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ORIGINAL ARTICLE

# A randomized clinical trial comparing pelvic floor muscle training to a Pilates exercise program for improving pelvic muscle strength

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**Abstract**
*Introduction and hypothesis* The purpose of this study is to determine whether a Pilates exercise program and a pelvic floor muscle-training (PFMT) program could provide similar improvements in pelvic muscle strength.
*Methods* Sixty-two women with little or no pelvic floor dysfunction were randomized to Pilates or PFMT. Each group had 24 biweekly 1-h sessions with either a physical therapist or Pilates instructor. Strength was measured via perineometry ($cmH_2O$). Two questionnaires—pelvic floor distress inventory (PFDI-20) and pelvic floor impact questionnaire (PFIQ-7)—were also collected.
*Results* At baseline, the Pilates and PFMT groups measured 14.9±12.5 and 12.5±10.4 $cmH_2O$, respectively ($p$=0.41). Both the Pilates and PFMT groups got stronger (6.2±7.5 $cmH_2O$, $p$=0.0002 and 6.6±7.4 $cmH_2O$, $p$=0.0002, respectively), with no difference between groups $p$=0.85. PFIQ and PFDI scores improved from baseline but not between groups.
*Conclusions* Further study is required to determine if Pilates can actually treat pelvic floor dysfunction.

**Keywords** Pelvic floor muscle training · Kegels · Pilates · Perineometry

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## Introduction

Urinary incontinence, pelvic organ prolapse, and other manifestations of pelvic floor dysfunction are highly prevalent conditions among women [1, 2]. Women suffering from pelvic floor symptoms are often advised to "do their Kegel exercises" because virtually all such disorders may be prevented or treated through programs that improve pelvic muscle strength and coordination [3, 4].

Assuming a woman can learn to effectively exercise her pelvic floor muscles, she must then maintain her results by becoming a "lifelong Kegeler", because—as with any exercise regimen—the intensity, frequency, and duration of pelvic floor muscle training (PFMT) will greatly influence clinical results. More simply put, if you don't use it, you lose it. Glazner et al. [5] reported long-term follow-up on a group of highly motivated women who had initially improved their post-partum incontinence symptoms

via PFMT. Their initial symptomatic improvements did not persist—due in part to decreasing patient compliance with the PFMT program over time. Other authors have demonstrated similar discouraging long-term adherence to PFMT programs [6–8].

Given the obvious short-term benefits of PFMT, why are long-term adherence rates so poor? Sluijs et al. [9] showed that patients are more likely to demonstrate long-term compliance to exercise programs that cause the least disruption to their normal daily activities and include positive feedback. Perhaps the focused positive feedback (or "pay off") recognized by patients following PFMT is not compelling enough to generate long-term adherence.

The popular exercise program, known as the "Pilates method" (named after founder, Joseph Pilates who developed these methods in the 1920s) consists of a series of low impact exercises believed to produce flexibility and strength for the entire body. Proponents of the Pilates exercise methods believe that they produce conditioning of the whole body and promote a "mind–body connection" [10]. Pilates instructors use verbal cues to teach these techniques which focus especially on "core" abdominal, lower back, and medial thigh muscles. Exercise repetitions rarely exceed ten, with resistance usually coming in the form of body weight and specially designed springs. Due to the fact that most of these exercises are performed in conjunction with a pelvic floor muscle contraction, many Pilates instructors believe that their methods can produce significant improvements in pelvic floor strength and that these improvements are very likely to persist over time [11]. If so, the Pilates methods might provide a new more compelling "full-body" alternative for the treatment and prevention of pelvic floor dysfunction. However, despite the increasing popularity of Pilates exercises, their specific effects on the female pelvic floor have not been studied.

The biologic rationale for PFMT programs has to do with improving patients' muscle strength and awareness. Therefore, the fundamental question when evaluating a Pilates program as an alternative method for PFMT should be: does the program actually result in improved pelvic floor muscle strength?

