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

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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, MA, RN, 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

Adame-Walker, J; California State University Fresno. Fresno, California, USA.
jadame@mail.fresnostate.edu

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

Author: Borgman-Quist, A; *Peninsula Pilates Project*, Monterey, California, USA.
PPP@redshift.com

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]
[1]Hochschule Fresenius University of Applied Sciences, School of Therapy and Social Work, Cologne, Germany
[2]Polestar GmbH, Cologne, Germany

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:
Duff, WRD; University of Saskatchewan, Saskatoon, SK, Canada
Andrushko, JW; University of Saskatchewan, Saskatoon, SK, Canada
Renshaw, DW; University of Saskatchewan, Saskatoon, SK, Canada
Chilibeck, PD; University of Saskatchewan, Saskatoon, SK, Canada
Farthing, JP; University of Saskatchewan, Saskatoon, SK, Canada
Danielson, J; [3]Lead Pilates, Cycle & Fitness and Lead Integrative Health Therapies, Saskatoon, SK, Canada, jana.danielson@leadpilates.com
Evans, C; University of Saskatchewan, Saskatoon, SK, Canada

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:

Paula Hilby, M.S.W. paula.hilby@gmail.com
Virginia Nicholas, M.A., R.N., PMA®-CPT 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.