EFFECT OF PILATES AS TREATMENT FOR DIASTASIS RECTI WITH ASSOCIATED LUMBO-PELVIC DYSFUNCTION: A CASE STUDY.

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PRESENTER: Holly Wallis; ReActive, Oakland, CA, USA

PURPOSE/FOUNDATION: This case study intends to bring awareness of Diastasis Recti (DR) and associated lumbo-pelvic pain and dysfunction, and the implications for Pilates as rehabilitation for this condition. DR is a common condition that is not well recognized or well managed due to a lack of understanding of the interrelated dysfunction and symptoms. The treatment intervention for DR must comprehensively restore the integrity of the linea alba as well the lumbo-pelvic motor control. A combined Physical Therapy and Pilates approach is instrumental for optimal rehabilitation of this condition.

DESCRIPTION: In this case, a 37-year-old female presented six years post-partum with low back and sciatic pain. When prompted, she revealed urinary incontinence with bladder discomfort. She had not previously received treatment for her symptoms.
The female patient presented with pelvic asymmetry, non-optimal firing pattern through trunk and lower extremity, inability to recruit pelvic floor (PF) and transversus abdominis (TA), and protrusion along the linea alba The final/working diagnosis was DR (three-finger separation at umbilicus) with inner unit dysfunction.
Pilates Principles guided the development of a treatment plan including; breathing, control, centering, and balanced muscle development. To optimize the length of the pelvic floor, Pilates exercises were selected that simultaneously activated the inner unit while supporting a neutral spine and pelvis. The Reformer was specifically used to enhance control and coordination through the pelvis. Treatment included one 60-minute session per week over 12 weeks.
1. Inner unit focus including neutral Pilates exercises, and education regarding contraindicated movements (spinal flexion, thoracic extension, double leg lifts, bracing, quadruped position) (weeks 1-4)
2. Dynamic outer unit stabilization (weeks 4 -8)
3. Functional core stabilization (weeks 8-12)

OBSERVATIONS: Repeat assessment at 12 weeks indicated DR reduced to 1 finger separation. GROC: lower back function (7/7) “a very great deal better”; urinary incontinence (4/7) “moderate improvement”.

CONCLUSIONS: This program supports a basis for Pilates as effective rehabilitation for DR and lumbo-pelvic dysfunction. Further studies are needed to replicate and substantiate these findings. Women suffering from DR and lumbo-pelvic dysfunction are challenged by traditional exercise that does not address the condition effectively. Practitioners are tested with modifying exercises to allow these women to safely participate in an active program. The extensive Pilates repertoire and equipment provide a safe and effective method to build the necessary trunk support to reduce the DR separation, while simultaneously rehabilitating the underlying lumbo-pelvic dysfunction.

FUNDING SOURCE: None.

ELECTROMYOGRAPHIC ANALYSIS OF *POWER HOUSE* MUSCLES IN THE *TEASER* EXERCISE ON THREE DIFFERENT APPARATUS OF PILATES METHOD

AUTHOR: Débora da Rocha Werba, PT; Débora Cantergi, PE, MD; Leandro Tolfo Franzoni, PE; Alex de Oliveira Fagundes, PE, MD; Jefferson Fagundes Loss, PhD; Aline Nogueira Haas, PE, PhD, PMA®-CPT Federal University of Rio Grande do Sul, Porto Alegre, Brazil. debora.werba@gmail.com

PRESENTER: Débora da Rocha Werba, PT; Nogueira Haas, PE, PhD, PMA®-CPT Federal University

PURPOSE: The purpose of this study was to analyze the electromyographic activation of *power house muscles* (external oblique, multifidus, gluteus medius and adductor longus) in the *Teaser* exercise on the *Mat, Wall Unit* and *Reformer*.

SUBJECTS: 15 healthy women, practicing Classic Pilates Method more than 6 months, age 32,6±7,6 years, weight 58,6±5,8 Kg, height 1,64±0,06 m.

METHODS AND MATERIALS: The subjects performed a series of three repetitions of the Teaser exercise on the Reformer, Wall Unit and on the Mat. Electromyographic (EMG) data of the muscles; external oblique (OE), multifidus (MU), gluteus medius (GM) and adductor longus (AL) were collected during trunk flexion. Kinematic data for separating the phases of the motion were also obtained. The root mean square (RMS) was calculated and normalized based on the maximal voluntary contraction. The materials used were a Reformer, Wall Unit, Mat, electromyograph and photographic camera.

ANALYSIS: One-way ANOVA was used to investigate EMG differences between muscle activations on each apparatus ($p<0,05$).

RESULTS: The activation of the multifidus muscle was significantly lower on the *Wall Unit* when compared to the reformer ($p< 0.001$) and to the mat ($p<0.001$). Conversely, there was no relevant difference in the muscular activation of the external oblique ($p=0.27$), adductor longus ($p=0.249$), gluteus medius ($p=0.249$) muscles in comparing the apparatus.

CONCLUSIONS: The Teaser exercise needs motor control and stabilization of the trunk and pelvis, requiring a balance of agonist and antagonist muscles. In this study the multifidus was less activated than the other muscles analyzed, probably by spring position on the top of the head that increases the spine length. These outcomes may help the instructor in their practice, generating thought in relation to the choice of the most appropriate apparatus for each client.

KEY WORDS: Pilates Method, Biomechanics, Electromyography.

FUNDING: none

Research Platform Presentations
15th Annual Meeting Denver, CO
Friday November 6, 2015
2:30-4:30pm

Research Committee Chair:
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PRESENTERS:

1. **Andrea Borgman-Quist, PMA®-CPT**
   Pilates Monterey; Monterey, CA
2. **Marylee Bussard, PMA®-CPT, CMT, KMI, IMS**
   Chaturanga Holistic Fitness; Chicago, IL
3. **Lanette Gavran, PMA®-CPT, PAA, AdvDip PilatesITC**
   The University of Canberra;
   Faculty of Health and Discipline of Sport and Exercise
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CAN PILATES EXERCISES IMPACT PARKINSON'S DISEASE?

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PURPOSE: To determine if Pilates exercises can maintain or improve neuromuscular movement potential for a person who has Parkinson's disease. Many medications are currently available for treating the signs and symptoms of Parkinson's disease, but none has yet been proven to slow or stop the progression of the disease. Since there is a "mind-body" connection controlling the symptoms of Parkinson's, my assumption was that Pilates methodology would demonstrate verifiable physical changes in Gait, Motor Function, Balance, and Activities of Daily Living for clients who have Parkinson's disease.

SUBJECT: 1 Subject (Female); 66 years old.

METHODS AND MATERIALS: Subject was instructed in Pilates exercises and given education regarding Parkinson's disease and its physical consequences in order to improve function in activities of daily living, posture, body awareness, and motor function.