Therefore, our objective for this study was to compare the change in pelvic muscle strength achieved by women after completing either a standardized 12-week Pilates exercise program or a "traditional" 12-week pelvic muscle-training program.

## Materials and methods

This study was approved by the Atlantic Health Human Studies Committee (study number R06-03-018) and was posted on the website www.clinicaltrials.gov (indicator number NCT00549458). It was a randomized controlled trial comparing a standardized physical therapy-based PFMT program to a standardized Pilates program in terms of improving pelvic floor muscle strength. In other words, we simply wanted to find out whether a Pilates exercise program could result in specific pelvic floor muscle strength improvement to the same degree as a traditional PFMT program.

Adult non-pregnant women were recruited for this study from the local community. Although some of the participants complained of lower urinary tract symptoms such as stress urinary incontinence, actual complaints of pelvic floor dysfunction were not required for participation in the study. Participants could not have prior experience with formal PFMT or Pilates. In other words, potential study participants were excluded if they had ever received formal instruction in PFMT by a healthcare provider or in Pilates techniques by a Pilates instructor. All patients underwent a screening physical exam including a pelvic exam. In an effort to optimize muscle strength assessments, no women with greater than stage 1 pelvic organ prolapse (using the pelvic organ prolapse quantification system [12]) were enrolled. All other inclusion and exclusion criteria are listed in Table 1.

A blocked random assignment technique (using blocks of six) was used to determine the allocation sequence, and sequentially numbered opaque sealed envelopes were used to conceal the group assignments. Randomization occurred immediately after enrollment. After randomization, baseline pelvic floor muscle strength (our main endpoint) was measured via a computerized vaginal pressure sensor (Pathway™ CTS 2000, The Prometheus Group, Dover, NH, USA). These measurements were obtained by a single clinical research nurse (JS). Three perineometry measurements were obtained pre-treatment and post-treatment for

**Table 1** Inclusion and exclusion criteria

| | |
|---|---|
| Inclusion criteria | Women ≥18 years of age |
| Exclusion criteria | Pregnant women |
| | Previous experience with either PFMT or Pilates |
| | Pelvic organ prolapse≥stage II[a] |
| | Inability to follow detailed verbal instruction |
| | Active vaginal or urinary tract infection |
| | Medical condition making it impossible to perform Pilates maneuvers |

[a] Using the pelvic organ prolapse quantification system [12]

each participant. To do so, the perineometry probe was placed into the vagina with the center portion of the probe located 3–4 cm from the introitus. The sensor was set to zero at the start of each test. The study participants were asked to perform three maximum pelvic muscle contractions holding each for 10 s if possible. They paused at least 20 s between contractions, and they were asked to breathe normally during the measurements. Our clinical research nurse visually and manually determined that no Valsalva maneuvers or other increases in intra-abdominal pressure or contractions of abdominal musculature were contributing to the measured values. The average of the three peak pressure values made up the pre- and post-treatment scores.

Although most of the study group did not actually complain of pelvic floor dysfunction, pre- and post-treatment pelvic floor symptoms were assessed as secondary endpoints using two questionnaires—the pelvic floor distress inventory short form 20 (PFDI-20) and pelvic floor impact questionnaire short form 7 (PFIQ-7) [13]. The PFDI-20 has a total of 20 questions regarding pelvic floor symptoms within three sub-scales—pelvic organ prolapse, colorectal-anal, and urinary symptoms. The worst possible summary score for the PDFI-20 is 300 (indicating worst possible symptoms). The PFIQ-7 is a companion questionnaire to the PFDI-20. It measures the extent to which pelvic floor symptoms affect the quality of life, and the worst possible summary score is also 300.

