

Comparison of satisfaction, motivation, flexibility and delayed onset muscle soreness between modern Pilates method and unstable Pilates method

Comparação da satisfação, motivação, flexibilidade e dor muscular tardia entre método Pilates moderno e método Pilates instável

Comparación de la satisfacción, motivación, flexibilidad y dolor muscular tardío entre el método Pilates moderno y el método Pilates inestable

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ABSTRACT | The aim of our study was to compare the satisfaction and motivation for the practice of exercise, flexibility and delayed onset muscle soreness (DOMS) in healthy participants after exercises in two types of the Pilates method. For this, 50 healthy participants performed a session of exercises of modern Pilates and other of unstable Pilates. We evaluated the outcomes for satisfaction and motivation after sessions, posterior flexibility of the torso and lower extremities (sit-and-reach box) before and after each session, and DOMS 24, 48 and 72 hours after each session (Numeric Pain Rating Scale). Results showed no statistically significant difference between both types of Pilates for satisfaction and motivation, flexibility and DOMS 72 hours after the session ($p>0.05$). Regarding the DOMS we observed statistically significant difference between the two types 24 hours (difference between the means: -0.7; 95%CI: -1.5 to 0.0) and 48 hours (difference between means: -0.8; 95%CI: -1.4 to -0.2) after the session, with greater pain in unstable Pilates. As a conclusion, both categories of Pilates showed the same level of satisfaction and motivation and similar flexibility gain. However, unstable Pilates caused more DOMS after 24 and 48 hours, but this difference was not clinically relevant.

Keywords | Exercise and Movement Techniques; Malleability; Myalgia.

RESUMO | O objetivo deste estudo foi comparar a satisfação e motivação para a prática de exercício físico, flexibilidade e dor muscular tardia (DMT) em participantes saudáveis após exercícios de duas modalidades do método Pilates. Para isso,

cinquenta participantes saudáveis realizaram uma sessão de exercícios do Pilates moderno e outra do Pilates instável. Foram avaliados os desfechos satisfação e motivação após as sessões, flexibilidade posterior do tronco e membros inferiores (banco de Wells) antes e após cada sessão, e DMT 24, 48 e 72 horas após cada sessão (Escala Numérica de Dor). Os resultados mostraram que não houve diferença estatisticamente significativa entre as duas modalidades do Pilates para satisfação e motivação, flexibilidade e DMT 72 horas após a sessão ($p>0,05$). Para a DMT foi observada diferença estatisticamente significativa entre as duas modalidades 24 horas (diferença entre as médias: -0,7; IC a 95%: -1,5 a 0,0) e 48 horas (diferença entre as médias: -0,8; IC a 95%: -1,4 a -0,2) após a sessão, com maior dor no Pilates instável. Como conclusão, as duas modalidades do Pilates apresentaram o mesmo nível de satisfação e motivação e ganho similar de flexibilidade. No entanto, o Pilates instável causou mais DMT após 24 e 48 horas, mas essa diferença não foi clinicamente relevante.

Descritores | Técnicas de Exercício e de Movimento; Maleabilidade; Mialgia.

RESUMEN | El objetivo de este estudio ha sido comparar la satisfacción y motivación para la práctica de ejercicio físico, flexibilidad y dolor muscular tardío (DMT) en participantes sanos después de ejercicios de dos modalidades del método Pilates. Para ello, cincuenta participantes sanos realizaron una sesión de ejercicios del Pilates moderno y otra del Pilates inestable. Se evaluaron los resultados de satisfacción y motivación después de las sesiones, flexibilidad posterior del

