

**The Fitness Effects of A Combined Aerobic and Pilates Program:
An Eight-Week Study**
Neil Wolkodoff/PhD

Research Summary

Exercisers want to be time efficient and combine endurance, strength and flexibility benefits. If novice exercise participants can improve general fitness, core strength, endurance, strength and other measures simply, they are more likely to start and maintain a fitness regime. Pilates has long been touted to develop flexibility and strength, yet until recently did not have a recognized endurance component, and a lack of scientific validation and study to popular claims clouded potential interventions and additional acceptance. For this study, a Pilates reformer with both strength and aerobic components, a Stamina Fitness Products (Springfield, MO) AeroPilates Pro XP 555 was used as an exercise intervention with sedentary participants for eight weeks of exercise combining a Pilates and aerobic program for an average of 3 sessions per week, 40 minutes per session. This reformer is unique in that it incorporates a trampoline attachment for use with a cardiovascular rebounding. *After statistical analysis, the AeroPilates combined cardio-rebounding and Pilates program provides a sufficient training stimulus for individuals to make significant gains in aerobic capacity, body composition, flexibility, strength/endurance, and dynamic balance.*

Study Methodology

13 previously sedentary subjects, (2 male, 11 female), underwent physiological testing for VO₂ peak (aerobic endurance), body composition (ratio of lean weight/muscle to fat weight), balance, isokinetic strength, flexibility and overall life stress. After subjects completed health history and informed consent, resting measures for height, weight, blood pressure and body composition from three-site skin fold measures were recorded. VO₂ peak was determined using an Oxycon Mobile using bicycle ergometry. Strength was assessed using an isokinetic dynamometer set to approximate 160 degrees per second, which would give an indication of abilities and changes in combined strength/endurance for 20 repetitions including measures of chest press, basic row, shoulder press, lat pull down, knee extension, knee curl, abdominal crunch and back extension. Dynamic balance was assessed for a total time in balance out of a possible 30 seconds using a stability platform. For the exercise group, visual posture photos were taken using an AlignaBod posture grid.

Flexibility was determined for hip flexion; low back and torso rotation using both common sit and reach tests as well as goniometer measurement for each side of the subjects' body. The subjects also completed a self-reported stress scale at the beginning and end of the program. The intervention group also received basic healthy eating guidelines to use during the study. A control group of 6 subjects (1 male, 5 female) underwent physiological testing during the same time period without an exercise intervention.

For the first two weeks, subjects completed three sessions of supervised training combining cardio-rebounding and Pilates exercise. The subjects alternated five minutes of cardio-rebounding with five minutes of Pilates for a duration of 40-45 minutes. Exercises were grouped during the Pilates portion to cover upper body, core, legs/hips and flexibility. During the cardio-rebounding portion, after familiarity was developed, subjects were asked to exercise at a rate of 40-46 jumps per minutes which was adjusted based upon subject levels by distance and resistance cords used. After the second week, subjects received a unit for use at their home and performed supervised exercise once per week until completion of the eight-week program, with the balance of workouts being performed in subjects' homes without supervision. Programs were adjusted slightly based upon individual abilities as determined each week when attempting new exercise progressions.

Results

After the 8 week program, parametric tests and independent samples t-tests revealed statistically significant ($p < .05$), gains and improvements in VO₂ (17%), Anaerobic Threshold (25%), body composition improvement/decrease (15%), gain in lean mass (5%), decrease in fat weight (17%), overall stress decrease (73%), low-back/hamstring flexibility (202%), combined hip flexion (8%), and combined torso rotation (23%). Overall strength/endurance improved (28%), as well as row (22%), knee extension (14%), knee flexion (12%), shoulder press (33%), lat pull down (28%), abdominal crunch (33%), back extension (57%) and overall strength/endurance to body weight ratio (30%). Chest press scores increased 24%, and were relatively significant at .06. While not analyzed statistically, visual assessment of posture indicated improvement in structural alignment. Additional initial investigations with this same group also indicated that cardio-rebounding was similar in energy expenditure per minute to elliptical and

treadmill exercise at the same rate of perceived exertion, and blood pressure changes from exercise in a supine position fell within normal, and safe values.