Both the PFMT and Pilates exercise programs consisted of 24 1-h sessions (i.e., twice weekly for 12 weeks). All sessions were conducted in a one-on-one fashion with either a physical therapist trained in pelvic floor rehabilitation or a certified Pilates instructor. Only two different physical therapists participated in the program (GGW and DD), and each followed the same structured protocol (Table 2) which was based on peer-reviewed regimens for PFMT [14–17]. There were four different certified Pilates instructors involved in that arm of the study, and they too followed a structured protocol (Table 3). Using verbal cues, the Pilates instructors taught full-body exercises that were also designed to emphasize the "core muscles", especially the pelvic floor. These Pilates instructors did not follow a particular script when describing how to perform a pelvic floor contraction. The physical therapists utilized computerized biofeedback, vaginal manipulation, neuromuscular re-education, and manual therapy to focusing strictly on the pelvic floor. Each participant had to complete at least 20 of 24 possible sessions to be considered a "successful" participant. All Pilates and PFMT sessions were provided at no cost to the participants—who were also paid up to $75 for completion of the study protocol.

Baseline group characteristics and outcome measures were compared using $X^2$ or *t* tests as appropriate. Based on previous measurements of pelvic floor muscle strength via perineometry [18], a prospective sample size calculation

**Table 2** Protocol for pelvic floor muscle training

| Session | Activities | Description |
|---|---|---|
| 1 | Exam, strength assessment, biofeedback | Pelvic examination |
| | | Perineometry with biofeedback |
| 2 | Education and exercises | "Hands-on" review of pelvic floor anatomy and physiology |
| | | Review transverse abdominal contractions (TA) |
| | | Thiele's massage×10 min (if needed) |
| | | Home exercise program (HEP) training |
| | | TA contraction 5 s 10 times (supine) |
| | | TA with clamshell 10 times |
| 3 | Exercises and biofeedback | Diaphragmatic breathing exercises |
| | | Thiele's massage×10 min (if needed) |
| | | TA contraction 5 s 10 times (supine) |
| | | TA with clamshell 10 times |
| | | Biofeedback with internal sensor including: relaxation/down-training (if needed); pelvic floor activity baseline; 8 repetitions, holding for 6 s; 3–4 quick flicks |
| 4–24 | Review HEP, exercises, biofeedback, and modifications | Review HEP from last session and answer questions |
| | | Thiele's continued 10 times (if needed) |
| | | Biofeedback with internal sensor including: relaxation/down-training (if needed); pelvic floor strengthening; 8 repetitions, holding for 6 s; 3–4 quick flicks |
| | | The following modifications are added as patient improves: increase repetitions up to 12; increase hold up to 8 s; increase quick flicks; change position from "gravity eliminated" to "antigravity"; functional training/"the knack" (if needed), "knack" with coughing, sneezing, blowing nose, etc. |