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tronco y miembros inferiores (banco de Wells) antes y después de cada sesión, y DMT 24, 48 y 72 horas después de cada sesión (Escala Numérica de Dolor). Los resultados mostraron que no hubo diferencia estadísticamente significativa entre las dos modalidades del Pilates para satisfacción y motivación, flexibilidad y DMT 72 horas después de la sesión ($p>0.05$). Para la DMT se observó diferencia estadísticamente significativa entre las dos modalidades 24 horas (diferencia entre las medias: -0.7, IC a 95%: -1.5 a 0.0) y 48 horas (diferencia entre las

medias: -0.8, IC a 95%: -1.4 a -0.2) después de la sesión, con mayor dolor en el Pilates inestable. Como conclusión, las dos modalidades del Pilates presentaron el mismo nivel de satisfacción y motivación y beneficio similar de flexibilidad. Sin embargo, el Pilates inestable causó más DMT después de 24 y 48 horas, pero esa diferencia no ha sido clínicamente relevante.

Palabras clave | Técnicas de Ejercicio y de Movimiento; Flexibilidad; Mialgia.

INTRODUCTION

Physical inactivity is among the four major risk factors to cause death, along with hypertension, tobacco use and high glucose¹. In addition, physical inactivity is responsible for 6 to 10% of noncommunicable diseases, such as coronary artery diseases, type II diabetes, cancer of cervix uteri and mama². The battle against the physical inactivity is a priority in primary cares to control the overall increase in prevalence and impact of these diseases³, and is made by the advisement and referral of physical activity in primary cares³.

Currently, modern Pilates and unstable Pilates have been recommended as physical activities to promote health improvement. Modern Pilates can be executed on the ground and with equipment^{4,5} and has eleven fundamental principles: breathing, control, concentration, centering (isometric contraction of transversus abdominis muscles, pelvic floor and multifidus)^{4,5}, flow, precision, awareness, alignment, coordination, stretching and persistence⁶. As for the unstable Pilates, it associates three types of exercises: Modern Pilates^{5,6}, functional exercises⁷ and circus activity^{8,9}. Besides that, unstable Pilates has as a characteristic the playful aspect⁹ and the execution of exercises in unstable bases, using differentiated equipment and accessories.

The effects of modern Pilates on the physical capacity of healthy practitioners have been evaluated. Results show that modern Pilates improves flexibility of the musculature of the torso¹⁰ and posterior chain^{11,12}, when compared with a control group, and also the flexibility of the torso musculature in healthy women, when compared with the conventional strengthening and elongation¹³. As for the unstable Pilates, though currently widespread, it shows no scientific evidences about its effect on flexibility, strength or coordination of practitioners who are healthy or have musculoskeletal dysfunction.

The practice of regular physical activity leads to benefits for the entire organism, including the musculoskeletal⁷ system,

but can lead to delayed onset muscle soreness (DOMS). DOMS corresponds to the sensitivity, pain and muscle rigidity that occur when individuals perform an exercise they are not used to, of high intensity or with eccentric contractions¹⁴⁻¹⁶. DOMS usually appears 24 hours after the exercise, with peak of pain between 48 to 72 hours after the exercise^{17,18}. During the period of pain, the individual may present restriction of range of movement and deficit of maximum muscle strength^{19,20}. Exercise Therapy has been a physiotherapeutic intervention recommended by clinical practice directives to improve symptoms of patients with musculoskeletal disorders. Thus, the satisfaction and motivation of patients regarding the treatment, as well as the level of DOMS, can influence the adherence to treatment and consequently affect the intervention.

Pilates exercises are an alternative to conventional exercises. However, DOMS can affect the motivation of practitioners to continue the exercises or keep them out of practice for a few days. Currently, there are no studies that evaluated the intensity of DOMS caused by modern Pilates, nor even if the unstable Pilates, since it exercises more muscle groups on unstable surfaces, may cause more DOMS. Also, we have a lack of evidence on the action of unstable Pilates in muscular flexibility. In addition, there is the doubt of whether unstable Pilates, having the playful component, brings more motivation and satisfaction than modern Pilates. Thus, the objective of our study was to compare satisfaction and motivation, flexibility and DOMS of healthy participants after a session of modern Pilates and unstable Pilates.

METHODOLOGY

Type of study

Quasi-experimental study, cross-over.