SPECIFIC TESTS:
Balance
Posture Grid
Gait
Proprioception
Hand/Eye Coordination

ANALYSIS: Written notes, photographs, and videos were used to record changes in balance, posture, gait, proprioception, and hand/eye coordination.

RESULTS: The results were, the Pilates Methodology did in fact maintain or improve neuromuscular movement potential as measured by the following tests: Posture Grid, Balance, Gait, Proprioception, and Hand/Eye Coordination. Eight months after starting the program the subject reported an increase in strength and balance. Subject transitioned on and off of Pilates equipment with ease, and reported improved gait. Subject could swing opposite arm with opposite leg when walking.

CONCLUSION: It appears that this type of program may provide PMA® Certified Pilates Teachers with specific tools for working safely and effectively with clients with Parkinson's disease, while maintaining or increasing their neuromuscular movement potential. More research is recommended and warranted in looking at the benefits of Pilates for clients with Parkinson's disease.

FUNDING SOURCE: Peninsula Pilates Project

FUNCTION FOLLOWS FORM: ENHANCING PRECISION IN THE PILATES ENVIRONMENT

AUTHOR: Marylee Bussard, CPT®-PMA, CMT, KMI, IMS, Chaturanga Fitness, Chicago, IL

PURPOSE: The recent appearance of movement assessments (such as those by Sarhmann, Cook, and Mottram & Comerford) represents progress towards scientific understanding of movement precision and how faulty or uncontrolled movements can be corrected in rehabilitative and athletic training realms. In contrast scored tests, measurements, and diagnostic tools found in the sources cited above, in Pilates assessment is organic—the focus on observing movement *quality* (e.g. fluidity) and, to varying degrees, movement *building blocks* (e.g. neutral pelvis). To provide sustained movement health and avoid unnecessary injury, Pilates exercises should be adapted to facilitate learning of foundation patterns (vs. the other way around) (Osar & Bussard, 2015). This paper suggests a systematic approach to assess, teach, and track motor learning in Pilates, offering a possible solution to the criticism that Pilates' benefits, while self-evident to many, are nonetheless "difficult to quantify and perhaps delivered with minimal long term planning and progression" (McNeil & Blanford 2015).

FOUNDATION: The Kinesthetic Milestones™ (KM) approach synthesizes practical experience with information from core-strengthening research (McGill), Motor-control learning (Hodges, Richardson), Neurodynamics (Butler & Mosely), Movement assessment (Sarhmann, Cook, Comerford & Mottram), Fascial Fitness (Schliep & Muller), Neurofitness (Baniel), Integrative Movement Systems (Osar), and Structural Bodywork (Myers, Earls).

DESCRIPTION: Eight KMs—Release Gripping Patterns, Neutral Pelvis/Hip Hinging, Appropriate Core Control, Breathing, Long Spine, Thoracic Mobility, Coordination & Flow, Alignment & Symmetry—each containing specific learning objectives, are monitored in Pilates sessions. This approach focuses instruction and appropriate exercise selection, and facilitates simple, yet accurate, record-keeping. It provides clients with meaningful "routes of progression" (McNeill, 2013) based on evidence-based motor-control objectives and promotes short-term memory retention and skills application.

OBSERVATIONS: During weekly private sessions, 15 clients learned about their individual "headline issue(s)," observed within the KM framework. 100% learned to execute at least one Pilates exercise adopting awareness of a KM (where they could not before), 86% adopted this awareness over multiple sessions, and 74% applied it across multiple exercises.

CONCLUSIONS: The KM tool formalizes Pilates' unique approach to assessment without sacrificing its organic nature or requiring skills outside the scope of practice of the average Pilates instructor. The strength of this tool is its simplicity documenting what the educated eye already sees while observing a body doing Pilates.

KEY WORDS: Pilates-based exercise, motor control, physical education

FUNDING: None

PILOT STUDY: PILATES: EFFECTIVE FOR DEVELOPING CORE STABILITY, BUT LIMITED SESSIONS HAVE LIMITED GLOBAL BENEFITS

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PURPOSE: A pilot study to achieve indications for a broad range study; to assess core stability, flexibility, body composition and foot strength in healthy individuals before and after 12 weeks of a single session per week of Pilates exercise, and compare them to aged matched controls.

DESIGN Observational cohort study.

SETTING: Exercise Physiology laboratory at a University, and local Pilates studio.

SUBJECTS: Healthy adults (4 males and 14 females), all naive to the Pilates method prior to the study's commencement.

METHOD AND MATERIALS: All participants participated in 12 weeks of studio and/or mat based Pilates classes once per week compared to age matched controls. All completed a Dual Energy X-Ray Absorptiometry scan to assess body composition and bone mineral density; completed the 5 stage Sahrmann Core Stability assessment; were assessed for joint mobility at the shoulder, cervical and lumbar spine, hip and ankle using a goniometer; had their lower limb strength assessed using an isokinetic dynamometer at 30, 60, 90 and 105°·sec-1; and their energy expenditure and energy intake assessed utilising the SenseWear™ Armband Mini and a 5 day food record, before and after completing 12 weeks of Pilates classes.

RESULTS: There were no significant differences identified between the groups as baseline in relation to demographics (age, weight, height) and all aforementioned physiological characteristics, with the exception of cervical neck flexion. After an average of 11.38 Pilates sessions were completed over the 12-week period, positive changes in core stability among Pilates participants was evident, Pilates group mean 0.78 ±1.302, Control group mean -0.33 ± 1.118 ($p=0.070$). No other meaningful differences were identified.

CONCLUSIONS: Though 12 weeks of Pilates completed once per week was effective for enhancing core stability, it did not appear to elicit positive outcomes for range of motion, body composition and foot strength. As the majority of individuals reportedly complete one Pilates session per week, future research should test a minimum of two sessions required per week for possible positive changes in body composition, flexibility and foot strength.

KEYWORDS: Pilates training, Body composition, Range of Motion, Exercise, Muscle strength

ACKNOWLEDGEMENT: No financial support was received to conduct this study.

CONFLICT OF INTEREST: None

PILATES-BASED EXERCISE FOR DIASTASIS RECTUS ABDOMINIS AND STRESS URINARY INCONTINENCE: A CASE REPORT

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PURPOSE: The purpose of this study is to investigate the use of Pilates-based exercise integrated with a systematic, evidence-based method for assessing breathing and training the deep core musculature in a subject with diastasis rectus abdominis and stress urinary incontinence.

SUBJECT: One multiparous female, age 43, who presented initially with diastasis rectus abdominis and stress urinary incontinence.