**Table 3** Protocol for Pilates program

| Week | Exercise | Description |
|---|---|---|
| 1 | Pilates breathing[a] | Inhale slowly and deeply focusing on diaphragm movement and exhale "wringing" the breath out |
| | Neutral pelvis[a] | Lie on back, knees bent, feet flat on mat |
| | Knee folds[a] | Lie on back, knees bent, feet off the floor, pelvis neutral |
| | Knee sways[a] | Lie on back, bent knees, feet off mat, arms are extended out to the side, rotate the pelvis to the left, use abdominals to bring the pelvis back to neutral and alternate sides |
| | Heel slides[a] | Lie on back, knees bent, feet on mat, extend leg out by pushing heel out along floor, alternate, then do both heels at the same time |
| | Elevator[a] | Sit upright, pelvis neutral, zip and hollow. Deep inhalation and exhale, repeat successively deeper to lengthen spine |
| | Pelvic clock[a] | Neutral pelvis, imagine clockface on pelvis facing toward ceiling. Elevate pelvis so that 6 o'clock is higher than lower pelvis so that 12 o'clock is higher |
| | Pelvic rocks[a] | Lie on back, knees bent, neutral pelvis then tilt from side to side |
| | Coccyx curl[a] | Lie on back, knees bent in neutral position. Draw navel in towards spine |
| | Pelvic lifts* | Lie on back, knees bent, feet on mat, gently rock hips towards face, press low back into floor—taking curve out of low back |
| | Bridging* | Lie on the back with knees bent and feet in parallel. Press feet down into the floor to engage the hamstrings, lift the pelvis up towards the ceiling and the feet simultaneously. Lower the pelvis down to the floor using the legs. The spine is in neutral |
| | Abdominal stabilization[a] | Contraction of the abdominal muscles, pull your navel back in toward your spine |
| 2–12 | Warm-up | Week 1 exercises |
| | Roll down[a] | Stand, feet hip-distance apart, arms to hang loosely at sides, gently drop your chin toward your chest, roll forward slowly, roll back up, to regain your original posture |
| | Leg springs[a] | Lie flat on back. Heels and legs together raise and lower with simultaneously elevated head and neck |
| | Walking[a] | Spine elongated, pelvis neutral, feet hip-width apart and accentuate foot arches by pressing toes and balls of feet to the floor |
| | Frog[a] | Lie on back, legs extended at 45°, heels together, bend knees keeping heels together and extend. Keep head and neck elevated |
| | Circles[a] | Lie on back, knees bent, straighten one leg to ceiling then circular motion across body first |
| | Rolling like a ball[a] | On back, knees towards chest, feet off mat, hands behind thighs, chin to chest, roll back and then forward back to a back to balanced position |
| | Single leg stretch[a] | On back, grab shin and bend knee of one leg with hands, lift head and neck, extend other leg perpendicular to floor then switch legs |
| | Double leg stretch[a] | On back, bend both knees, grab shins with hands, lift head and neck, then extend legs at 90° angle to floor and arms in plane of head and neck |
| | Scissors[a] | Lie flat on back, bring legs to 90°, hands just above hips, split like movement alternating legs |
| | Lower and lift[a] | Lie on the back with knees bent and feet in parallel, lift the pelvis up with the strength of the legs, press feet down into the floor to engage the hamstrings, lift the pelvis up towards the ceiling |
| | Crisscross[a] | Lie on back, sit-up position, then extend one leg out, bring elbow to opposite bent knee, then alternate. Works core and obliques |
| | Spine stretch[a] | Sit up tall, legs extended on mat, knees slightly bent, chin to chest, roll down, form letter C with body, roll up to starting position |
| | Swan prep[a] | Lie on stomach, palms on mat raise torso |
| | Swan[a] | Release hands, rock forward onto breastbone with arms extended in front of you and straight legs lifted behind you. Then rock back lifting chest, legs, and feet parallel to mat |
| | Footwork[b] | Neutral pelvis, feet on foot bar (first balls of feet), heels together, and push out carriage. Keep abdominals engaged and incorporating breathing. Then, place heels on bar and repeat |
| | Hundreds[b] | Lie on back, knees bent in table top position, arms straight up then bring down to the sides. Inhale arms up and exhale arms down |
| | Arm circles[b] | Grasp handles, bring arms down towards the sides, then out, then circle up towards ceiling. Repeat and then repeat in opposite rotation |
| | Leg circles[b] | Lie on back, knees bent, straighten one leg to ceiling then circular motion across body first with foot in foot straps |
| | Elephant[b] | Arms on bar. Feet flat on reformer in a pike position. Push heels back then slowly return to neutral position with abdomen engaged |

**Table 3** (continued)

| Week | Exercise | Description |
|---|---|---|
| | Knee stretches[b] | One leg on the carriage, the foot flat on floor. Bend knee of leg on floor while simultaneous pushing the carriage back with the other foot. Hold position. Then repeat on the opposite side |
| | Pelvic lift[b] | Lie on back, heel on foot bar, arms at sides, raise pelvis, proceed with alternating leg lifts |

[a] Performed on a simple floor mat

[b] Performed using the Pilates "Reformer" machine

called for 24 patients in each group to have 80% power for detecting a 25% difference in muscle strength between groups.