Participants

Sample size was defined by convenience. We included 50 healthy participants, aged between 18 and 60 years of both sexes and independent locomotion, who never performed modern Pilates and unstable Pilates exercises, that could or not be performing other sportive practice. They were recruited in a Pilates studio in São Paulo and in the community of the Universidade Cidade de São Paulo. All participants must have presented readiness to physical activity²¹. Exclusion criteria were uncontrolled metabolic diseases, osteoporosis; inflammatory, rheumatic and neurological disorders; presence of fractures; previous surgeries of musculoskeletal origin and pregnancy.

Interventions

The sequence of the method the participant would perform first, whether modern Pilates or unstable Pilates, was randomized, using Microsoft Excel for Windows software. Therefore, after evaluation, the physical therapist responsible for the intervention scheduled a session to perform the Pilates method indicated on randomization and another session, four days later, to perform the other type. This physical therapist had four years of experience in modern Pilates and two years in unstable Pilates.

All participants received a session of modern Pilates exercises (ground and equipment: Cadillac, Reformer, Chair and Barrel) and a session of unstable Pilates exercises (with accessories and equipment: Lyra, Gravity, Ladder, Skier, Wall, Coreskate, Slackline and Fix Ball). Both sessions lasted one hour. The four-day interval between sessions was determined to minimize the previous session effects, as the DOMS. Sessions were performed in groups of up to three participants. Exercises performed with unstable Pilates method are described in Appendix 1. Exercises from modern Pilates method were based on a previously published workbook²².

During both sessions, participants received common guidelines on modern Pilates and unstable Pilates. An initial training of the powerhouse activation (isometric contraction of the abdominal muscles and pelvic floor) was performed during the exhalation^{4,5}, which was requested in all exercises. In modern Pilates session, exercises were performed to globally recruit the musculature, involving torso, upper and lower extremities. In unstable Pilates, exercises were performed in unstable bases with the same goals.

The exercises of the two types were executed in three degrees of difficulty: beginner, intermediate and advanced. The level was set according to the physical condition of each participant²³. Some basic exercises were adapted to the conditions of the participant. In modern Pilates, the adaptations were performed by reducing the movement amplitude or removing/adding resistance to facilitate the movement. In unstable Pilates, adaptations were performed by increasing or decreasing the supporting base, evolving from static to dynamic exercises, low complexity to high complexity exercises and using a stable or unstable base⁹. In both types 10 repetitions of each exercise were performed, except for isometric exercises in which the posture was maintained for up to 10 seconds⁹.

Evaluation

A trained blind evaluator performed the evaluation to confirm the eligibility and obtain demographic and anthropometric data of the participants. After the evaluation, the participants signed a Free and Clarified Consent Term to participate in the study, approved by the Committee for Ethics in Research of the Universidade Cidade de São Paulo (CAAE 53159916.5.0000.0064). The outcomes evaluated were: satisfaction and motivation regarding the practice of physical activity, flexibility and DOMS.

To evaluate the satisfaction and motivation for physical activity, a questionnaire with four questions was especially developed to this study: “how satisfied were you after this program of exercises”?, “how confident are you that this exercise program will help you achieve your goals regarding the practice of physical activity”?, “how confident would you be to recommend this exercise program to a friend”?, and “how motivated are you to continue practicing this program of exercises”?. The responses were quantified by a numeric scale of 11 points, with zero corresponding to “not at all satisfied/confident/motivated” and 10 to “extremely satisfied/confident/motivated”. This questionnaire was immediately applied after the session of each exercise method.

Flexibility of the posterior part of the torso and lower extremities was evaluated through the sit and reach box, with the chair sit-and-reach test, before and after each session. Participants sat down on the mattress facing the box, putting their feet slightly apart and in full contact with the anterior face of the box, with flexed hip and extended knees. After proper positioning, participants were instructed to move the scale ruler of the box to a maximum, with hands

superimposed on another, performing flexion of torso, keeping knees, elbows and wrists in extension, for three times. The value obtained for each attempt was expressed in centimeters and was considered the highest measure between the three attempts^{24,25}.