MATERIALS/METHODS: Subject participated in Pilates-based exercise on the mat, Arc Barrel, Reformer, Tower, and EXO Chair for 16 1-hour sessions in a 4-month period by a PMA® Certified Pilates Teacher. Subject was evaluated for diastasis rectus abdominis at initial session and again at 6 weeks and 4 months. Urinary incontinence was not reported by the subject at assessment. Self-report data regarding stress urinary incontinence was collected at 4 months. Breathing and postural assessments were included in the initial session and evaluated throughout the intervention. In addition to Pilates-based exercises, basic neuromuscular re-education was given based on current research in diastasis rectus abdominis and other core canister dysfunction.

RESULTS: After 16 sessions over a four month period, the inter-recti distance decreased by 2cm at its widest point. Her breathing pattern disorder was resolved, she was able to generate tension along her linea alba significantly enough to no longer feel any gap between her recti muscles, and she reported no longer experiencing stress urinary incontinence. Her posture improved from a posterior pelvic tilt and high lordosis, to a more neutral pelvic and rib cage or thoracic alignment.

CONCLUSIONS: Pilates-based exercise, in addition to a research-based intervention that assesses and corrects breathing pattern disorders and teaches coordination of breathing, pelvic floor muscle and transverse abdominal activation with movement, may be a viable intervention for persons experiencing diastasis rectus abdominis and stress urinary incontinence. The author will continue to use this method when working with clients who present with either of these conditions. Larger, randomized controlled trials using this method compared to the standard of care for each condition are needed to further investigate its efficacy.

KEY WORDS: Pilates-based exercise, core training, breathing patterns, diastasis rectus abdominis, stress urinary incontinence, women's health

FUNDING: None

A NOVEL APPROACH TO ASSESSING AND LEVERAGING PHYSICS, NEUROSCIENCE AND PSYCHOLOGY TO BUILD A MOVEMENT MAP FOR A CLIENT WITH HYPERTONIC CEREBRAL PALSY

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PURPOSE: The purpose of this research is to discover movement possibilities in a Pilates environment that build a movement map in the brain and body. This research aims to demonstrate the effectiveness of a quantitative and qualitative assessment that leverages the principles of physics, neuroscience and psychology for a client with Hypertonic Cerebral Palsy (Gross Motor Function Classification System Level II). Goals include: improving gait speed, stride length, and heel strike, joint range and sequencing, improving posture, building self esteem, increasing proprioception.

SUBJECT: One female, currently 58 years of age with self described moderate Hypertonic Cerebral Palsy (GMFCS level II) that has experienced little positive results from various mainstream therapies and fitness programs. Starting movement abilities included walking on a flat surface, seated activities such as eating, reading, computer work, and driving.

METHODS AND MATERIALS: Client attended 55-minute sessions at a frequency of 2-3 times per week for 4 years. Sessions were conducted in a Pilates environment on the following equipment: Arcus™, Cadillac, Reformer, Chair, Barrels, Bands, Balls, rebounder and balance discs. Methods used included a 3-pronged approach to assessing and leveraging Physics, Neuroscience and Psychology.

ANALYSIS:
1. Physics: gait analysis (speed, heel strike, stride length, pain), joint sequencing, breath endurance, posture
2. Neuroscience: Movement Map™, proprioception
3. Psychology: self esteem, trust, confidence

RESULTS: Gait analysis shows a 500% increase in speed (from .08 M/second to .48 M/second), visibly increased heel strike and stride length, as well as pain reduction as reported by client. Breathing endurance improved as client reported having less shortness of breath while walking longer distances at a greater speed. Posture visibly improved. Client described feeling and seeing self as more vertical. The client's Movement Map™ visibly improved in several areas: 1) 70º increase in knee flexion AROM. 2) Active pelvic tilt increased 20º posteriorly and 10º anteriorly. The visible improvement of the client's Movement Map is noted by the new ability to walk up hills, walk in the wind, carry large loads to and from the car, stooping to pick up items off the floor, opening and closing heavy doors, navigating stairs and walking on snow and ice. The client has also transitioned from a cane to Nordic walking sticks. Hypersensitivity in weightbearing has improved as noted by the new ability to walk pain-free without shoes. Proprioception improved as noted by client description of a new sense of feedback from the floor resulting in feeling grounded while standing and walking. Self-esteem, trust, and confidence has improved as noted by client's new willingness to join a gym for access to cardiovascular exercise, perform a home movement program, publicly share details about her condition, willingness to try new exercises and walk on new terrains without threat, and attending (and fully participating) in an educational summit for Pilates professionals.

CONCLUSIONS: Video documentation of this client demonstrates a measurable improvement in gait speed, joint sequencing and heel strike. The client's self esteem improved especially noted by describing herself as more comfortable being videotaped and by excitement in sharing her results with others. While Cerebral Palsy is a permanent condition, this case report demonstrates that a Pilates-based movement intervention has the possibility to make measurable improvements in gait quality, improve confidence in daily tasks and maintain or improve the ability to live independently. More research is needed in evaluating Pilates-based interventions for adults with CP or other neurological disorders.

FUNDING SOURCE: None

A RANDOMIZED CONTROLLED TRIAL OF THE EFFECTIVENESS OF PILATES ON BALANCE AND FALLS IN COMMUNITY DWELLING OLDER ADULTS

AUTHORS: Josephs SD, Pratt M, Calk E, Thurmond S, Wagner A; The University of Incarnate Word San Antonio, TX maryleepratt@sbcglobal.net

PURPOSE: The purpose of this study was to determine whether Pilates is more effective than traditional strength and balance exercises for improving balance measures and reducing falls in community dwelling older adults with fall risk.

SUBJECTS: Community dwelling adults, aged 65 or older who either had a fall in the last year or met the inclusion criteria of Timed Up and Go (TUG) >13.5 seconds or a score of ≤ 25 on the Fullerton Advanced Balance Scale (FAB).

METHOD: Thirty-nine community dwelling adults, aged 65 or older, underwent evaluation by a blind assessor to assess balance and fall risk as measured by the TUG, FAB and balance confidence using the Activities Specific Balance Confidence Scale (ABC). Thirty-one subjects met the inclusion criteria. Subjects were randomly allocated to the Pilates group or the traditional exercise group. Subjects in both groups participated in 12 weeks of exercise, twice per week for 1 hour. Twenty-four subjects completed the 12-week exercise program and underwent re-evaluation by a blind assessor. The materials used in the traditional group included resistance bands, ankle weights, and foam cushions. The Pilates group used Pilates equipment and the foam cushions.

ANALYSIS: All data was analyzed at the .05 alpha level using SPSS software. The pre-test to post-test within group and between group data was analyzed with paired t-test, independent t-test and 2 x 2 factorial ANOVA.