## Results

Sixty-two women were enrolled. All of these women were able to perform a pelvic muscle contraction correctly, and no screened patients were excluded on the basis of not being able to contract their pelvic floor. There were 30 and 32 participants in the Pilates and PFMT groups, respectively. There was a differential dropout rate between groups—leaving 28 and 24 participants in the final Pilates and PFMT groups, respectively. Details of enrollment and fulfillment of the study protocol are displayed in Fig. 1. There were no demographic differences between the original randomized groups and the final subsets of those groups who actually completed the study (Tables 4 and 5). The two participants who left the Pilates arm of the trial reported doing so reluctantly due to circumstances out of their control. One injured her wrist rendering her unable to continue the program, and the other had a very sick child and could no longer afford the time for study participation. In contrast, seven of the eight participants who dropped out of the PMFT arm reported doing so because they found the treatments unpleasant in some way.

Mean pre-treatment muscle strength for the Pilates and PFMT groups were 14.9±12.5 and 12.5±10.4 $cmH_2O$, respectively ($p$=0.41). Both groups demonstrated improved strength at the end of the study. Mean improvement in the Pilates group was 6.2±7.5 $cmH_2O$ ($p$=0.0002) and in the PFMT group was 6.6±7.4 $cmH_2O$ ($p$=0.0002). When compared between groups, these muscle strength improvements were not significantly different ($p$=0.85).

Mean pre-treatment PFDI-20 scores for the Pilates and PFMT groups were 59.2±42.3 and 51.9±37.8, respectively ($p$=0.48). After treatment, PFDI scores improved by 28.4±36 points (48%) in the Pilates group ($p$=0.0004) and by 27.4±24.7 points (53%) in the PFMT group ($p$<0.0001). When compared to each other, these improvements in PFDI-20 scores were not significantly different between groups ($p$=0.86).

Mean pre-treatment PFIQ-7 scores for the Pilates and PFMT groups were 25±29.9 and 22.4±31.1, respectively ($p$=0.74). After treatment, PFIQ scores improved by 10.9±28 points (44%) in the Pilates group ($p$=0.049) and by 12.3±30.9 points (55%) in the PFMT group ($p$=0.043). When compared to each other, these improvements in PFIQ-7 scores were not significantly different between groups ($p$=0.91).

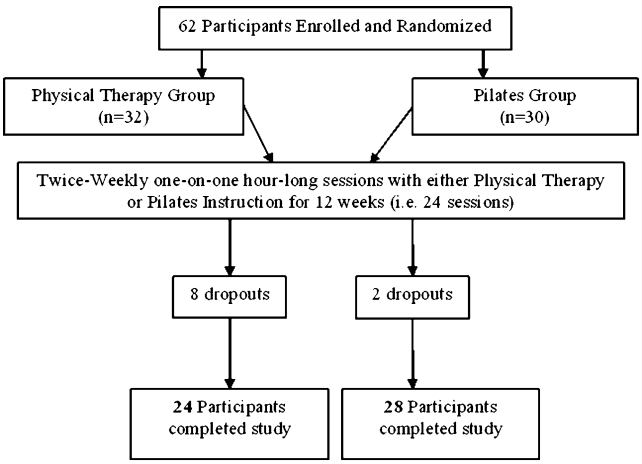


**Fig. 1** Flow diagram of enrollment and dropout

## Discussion

PMFT is a widely used treatment for pelvic floor disorders such as stress urinary incontinence [1]. Two recent Cochrane systematic reviews described PFMT as the recommended first-line conservative prevention and management program for women with stress, urge, or mixed urinary incontinence as well as fecal incontinence [19, 20]. There are two hypotheses regarding the mechanisms by which PFMT may provide prevention and treatment of stress urinary incontinence and pelvic organ prolapse [4]. These two proposed mechanisms are (1) that women develop a "knack" for consciously contracting the pelvic floor muscles before and during increases in abdominal pressure, and (2) that strengthening these muscles can build