DOMS was evaluated by the numeric pain rating scale of 11 points, 0 being no pain and 10 the worst pain possible²⁶. Evaluation of DOMS was performed by phone 24, 48 and 72 hours after each session, in which participants were asked to rate their pain intensity at that moment.

Statistical analysis

Statistical analysis was performed using SPSS 24 software for Windows. A descriptive analysis of the demographic characteristics of participants and a comparison of the outcomes between groups was made with t test for paired samples, with $p \leq 0.05$.

RESULTS

From the 50 evaluated participants, 69% were female, with an average age of 30 years, 88% had high level of education and 58% did not perform prior physical activity (Table 1). Among the practitioners of prior physical activity, most performed weight training (52.4%), followed by walk (14.3%) and *ballet* (9.5%). Besides that, 33.3% of the participants practiced physical activity five times a week. Three participants did not attend the second session of exercises.

Regarding the comparative analysis, there was no difference between both types of Pilates for satisfaction and motivation, flexibility and DOMS 72 hours after the session. There was difference in DOMS evaluated

24 hours (-0.7 [95%CI: -1.5 to 0.0]) and 48 hours (-0.8 [95%CI: -1.4 to -0.2]) after the session, in which unstable Pilates caused more pain. The peak of pain happened after 24 hours in both types of Pilates (Table 2).

Table 1. Demographic characteristics of patients

Characteristics	
Sex	
Male	16 (32)
Female	34 (68)
Age (years)	
	30.9 (10.7)
Weight (Kg)	
	69.6 (10.3)
Height (meters)	
	1.7 (0.1)
Body mass index (kg/m²)	
	25.0 (3.4)
Marital status	
Single	34 (68)
Married	15 (30)
Divorced	1 (2)
Education	
Some Elementary or Middle School	1 (2)
Some High School	1 (2)
High School	4 (8)
Some College	17 (34)
College Degree	26 (52)
Graduate studies	1 (2)
Physical activity	
Yes	21 (42)
No	29 (58)
Smoker	
Yes	8 (16)
No	42 (84)

Categorical variables were expressed as numbers and percentages, and continuous variables in mean and standard deviation

Table 2. Comparison of outcomes between groups

Outcomes	Modern Pilates	Unstable Pilates	Difference between means (95%CI)	p
Questionnaire of satisfaction and motivation – question 1	9.5 (1.0)	9.4 (0.9)	0.1 (-0.2 a 0.5)	0.359
Questionnaire of satisfaction and motivation – question 2	9.3 (1.0)	9.2 (1.0)	0.0 (-0.3 to 0.4)	0.789
Questionnaire of satisfaction and motivation – question 3	9.6 (0.8)	9.5 (0.9)	0.1 (-0.1 a 0.4)	0.336
Questionnaire of satisfaction and motivation – question 4	8.9 (1.2)	8.9 (1.1)	0.0 (-0.3 to 0.3)	1
Flexibility (pre- and post-session difference)	3.4 (3.1)	3.1 (2.6)	0.3 (-0.6 to 1.2)	0.537
Delayed soreness after 24 hours	2.7 (2.5)	3.5 (2.6)	0.7 (-1.5 to 0.0)	0.047*
Delayed soreness after 48 hours	1.6 (2.1)	2.4 (2.2)	-0.8 (-1.4 a -0.2)	0.008*
Delayed soreness after 72 hours	0.7 (1.5)	0.6 (1.4)	0.1 (-0.3 a 0.5)	0.559

*Statistically significant difference between modalities of exercises ($p \leq 0.05$)

CI = Confidence interval

DISCUSSION

The aim of our study was to compare the satisfaction and motivation, flexibility and DOMS of healthy participants after a session of modern Pilates and unstable Pilates. We observed no statically significant difference between both types for satisfaction and motivation, flexibility and DOMS 72 hours after the sessions. However, there was statistically significant difference in DOMS 24 and 48 hours after sessions, with peak of pain happening 24 hours after both types, with difference in unstable Pilates.