RESULTS: In the traditional group, there was significant improvement in the FAB ($p=0.01$; mean 27.27±6.4) from pre-test to post-test. In the Pilates group, there was significant improvement in the FAB ($p<.05$; mean 24.84±12.5) and the ABC ($p=.008$; mean 73.65±22.47) from pre-test to post-test. There were no between group differences on any of the selected tests.

CONCLUSIONS: Both the traditional and Pilates exercise groups showed significant improvement in the FAB scores following 12 weeks of exercise. Only the Pilates group showed improvement in the ABC following the exercise program. The results suggest that both programs are effective at improving balance measures in community dwelling older adults with fall risk, with neither program showing superior results, but only the Pilates group showed improvement in reduced fear of falling. This study shows equipment based Pilates can be used with confidence in an at risk population to improve balance measures and reduce fear of falling, a contributing factor in the decline of physical activity.

FUNDING SOURCE: None

THE EFFECTIVENESS OF SCROTH BASED PHYSICAL THERAPY AND A MODIFIED PILATES PROGRAM ON AN ADULT WITH IDIOPATHIC SCOLIOSIS: A CASE REPORT

AUTHOR: Stolze LS; Stolze Therapies Denver, Colorado USA lise@stolzetherapies.com

PURPOSE: The purpose of this study was to explore the effects of Physiotherapeutic Scoliosis Specific Exercises (PSSE) based on the Schroth Method in conjunction with a modified Pilates program on an adult with Idiopathic Scoliosis (IS).

SUBJECT: The subject is a 42 year old woman with IS who experiences pain in her thoraco-lumbar convexity limiting her activities of daily living and recreation.

METHODS AND MATERIALS: The subject volunteered to enter a 12 week study utilizing PSSE based on the Schroth Method in conjunction with a Pilates program, modified for her scoliosis. Sessions took place 2x per week and lasted 60 minutes. The treating therapist is a Schroth trained physical therapist through the Barcelona Scoliosis Physical Therapy School and is a certified Pilates instructor through the Pilates Method Alliance. A full spine X-ray was obtained confirming a double curve: left lumbar Cobb angle 30 degrees and right thoracic Cobb angle19 degrees. The subject received the following pre-tests and post-tests at 12 weeks:

Scoliosis Special Test: Angle of Trunk Rotation (ATR) using Scoliometer
Functional Tests: Chest Wall Expansion, Diaphragmatic Excursion, Forced Vital Capacity (FVC), Timed Single Limb Stance
Subjective Tests: Quality of Life score using SRS 22r Questionnaire; Pain score using the Visual Analog Scale (VAS)
Strength/Endurance Test: Side Support Test
ROM: Shoulder Flexion AROM (Supine); Hip Passive Rotation ROM Test (Prone)

RESULTS: Post test results at 12 weeks showed improvement in the following areas:
ATR: -2 degrees at thoracic curve apex and -3 degrees at Lumbar curve apex; Chest Wall Expansion: (subaxillary +1.5 cm, xyphoid +2 cm); Diaphragmatic Excursion: +1.5 cm; FVC +.4 liters; Timed Single Leg Stance left +19 seconds; VAS: -2 points; SRS 22r Questionnaire: +2 points. ROM and strength/endurance tests were unchanged.

CONCLUSIONS: PSSE based on the Schroth Method in conjunction with a modified Pilates program appears to reduce pain in an adult with IS while improving balance, respiration and overall quality of life parameters. Physical therapy using PSSE has demonstrated positive results in adolescent and adult patients with IS. Since adult patients with IS frequently choose a Pilates-based exercise program as their fitness option, more research is needed to study the effects of a modified Pilates program in conjunction with PSSE as part of a comprehensive physical therapy approach to the adult patient with IS.

KEY WORDS: Physiotherapeutic Scoliosis Specific Exercise, the Schroth Method, Schroth Based Physical Therapy, Pilates-based Exercise Program, Modified Pilates Program, Idiopathic Scoliosis

FUNDING: None

Research Platform Presentations
16th Annual Meeting Phoenix, AZ
Friday October 28, 2016
2:30-4:00pm

Research Committee Chair:
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PRESENTERS:

1. **Craig Ruby, PT, MPT, DEd, PMA®-CPT**
   (Ben Reuter, MS, PhD-presenting)
   PHI Pilates, Pittsburgh, PA
2. **Rafael Humanes, PhD, PMA®-CPT**
   University of Leon; Leon, Spain
3. **Melissa Mazzarino, BNurs, BMid, MClinMid**
   Victoria University; Melbourne, Australia
4. **Enja Schenck, MS, PMA®-CPT**
   Classical Pilates NYC, New York, NY
5. **Adriano Bittar, MA, PT, MSCPT, PhD, PMA®-CPT**
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THE EFFECTIVENESS OF PILATES VERSUS STATIC STRETCHING ON HAMSTRING FLEXIBILITY

AUTHORS: Craig Ruby, PT, DEd, MPT, PMA®CPT, Christine Romani-Ruby PT, DEd, MPT, ATC, PMA®CPT, Alena Regelski, MSEd, SPT, Sarah Lusby, SPT, Erin Strigenz, ATC, SPT

PURPOSE/HYPOTHESIS: The hamstring muscles are important contributors to the control of human movement through lumbo-pelvic stability and during functional activities such as gait and agility. Due to the significance of hamstring muscles, the purpose of this study was to examine whether core stability training in the form of Pilates exercises or static stretching was the better method to increase hamstring flexibility. It was hypothesized that participants performing the Pilates exercises would have greater improvement in the length of their hamstring muscles than the participants performing static stretching.

NUMBER OF SUBJECTS: 34 healthy Wheeling Jesuit University (WJU) Doctor of Physical Therapy (DPT) students ranging in age from 20 to 30 years. Participants were considered healthy based on their annual physical required for this DPT program. Participants were considered lightly to moderately active based on American College of Sports Medicine (ACSM) guidelines, lightly active: exercise 1-3 times per week and moderately active: 3-5 times per week. Total participants treated during the study was 32, as two participants dropped prior to the interventions.

MATERIALS/METHODS: After completion of initial paperwork and demographic questionnaire, participants were randomly assigned to one of two groups: the Pilates group or the static stretching group. Hamstring flexibility was measured supine (B) pre- (week 0) and post- (week 6) treatment protocol for both groups with a goniometer. The Pilates group met 2xW and performed 5 Pilates exercises (Straight Bridge, Leg Pull Front, Leg Pull Back, Table Top and Side Plank). The participants in the static stretching group stretched each leg 3x 30 seconds, 1x daily, 2xW. A Sportline stopwatch was used to track the holding time for the static hamstring stretch.