**Table 4** Pre-treatment characteristics of Pilates versus pelvic floor muscle-training groups before any patients dropped out of the study

| | Pilates ($n$=30) | PFMT ($n$=32) | $P$[d] |
|---|---|---|---|
| Age (years) | 51.1 (10.6) | 48.8 (12.1) | 0.43 |
| Body mass index | 24.7 (5.0) | 25.1 (4.6) | 0.74 |
| Parity | 2.1 (0.9) | 1.8 (0.96) | 0.30 |
| Peak perineometry value[a] ($cmH_2O$) | 14.9 (12.5) | 12.5 (10.4) | 0.41 |
| Pre-treatment PFDI[b] | 59.2 (42.3) | 51.9 (37.8) | 0.48 |
| Pre-treatment PFIQ[c] | 25.1 (29.9) | 22.4 (31.1) | 0.74 |

Data expressed as means (standard deviation) unless otherwise indicated

[a] Peak pelvic floor muscle strength measured using computerized perineometry via the Pathway™ CTS 2000, The Prometheus Group, Dover, NH, USA

[b] PFDI-20, pelvic floor distress inventory short form 20

[c] PFIQ-7, pelvic floor impact questionnaire short form 7

[d] $p$ value

up the structural support to the pelvic floor. However, some authors have called for a critical reappraisal of PFMT—given the relative dearth of evidence to support the long-term benefits of focused PFMT programs [21].

Our randomized clinical trial clearly demonstrated the feasibility of a Pilates exercise program for strengthening the pelvic floor muscles. This being a feasibility study—with change in muscle strength being the main endpoint—we did not focus on whether patients were actually experiencing pelvic floor symptoms when setting up the inclusion/exclusion criteria. Also, it is important to note that our findings are only relevant to those women who can "find" their pelvic floor muscles. Women who cannot correctly flex these muscles would not be likely to benefit from the Pilates protocol to the same extent as our study participants.

Although pelvic floor dysfunction was not required for participation in this study, we also showed a 44–55% improvement in both groups with regard to PFDI-20 and PFIQ-7 scores. Of course, the clinical significance of these subjective findings among a group of largely asymptomatic women is unclear. Nevertheless, these improved scores are intriguing given the reported "minimal clinically important difference" of approximately 15% for these questionnaires [13].

Our results are complementary to those from a recent non-randomized longitudinal study by Brubaker et al. [22] in which "pelvic fitness" classes showed promise for improving symptoms of pelvic floor dysfunction. These classes combined a total-body fitness program with education about pelvic anatomy and bladder health. Although it was assumed that increased pelvic floor muscle strength played a major role in improving these study participants' symptoms, actual pelvic floor muscle strength was not measured. Nevertheless, Brubaker et al. illustrated a very important idea—that a "non-medicalized" program incorporating pelvic muscle exercises into an appealing "gym-based" regimen can improve pelvic floor symptoms in

**Table 5** Characteristics of participants who completed the study versus those who dropped out

| | Participants who completed trial ($n$=52) | Participants who dropped out ($n$=10) | $P$[d] |
|---|---|---|---|
| Age (years) | 49.5 (11.1) | 52.1 (12.9) | 0.52 |
| Body mass index | 24.5 (3.9) | 27.0 (5.2) | 0.14 |
| Parity | 1.9 (1.0) | 2.1 (.6) | 0.56 |
| Peak pelvic floor muscle strength[a] ($cmH_2O$) | 14.5 (12.0) | 8.7 (5.3) | 0.16 |
| Pre-treatment PFDI[b] | 57.7 (41.5) | 42.7 (28) | 0.30 |
| Pre-treatment PFIQ[c] | 26.2 (31.9) | 9.5 (11.4) | 0.13 |

Data expressed as means (standard deviation) unless otherwise indicated

[a] Peak pelvic floor muscle strength measured using computerized perineometry via the Pathway™ CTS 2000, The Prometheus Group, Dover, NH, USA

[b] PFDI-20, pelvic floor distress inventory short form 20

[c] PFIQ-7, pelvic floor impact questionnaire short form 7

[d] $p$ value

women. Their exercise program was very similar to the Pilates program in our study.