The use of equipment to perform the exercises in both types may have contributed to the nonexistence of difference in satisfaction and motivation. Although unstable Pilates is considered more playful, both types have similar exercises and postures. In addition, other factors can also influence the patients' satisfaction during a treatment, such as waiting time to be treated, contact time with therapist, empathy, good communication, trust and connection between therapist and patient, understanding of patient's expectations by the therapist, which increases the patient's adherence and enhances the results of treatments²⁷. All these factors were common to both types of Pilates, and may have contributed to the lack of difference in this outcome between them.

Also, there was no statistically significant difference in flexibility. The studied types exercise the articular motion of the spine and posterior chain stretching, based on the same principles. Although unstable Pilates has some different concepts, such as using functional exercises and circus activities, both types were similar regarding the improvement of muscle flexibility. Results of this study corroborate with some studies that show that modern Pilates can improve muscular flexibility of torso and posterior chain in short-term¹⁰⁻¹².

DOMS showed statistically significant difference 24 and 48 hours after the session, being higher in unstable Pilates, with peak of pain in 24 hours. However, this difference is clinically irrelevant, since it is lower than 1 point, and the minimal clinically important difference of DOMS is 2.8 points²⁸. Exercise in unstable basis is often used to increase the proximal activation of musculature, demanding control of the center of mass and stimulating articular receptors to proprioception²⁹, which justifies an increased recruitment of muscle fibers during exercise, and consequently higher DOMS. However, this factor may be unfavorable for patients with musculoskeletal

pain, since it causes a worsening of the pain and may lead to kinesiophobia³⁰.

A weakness of this study is not controlling the prior practice of physical activity, since participants that perform any prior physical activity (42%) were more prepared for the exercise, with a better muscle preparation than sedentary participants. This factor may be responsible for the fact that participants do not present a high degree of DOMS, since they already had certain tolerance to exercise. However, the exercises of both types of Pilates generate stimuli very different from other forms of exercise, which can cause this factor to not directly influence the results. Besides that, as this is the first study to investigate the effects of the unstable Pilates method, it was not possible to perform a sample calculation due to the absence of data from previous studies as a reference. A strong point was the concern in prescribing exercises with similar objectives in both types, mainly regarding muscular work. In addition, the same therapist performed the application of both types, thus avoiding therapist's influence, regarding the empathy with the participant. Another strong point is that this was the first scientific study to evaluate the effects of unstable Pilates.

This study brings as clinical implications that modern Pilates and unstable Pilates similarly improve muscular flexibility immediately after the exercises, and can be used for this purpose in people with muscle shortening. However, the fact that unstable Pilates causes more DOMS shows that therapists must have caution when prescribing this modality of exercises to patients with musculoskeletal pain in an initial phase of treatment, to not exacerbate the pain and cause kinesiophobia. However, both methods do not cause high levels of DOMS during the peak of muscle pain. Moreover, results of this study are relevant because they show the effects of a new modality of exercise that can be used as another tool in the treatment for musculoskeletal disorders, since exercise therapy is one of the most suitable treatments for these patients.

CONCLUSION

Both methods of Pilates presented the same level of satisfaction, motivation and similar flexibility gain. However, unstable Pilates caused more DOMS 24 and 48 hours after exercises, but this difference was not clinically relevant.