ANALYSIS: Raw data entered into SPSS. T-tests were calculated to determine statistical significant differences

RESULTS: Static stretching pretest combined mean of 73.5 ± 10 degrees. Pilates pretest combined mean of 79.2 ± 16 degrees. Static stretching posttest combined mean of 89.6 ± 8 degrees. Pilates posttest combined mean of 89.9 ± 15 degrees. Paired T-test for the static stretching and Pilates group indicates a significant difference in hamstring flexibility with a value of 0.003 and 0.005 respectively. The independent T-test suggested there was not a significant difference in hamstring flexibility between the static stretching and Pilates group with a value of 0.34.

CONCLUSION: Pilates and static stretching were found to be effective interventions that improved hamstring flexibility. It can be concluded that a Pilates intervention focused on core stability is equally as effective at significantly improving hamstring flexibility as a static stretching intervention. Rehabilitation specialists, including physical therapists, should consider implementing a Pilates program as an alternative to static stretching, which is considered the gold standard, to improve flexibility.

FUNDING SOURCE: None

DO HYPOPRESSIVE TECHNIQUE AND PILATES INCREASE THE ACTIVITY OF THE STABILIZING CORE MUSCLES?

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INTRODUCTION: Pilates (abdominal hollowing techniques) and hypopressive techniques are used for activating deep abdominal musculature and causing low compressive spine stress [1]. The aim of this study was to investigate surface electromyographic (EMG) activity of the rectus abdominus (RA) and internal oblique abdominus (OI) muscles during abdominal-hollowing (AH) and hypopressive technique (HT) exercises performed in a supine position with legs and knees bent to 90º [2].

METHODS: Ten healthy female participants, aged 31.4 ± 4.92 years, were recruited to the experiment. Participants performed a maximal voluntary contraction (MVC) of abdominal muscles (OI and RA) for 5s where muscle activity was recorded employing surface electromyography (EMG). EMG data of each muscle during the AH, HT were normalized as a percentage of the MVC.

RESULTS: The results showed significant differences in EMG activity between OI and RA for the two exercises ($p < 0.05$). The HT task produced lower activation of RA than AH ($p = 0.042$), on the other hand. The AH technique produced an increase around 20% of the MVC in OI EMG levels compared to HT.

DISCUSSION: The results suggest that the performance of AH and TH in the supine position with legs and knees bent to 90º can facilitate OI activity with minimal activity from RA. Similar results were obtained by Richardson et al. (1995) and Bjerkefors et al. (2010). These exercises can be used in lumbo-pelvic stability programs and for working with low superficial muscle activation [3].

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PILATES METHOD FOR WOMEN'S HEALTH: SYSTEMATIC REVIEW OF RANDOMIZED CONTROLLED TRIALS

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PURPOSE: Systematically evaluate the benefits of Pilates on health outcomes in women.

METHODS: Databases (CINAHL, MEDLINE, PubMed, Science Direct, SPORTDiscus, Physiotherapy Evidence Database (PEDro), Cochrane Central Register of Controlled Trials, and Web of Science) were searched using the terms Pilates and Pilates Method. Publications which met the following criteria were included: Randomized controlled trials (RCTs), English language, peer-reviewed journal from 1980 to July 2014, Pilates as an intervention, and measurement of a health outcome in female participants with a health condition.

DATA EXTRACTION: Two authors independently applied the inclusion criteria to potential studies. Methodological quality was assessed using the PEDro scale. Strength of evidence was measured using the best-evidence grading system.

RESULTS: Thirteen RCTs met the inclusion criteria. A relatively low quality was found overall with PEDro scale values ranging from 3 to 7 (mean, 4.5; median, 4.0). The most often trialled women's health condition was breast cancer (n=2). The most frequent health outcomes investigated were pain (n=4), quality of life (n=4), and lower extremity endurance (n=2). Emerging evidence was found for Pilates improving quality of life and lower extremity endurance and reduction in reporting pain.

CONCLUSIONS: There is a paucity of evidence on Pilates for improving women's health during pregnancy and for health conditions such as breast cancer, obesity, or low back pain. Further high-quality RCTs are needed to determine the benefits of Pilates on women's health outcomes.

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EFFECTIVENESS OF THE PILATES METHOD OF EXERCISE IN THE TREATMENT OF LOW BACK PAIN – A COMPARATIVE REVIEW

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PURPOSE: The goal of this review study was to assess the effectiveness of the Pilates method in the treatment of chronic low back pain. In addition to assessing the effectiveness of the Pilates method, a critical look was also taken at the types of exercises used. The results of mat versus Pilates on the equipment are compared, as well as classical Pilates versus contemporary Pilates.

METHODS: Inclusion criteria: the studies were required to meet scholarly standards, be peer reviewed and randomized and controlled trials. A Boolean search for randomized controlled and clinical trials using (Pilates) AND "low back pain" on PubMed (including MEDLINE) returned 24 results; 11 studies were selected.

RESULTS: There is evidence that Pilates-based exercise in the rehabilitation of low back pain is effective.

CONCLUSION: Additional peer-reviewed and randomized, controlled research is needed to produce scientifically reliable meta-analyses, preferably utilizing similar measurements, intervention durations, frequencies and equipment.
For further scientific evaluation and in order to achieve reproducible exercise protocols and results, a standardization of contemporary Pilates exercises is desirable.
There is also need for further analysis comparing Mat Pilates and equipment-based Pilates in order to establish if one is superior to the other.
Classical Pilates has not been scientifically analyzed. Such analysis would be of benefit as the method is highly regarded in the treatment of low back pain.

FUNDING SOURCE: None

THE EFFECTS OF FLETCHER TOWELWORK® IN WOMEN WITH BREAST CANCER: CLINICAL TRIAL

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PURPOSE: to investigate the effects of Fletcher Towelwork® in women with breast cancer.

SUBJECTS: 11 women, mean age 37, from 21 to 57 years.

METHODS AND MATERIALS: **Inclusion criteria -** women (21 to 65 years); breast cancer without reoccurrence or progression; unilateral mastectomy or quadrantectomy; radiation treatment over + 20 days; no cognitive impairment; AULROM + 90^{o} of shoulder FLE and ABD. **Excl criteria -** severe III/IV linphoedema; uncontrolled HBP; COPD; uncontrolled diabetes; mental illness; AWS; severe musculoskeletal disorder; participation in regular exercise program (last 6 months). Subjects volunteered to participate in 2x/week 30 minutes Fletcher Towelwork® classes for 4 weeks.
Pre-tests and post-tests at 4 weeks:
Breath: Exhale time and coordination, (Breath-a-Cizer), Chest Expansion(Circometry)
AROM and PROM Shoulder: (Flex, Ext, Abd, IR, ER)
MMT: Shoulder (Flex, Ext, Abd, IR, ER
Quality of Life: Disabilities of the Arm Shoulder and Hand Questionnaire (DASH)
Posture: Fletcher Pilates® Standing Postural Assessment

ANALYSIS: Descriptive and inferential statistics with normality test Shapiro-Wilk and Kolmogorov-Smirnov test to identify the standardization of data. Parametric or non-parametric tests for linear correlation, nonlinear and analysis of variance test in BioEstat program with a significance level of $p < 0.05$.