Both groups of women who actually completed the PFMT or Pilates protocols expressed gratitude and enthusiasm for their respective treatments, yet a larger number of enrollees dropped out of the PFMT study arm. There were several characteristics of the two exercise programs that could have been responsible for the differential dropout rates between groups. Perhaps the whole experience surrounding participation in the Pilates protocol was generally more acceptable than that of the PFMT protocol. The PFMT techniques employed by the physical therapists in our study involved "invasive" techniques using vaginal manipulation—obviously requiring that the participants undress. In contrast, The Pilates program was conducted in a non-medical facility (the Bodies in Balance Pilates studio, Madison, NJ, USA) where the participants remained fully clothed. One other important difference between the two exercise regimens had to do with perceived "extra pelvic" benefits. While the PMFT program was designed to focus almost exclusively on the levator ani muscles, the Pilates program was designed to provide greater strength, flexibility, and posture for the whole body.

Another important difference between these two programs involved our primary endpoint—perineometry. The PFMT participants essentially "practiced" perineometry during each exercise session, but the Pilates participants performed that measurement only at the pre- and post-treatment data collection sessions. Thus, even given this theoretic advantage, the PFMT group did not demonstrate better post-treatment perineometry scores.

Several important limitations of this study must be considered. It is possible that our PFMT regimen was not optimal for increasing pelvic floor muscle strength. PFMT teaching recommendations tend to evolve and change over time, so our PMFT program could possibly be considered "out of date" by some providers.

Although we excluded women with prior formal training in either Pilates or PFMT, it was possible that women could have been informally exposed to one or both of these exercise methods.

Although we did meet our desired sample size of 24 participants per group (and therefore achieved our desired power), this was a relatively small study. Larger randomized trials designed to determine whether a Pilates program can actually improve significant pelvic floor dysfunction would be required before we could recommend the widespread use of this protocol for that purpose. Nevertheless, our results clearly indicate that such randomized trials are warranted.

Another possible criticism of this study could be the lack of a sham group, but we considered it impossible to feasibly create a believable sham treatment protocol.

One might also argue that we should have performed an "intention-to-treat" analysis in order to include those women who did not complete the study. The intention-to-treat principle dictates that all patients who had been randomly allocated to treatments under the auspices of the study should be included in the final data analysis as a part of their original group assignment. This principle can only be applied when some sort of outcome measure exists for all study participants [23]. Our study design did not offer any way to perform such an analysis, because we collected only one set of outcome measures at the end of the 12-week exercise period. Therefore, women who dropped out of the study did so before submitting to any collection of post-treatment data. Nevertheless, our randomization scheme seems to have worked well—as there were no statistical differences between our original study groups and the groups of women who actually completed the study.

Finally, the cost of a one-on-one Pilates instruction program such as ours (approximately $1,800) would be prohibitive for most women. However, if our results remain positive within future studies among symptomatic patients, adapting the Pilates protocol to fit a group class or even a web-based platform may be worthwhile. Our results are encouraging and may eventually lead to widespread use of Pilates-based exercise programs to treat and prevent pelvic floor dysfunction. It is easy to imagine the use of Pilates during the peripartum or perioperative periods—as a form of pelvic floor rehabilitation following vaginal deliveries and/or pelvic reconstructive surgery.

**Conflicts of interest** None.

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