In conclusion, as measured in this study, the AeroPilates Pro XP 555 program combining both cardio-rebounding and traditional Pilates exercises provided a number of positive fitness benefits in a modality which has not previously been researched for changes in strength-endurance, aerobic fitness, body composition, flexibility and balance. These results were similar, and in some cases exceeded gains reported with other forms of more intense exercise. Additional study is needed to determine if this program and these benefits would extend to an already exercising population.

Table 1, Overall Results

Variable	Pre/Start	Post/Finish	Change	% Change	Statistical Significance
Weight/Pounds	185.61	180.65	4.96	3	0.005
Body Composition/%Fat	32.3	27.79	5.51	15	0.006
Lean Weight/Pounds	125.16	131	5.84	5	0.001
Fat Weight/Pounds	60	50.92	9.08	17	0.001
Stress Scale/30 pts	17.08	9.85	7.23	73	0.001
VO2 Peak - ml/kg/min	28.82	34.98	6.16	17	0.001
Anaerobic Threshold	19.85	24.9	5.05	25	0.001
Kcal Per Minute/AT	7.83	9.78	1.95	25	0.001
Balance/time out of30 seconds	11.72	14.31	2.59	22	0.029
Sit/Reach/cm.	5.69	17.54	11.85	202	0.001
Hip Flexion-L/Degrees	113.92	123.46	9.54	8	0.023
Hip Flexion-R/Degrees	113.77	123.08	9.31	8	0.016
Torso Rotation-L/Degrees	52.85	65.77	12.92	24	0.003
Torso Rotation-R/Degrees	54.46	66.31	11.85	22	0.011
Chest Press-Ft. Pounds/20 Repetitions	626.77	775.23	148.46	24	0.06
Row	684.15	835	150.85	22	0.001
Knee Extension	439.38	501.46	62.08	14	0.035
Knee Flexion	577.08	644.69	67.61	12	0.019
Shoulder Press	261.15	348.08	86.93	33	0.001
Lat Pulldown	493.69	643.85	142.57	28	0.001
Abdominal Crunch	291.92	417.62	135.35	33	0.001
Back Extension	335.23	527.08	191.85	57	0.001
Isokinetic Total	3667.85	4697.46	1029.6	28	0.001
Strength/End. Body Weight Ratio	20.06	26.19	6.13	30	0.001

Selected References

- Alexander, N.B. (1994). Postural control in older adults. *J Am Geriatr Soc.* Jan;42(1):93-108.
- Andersen, R.E., Franckowiak, S.C., Bartlett, S.J., Fontaine, K.R. (2002). Physiologic changes after diet combined with structured aerobic exercise or lifestyle activity. *Metabolism.* Dec; 51(12): 1528-33.
- Butts, N., & Price, S. (1994). Effects of a 12-week weight-training program on the body composition of women over 30 years of age. *Journal of Strength and Conditioning Research*, 8(4), 265-269.
- Jago, R, Jonker, M.L., Missaghian, M., Baranowski, T. (2006) Effect of 4 weeks of Pilates on the body composition of young girls. *Prev Med.* Mar;42(3):177-80.Epub 2005 Dec 27.
- Hides, J.A. et al. (2001) Long term effects of specific stabilising exercises for first episode low back pain. *Spine*, Vol 26: 243-248.
- Jones, M.T. (2003) Effects of physioball and conventional floor exercises on early phase adaptations in back and abdominal core stability and balance in women. *Journal of Strength and Conditioning Research* 17, 721-725.
- Perri M.G., Anton S.D., Durning, P.E., Ketterson TU, Sydeman SJ, Berlant NE, Kanasky WF Jr, Newton,R.L. Jr, Limacher, M.C., Martin, A.D. (2002). Adherence to exercise prescriptions: effects of prescribing moderate versus higher levels of intensity and frequency. *Health Psychology.* Sep;21(5):452-8.
- Pollock, M.L. (1973). Quantification of endurance training programs. *Exercise and Sport Science Reviews*, 1, 155-188.
- Takeshima, N., Rogers, M.E., Islam, M.M., Yamauchi, T., Watanabe. E., and Okada A. (2004). Effect of concurrent aerobic and resistance circuit exercise training on fitness in older adults. *Eur J Appl Physiol.* Oct;93(1-2):173-182.
- Harvard Womens Health Watch. (2000) Exercise. Pilates incorporates mind and body. [No authors listed] *Feb;7(6):6.*

To contact the primary researcher, please email to: wolk1@physicalgolf.com.