RESULTS: 40% of the sample data has being analysed so far. Breath, AROM, PROM and strength for all shoulder movements have improved. Quality of life has changed significantly. Posture has not significantly being affected.

CONCLUSIONS: Fletcher Towelwork® seems to be effective for helping women with breast cancer. More studies are needed.

FUNDING SOURCE: None. Support: Fletcher Pilates® International. Material gain: none

Research Platform Presentations
17th Annual Meeting Indian Wells, CA
Friday October 27, 2017
8:45-10:15am

RESEARCH COMMITTEE MEMBERS:

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PRESENTERS:

1. **Jennifer Adame-Waker, PT, OCS**, **PMA®-CPT**
   California State University Fresno. Fresno, California, USA
2. **Andrea Borgman-Quist, PMA®-CPT**
   Peninsula Pilates Project, Monterey, California, USA
3. **Adriano Bittar, PT, PhD, PMA®-CPT**
   Fletcher Pilates, Universidade Estadual de Goias
4. **Alexander Bohlander, PT, DO**
   SPRINGS Köln GmbH, Germany
5. **Jana Danielson, MBA, PMA®-CPT**
   Lead Pilates, Cycle & Fitness and Lead Integrative Health Therapies, Saskatoon, SK, Canada
6. **Paula Hilby, MSW; Virginia Nicholas, PMA®-CPT**
   Core Dynamics/Moving Breath Pilates, Tempe, AZ

THE EFFECTS OF A 15 WEEK PILATES MAT PROGRAM ON THE STRENGTH, POSTURE AND SELF CONFIDENCE OF COLLEGE STUDENTS

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Purpose: The purpose of this pilot study was to examine the effects of Pilates Mat exercises on perception of posture, strength and confidence in college students, as well as determine any correlation between the variables.

Foundation: Pilates exercises focus on strengthening core muscles including the transverse abdominus and back extensors as well as the pelvic floor and diaphragm. This method is based on six principles; concentration, centering, control, breath, flow and precision. It is often referred to as a mind-body exercise for these very reasons and claims to promote core strength and stability, flexibility and overall balance within the mind and body. Improved posture or biomechanical alignment is the foundation for optimal health, both mental and physical. The focus on core musculature recruitment, breathing mechanics and mental awareness in a Pilates exercise program have beneficial effects on participants' health and wellness.

Description: 55 college age students voluntarily enrolled in a Pilates Mat class at a State College. They participated in 15 weeks of class with a PMA Certified Pilates Teacher with 10+ years of experience. They were asked to complete a Likert Scale assessment of their strength, posture and self-confidence as week 1, week 8 and week 15. A general linear model for repeated measures was used to determine average, standard deviation and change over time. The correlation between the variables was determined through a bivariate analysis in SPSS.

Observation: There was a significant increase in scores for all three variables over time. There was a significant moderate correlation between strength and posture, a significant strong correlation between strength and self-confidence, and a significant strong correlation between posture and self-confidence. This indicates that subjects' reported an increase in self-confidence as their posture improved.

Conclusion: This study gives evidence to the benefit of Pilates exercises in perceived strength, posture and self- confidence in college students. While the measurements are subjective, self-perception is powerful. What the mind believes, it can achieve. A significant strong correlation between strength and self-confidence as well as posture and self-confidence was also noted in this study. As subjects' perception of strength and posture increased, so did their self-confidence. With the decline in health status of college students, it is important to determine low cost, effective, available programs to counteract this trend. A Pilates Mat program may provide these benefits through improved alignment and strength, decreasing risk of injury or musculoskeletal pain, as well as somatic input to improve psychological health.

Funding: There was no funding for this study.

PILATES THERAPY FOR TRAUMATIC BRAIN INJURIES

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Purpose: To determine if Pilates exercises could improve the physical functionality, energy level, and mental outlook, for those undergoing treatment for Traumatic Brain Injury (TBI) and hemiparesis. My assumption was that Pilates methodology would continue to demonstrate verifiable physical and psychological changes in those undergoing TBI rehabilitation.

Foundation: This "Phase 2" report was developed to record the progression of one subject (female), 34 years old, who sustained TBI after a car accident in 2015 and was in a coma for nearly 5 weeks. Her initial Glascow Coma score was 3, indicating the most severe coma status. Subject suffered an axonal brain injury and underwent subsequent craniotomy and partial lobectomy on the left side of her brain. Due to hemiparesis, she experienced some loss of motor skills on the right side of the body. Cognition, speech, and gait were impaired. Outside treatments included general Occupational Therapy.

Description: During "Phase 1," subject was instructed in Pilates exercises three hours per week for 11 weeks, and was given Pilates small apparatus and home exercises to improve daily functions of posture, movement, hand-eye coordination, contralateral arm swing, body awareness, and balance. After 11 weeks of Pilates, cumulating in August 2016, verifiable progression had been made and the research findings were compiled in a report and presentation for the 2016 PMA Research Forum. Since August, Pilates therapy has continued, and further progress has been compelling. The Phase 2 has built upon initial exercises, but with more focus on affected/weak side of body.

Observations: Written notes, photographs, videos, observations, and interviews were used to record progression in balance, posture, gait, proprioception, hand-eye coordination, and improved strength on hemiparetic side.

Conclusion: The results show that the Pilates methodology has continued to improve neuromuscular movement potential as measured by the following tests: push-through at the Trapeze Table with increased spring; contralateral arm swing and improved function of affected leg during gait; hand-eye coordination; core strength at roll down bar, and balance.

In conclusion, it appears that this type of program may provide PMA® Certified Pilates Teachers with specific tools for working safely and effectively with clients with TBI, while maintaining or increasing their neuromuscular movement potential. More research is recommended and warranted in looking at the benefits of Pilates for clients with TBI.

Funding: Self-funded/Peninsula Pilates Project supported

EFFECTS OF FLETCHER PILATES® MAT ON POSTURAL ALIGNMENT AND BODY COMPOSITION OF MIDDLE-AGED WOMEN

Oh H, Lee H, Jin K, Han H, Roh H, Kim A, Waugaman K, Bittar A; Dept. of Sports Sci., Dongguk Univ., Rep. of Korea. adriano@studioabittar.com Funding: Dept. of Sports Sci., Dongguk Univ., Rep. of Korea; Dept of Marine Sports, Pukyong Nat. Univ., Rep. of Korea; Dept. of Computer Eng., Kangwon Nat. Univ., Rep. of Korea; Dept. of Phys. Edu., Pusan Nat. Univ., Rep. of Korea; Dept. of Phys. Ther., Kangwon Nat. Univ., Rep. of Korea; Fletcher Pilates®, Tucson, AZ, USA; Phys. Ther. Course, State Univ. of Goias/ESEFFEGO, Goiania, Brazil.

PURPOSE: The purpose of this study was to examine if Pilates is an effective exercise for improving postural alignment and health of middle-aged women.

SUBJECTS: 36 women (mean age 36, age range 30-40, 20 in Experimental Group/EG, 16 in Control Group).

MATERIALS/METHODS: Inclusion criteria - middle-aged women from a community center in Gyeongju, Republic of Korea, that had no previous experience with Pilates and were enrolled to start classes at the Pilates Center (EG), or would just participate in the general cultural program offered (CG). Objectives and procedures were explained to the subjects, that voluntarily agreed to participate (Kangwon Nat. Univ.'s review board approval #KWNUIRB-2014-09-004). The EG agreed to participate in 3x per week 60 minutes Fletcher Pilates® Mat classes for 12 weeks, taught by a fully qualified Fletcher Pilates® teacher and faculty. Tests were performed in a standing position with the use of a body composition analyzer (X-scan Plus II) and a 3-D scanner (model WB4, Cyberware, Monterey, CA, USA).
Subjects received the following pre-tests and post-tests at 12 weeks:

Body alignment:
.Scoliosis analysis - MediCube®
.Body mass analysis
.Body surface analysis (volume and surface report)
.Skeletal muscle angles analyses (lateral, hip, and knee views)

Body Composition:
.Weight
.Body Mass Index
.Body fat
.Muscle mass
.Obesity in the abdominal region
.Muscle development (according to body part)

RESULTS: Postural alignment in the sagittal and horizontal planes was enhanced in the Pilates exercise group. Trunk alignment showed correlations with body fat and muscle mass.

CONCLUSIONS: The Pilates exercises are performed symmetrically and strengthen the deep muscles. Moreover, the results showed that muscle mass was correlated with trunk postural alignment and that the proper amount of muscle is critical in maintaining trunk postural alignment.

Key words: Pilates-based exercise, Fletcher Pilates®, middle-aged women, postural alignment

INFLUENCE OF AN AUTONOMOUS 8-WEEK PILATES REFORMER TRAINING ON TRUNK MUSCLE ACTIVITY, WELL-BEING AND UNSPECIFIC LOWER BACK PAIN

Authors/Institutions: Gräuling, J[1], Maletzke, S[1], Bohlander[2], A, Bungartz, G[1], Schulte-Frei, B[1]
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Background: Unspecific low back pain (LBP) is a substantial health problem affecting 67% - 84% of all adults in industrialized countries at some point in their lives. As the leading cause of activity limitation and work absence throughout much of the world, LBP accounts, in the US alone, for an estimated 149 million lost work days per year with a total estimated costs of US$ 100 to 200 billion. A recent review pointed out studies testing Pilates training to combat LBP, however, came to the conclusion that high quality evidence is lacking.

Purpose: This trial evaluated the effects of autonomous Pilates training on trunk muscle activity, disability/well-being and pain intensity in affected patients.

Methods: 51 participants were randomly allocated into an intervention- (n=27) and a control group (n=24). The intervention group was instructed in a Pilates reformer training and performed the exercises autonomously for 8 weeks, 2x/week, 60 minutes/training. The control group received no treatment. Muscle activity was measured of M. obliquus int. (OI) and M. multifidus (MF) using surface electromyography (sEMG) and calculated and displayed as a percentage of Maximum Voluntary Contraction (MVC). Hence, the muscle activity was measured before the intervention of both study groups. Pain intensity was assessed using the Oswestry disability index (OWD-I) and well-being through the WHO-5 Well-Being Index (WHO-5). All outcomes were measured before the intervention and after the 8 week period.

Results: Muscle activity of the OI muscle was increased significantly ($p<0.05$) after the Pilates intervention as compared to pre- exercise sEMG values (mean value differences). For MI muscle activity the majority of patients in the intervention group showed an improvement (76.9% vs. 50% in control group), however, mean value differences did not reach significance. These improvements translated into a significant ($p<0.05$) decrease in pain intensity as well as a significant ($p<0.05$) increase in well-being in the intervention group, with no changes in the control group, respectively.

Conclusions: This study demonstrates that an autonomous 8-week Pilates exercise program is well suited to relieve LBP-patients from pain and increase their overall well-being. Apart from these subjective outcome measures sEMG values substantiate that the improvements come with an increase in trunk muscle activity. Together these data provide novel evidence supporting the safety and efficacy of Pilates training to treat LBP.

Implications: Considering the prevalence of LBP and the accessibility and ease of use Pilates exercise appears to be a valuable strategy for health care professionals to help patients suffering from LBP in a short term setting. Potential long term effects of this exercise regimen as well as benefits for LBP subgroups remains to be addressed.

Key words: low-back-pain, Pilates, biomechanical analysis

Funding: None

THE IMPACT OF PILATES THERAPY IN MULTIPLE SCLEROSIS: A RANDOMIZED CONTROLLED TRIAL

AUTHORS:
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PURPOSE: The purpose of this study was to examine the effects of Pilates-based group exercise on physical performance in people with multiple sclerosis (MS)

SUBJECTS: We recruited people with MS (n = 30) who had a Patient Determined Disease Steps of less than 8.

MATERIALS/METHODS: Participants were randomized to 12-weeks of Pilates classes using the CoreAlign and Pilates mat as our movement modalities (50 minutes twice weekly) and massage therapy (1 hour, once weekly) or massage therapy only (i.e. control). The primary endpoint was the change in walking performance (6-minute walk test). Secondary endpoints included 1) independent functional ability (timed up and go with left and right turns); 2) balance (Fullerton Advanced Balance Scale); 3) flexibility (sit and reach); 4) body composition (Dual energy X-ray absorptiometry); 5) core endurance (plank-hold for time); and 6) muscle strength and voluntary activation (isometric maximal voluntary contraction with interpolated twitch before and after a 2-minute fatiguing task). Descriptive outcomes including quality of life (Multiple Sclerosis Quality of Life-54) and physical activity (Actical accelerometers) were also assessed.

ANALYSIS: A two-factor repeated measures (ANOVA) was utilized with significance at p-values ≤ 0.05. All results were expressed as means and standard deviations

RESULTS: Pilates improved walking performance (baseline: 420 ± 138; post: 473 ± 150 m) more than control (baseline: 455 ± 166; post: 470 ± 168 m), $p = 0.010$, $\eta_p^2 = 0.213$. Pilates improved independent functional ability (baseline: 10.1± 4.6; post: 8.6 ± 2.8 s) versus control (baseline: 8.6 ± 4.9; post: 8.9 ± 5.0 s), $p = 0.028$, $\eta_p^2 = 0.167$. Mental quality of life scores improved over time for Pilates (baseline: 63 ± 19; post: 69 ± 19) and control (baseline: 71 ± 15; post: 76 ± 14) groups, $p = 0.028$, $\eta_p^2 = 0.160$.

CONCLUSION: Pilates may be beneficial for improving physical performance in people with multiple sclerosis.

KEY WORDS: Pilates-based exercise, multiple sclerosis, physical performance

FUNDING: Hermes Canada | Multiple Sclerosis Society Wellness Research Innovation Grant

A STUDY TO IMPROVE THE PSYCHOLOGICAL AND PHYSICAL WELLBEING OF NATIVE AMERICAN WOMEN

Authors of the Pilot Native American Pilates Study:

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Virginia Nicholas, M.A., R.N. movingbreathpilates@gmail.com

Purpose: This study is to determine if Native American women who participated experienced:

- A measurable reduction in anxiety, depression and stress during this eight week Pilates mat class/study.
- An improvement in strength, flexibility or muscular endurance during the Pilates mat class/study

Subjects: Seven Native American women completed this pilot study of a structured Pilates exercise class. Eight women began the class with one failing to complete the course.

Materials and Methods

- **Subject Pool:**

Native American Connections, Inc. (NACI), a Phoenix, Arizona, nonprofit social services agency primarily serving Native Americans, agreed to provide exercise space, notify its employees, and allowed them to participate in a study on the benefits of Pilates exercise in improving physical and mental health. Researchers met with interested participants, briefed them on Pilates protocol and on the proposed study. Pretest was administered to receptive participants. Researchers scheduled the study start date.

- **Data Collection:**
  - **First part pre- and posttest: DASS 42.** The Depression, Anxiety, Stress Scale is a psychological instrument of 42 questions that assesses these emotional characteristics. The validity and reliability of DASS has been established, found to be effective in both clinical and research settings, and comparable with the Beck inventories for depression and anxiety. (Lovibond & Lovibond, "Manual for Depression, Anxiety, Stress Scales" (2nd ed.). Sydney: Psychology Foundation, University of New South Wales.)
  - **Second part pre- and posttest: Rubric for strength, endurance, flexibility assessment.** Virginia Nicholas prepared a rubric (available on request) containing nine exercises and 25 evaluative components which assess participants' strength, muscular endurance and flexibility. She monitored pre- and post testing.
  - **Third part pre- and posttest: Student-participant survey.** Clients were surveyed for information, including expectations, class evaluation, self-reported perceptions of change in fitness, changes in movement ability, difference in pain/stiffness levels, and interest in continuing this exercise program.

- **Participant Information Collection:**

All pre- and posttest were administered as per HIPPA and American Psychological Association requirements for research subject confidentiality.

- **Class Structure:**

Classes taught by Paula Hilby contained ten minutes of Pilates fundamentals, warm up exercises, ten minutes of Pilates-related strength exercises (plank hold, push-ups, bird dog or contra-lateral arm/leg holds, etc.), twenty minutes of classical Pilates exercises (100's, roll ups, leg circles, abdominal series, single and double leg kicks, saw and/or side bends, abbreviated leg series, side planks, etc.). The effort finished with a cool down period of five minutes of Pilates fundamentals and stretches.

Results: Seven Native American women completed the study by attending 21 of the 23 classes given over eight weeks. The posttest was administered after the last class.

- **Posttest assessment: DASS 42.** Women showed posttest a large improvement in reduction of Anxiety (significant to the .027 level) measured by the DASS 42 raw scores. Further trends indicated improvement in Stress (.187) and Depression (.087). See variable charts below.
- **Posttest assessment: Rubric for strength, endurance and flexibility.** Participants showed gains in a number of areas. Some gains were outstanding, including 4 measures for strength (average increase in roll up repetitions=9.4, push up repetitions=9.4, swan height=7.9"; decrease in elbow height of push ups=.9"); and in flexibility (lying hamstring stretch=10 degrees average increase).
- **Posttest student-participant survey.** Although it is outside the scope of this study, it is worth mentioning the improved sense of well-being that participants gained from their class. All seven participants reported at the end of the 8 weeks, that:
    - They moved without prior pain/stiffness in 3 or more areas of their bodies;
    - This class had a carryover value to their daily lives (they felt calmer, had less discomfort with sitting, more energy, etc.);
    - They wanted a follow-up class, and all but one participant signed up.

Conclusions: Results show a significant decrease in anxiety and increase in both strength and flexibility. This was despite an extremely small study population. Results are worth further investigation. Given this largely underserved population, Pilates may have considerable culturally acceptable attributes that may lend it to long term adaptation for Native Americans. Any intervention that increases motivation to exercise should be closely observed.

Funding: Native American Connections, a nonprofit organization acting as fiscal agent received funds for this study from the Hilby Family Funds, administered by Arizona Community Foundation. Paula Hilby received no compensation. Virginia Nicholas, Pilates consultant, and Dr. Gregory Archer, psychologist and statistical consultant, were compensated for their time.

Research Platform Presentations
17th Annual Meeting Phoenix, AZ
Friday October 26, 2016
9:00-10:30pm

RESEARCH COMMITTEE MEMBERS:

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Lise Stolze, MPT, DSc, PMA-CPT
Craig Ruby, MPT, DEd, PMA-CPT

PRESENTERS:

1. **Anna Tischenko, PT, PhD, PMA®-CPT**
   Physical Therapy & Wellness Center; Miami, FL
2. **Pamela Hess, OTR, PMA®-CPT**
   University of Indianapolis, Indianapolis, IN
3. **Brent Anderson, PT, PhD, OCS, PMA®-CPT** (On behalf of Juan Nieto)
   Polestar Pilates; Miami, FL
4. **Craig Ruby, PT, DEd, MPT**
   PHI Pilates; Pittsburgh, PA
5. **Sarah Wilcoxon, MFA, MS**
   Missouri State University; Springfield, MO

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

AUTHORS: Burns Robertson M; Garcia K; Tischenko A; Cahalin L; Physical Therapy, University of Miami, Coral Gables, FL, United States. motburns@yahoo.com

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

BURNS ROBERTSON REFERENCES

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

AUTHORS: Hess, PC, Jochum, JE; University of Indianapolis, Indianapolis, IN
hessp@uindy.edu

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

AUTHOR: Nieto J; Polestar Pilates Education; Madrid, Spain juan@polestarpilates.es

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 though additional qualitative assessment.

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