ACKNOWLEDGEMENTS



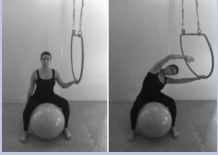



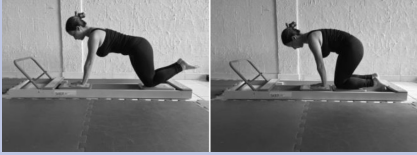

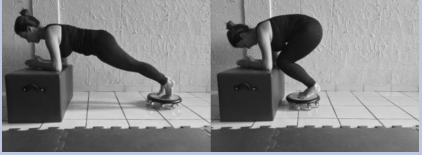

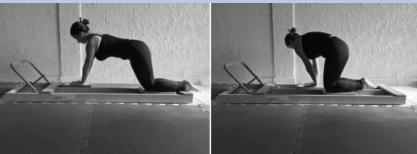
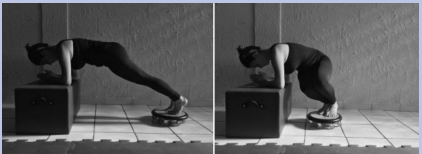
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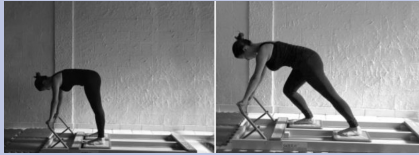

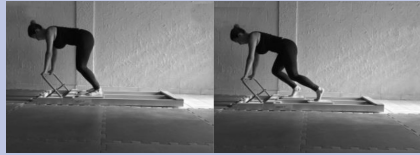

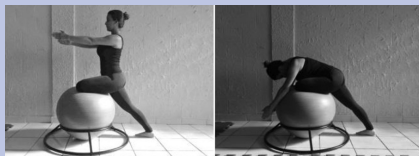





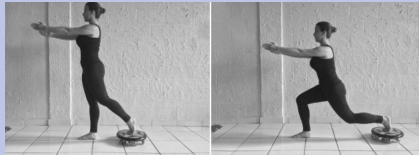
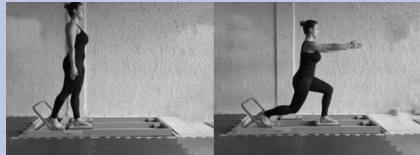
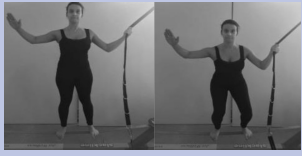


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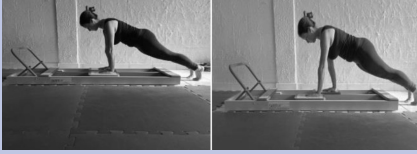

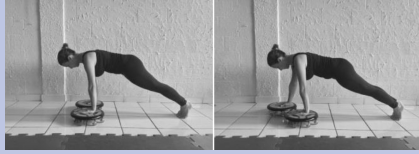
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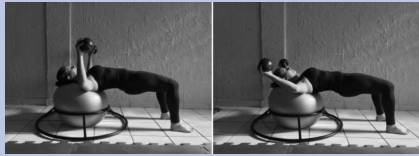
APPENDIX 1 – WORKBOOK OF EXERCISES

Exercises of the Unstable Pilates method

Exercises for Spine		
Beginner	Intermediate	Advanced
<p><i>Spinal mobilization</i></p>  <p>Equipment: Lyra Objective: to mobilize the spine and stretch the muscles of the posterior chain.</p>	<p><i>Shoulder bridge</i></p>  <p>Equipment: Slackline and foam roller Objective: to mobilize the pelvis and spine and strengthen gluteal and hamstrings muscles in unstable base.</p>	<p><i>Lateral stretch</i></p>  <p>Equipment: Lyra and peanut ball Objective: to stretch muscles from lateral chain and control the movement of scapular elevation in unstable base.</p>
<p><i>Spinal mobilization in sitting position</i></p>  <p>Equipment: Core Skate Objective: to mobilize spine and scapulae.</p>	<p><i>Spinal mobilization in sitting position (variation 1)</i></p>  <p>Equipment: Skier Objective: to mobilize spine and scapulae.</p>	<p><i>Inversion</i></p>  <p>Equipment: Gravity Objective: to promote traction of spine, and strengthening of abdominal muscles.</p>
Exercises for Abdomen		
Beginner	Intermediate	Advanced
<p><i>Abdominal in Skier</i></p>  <p>Equipment: Skier Objective: to strengthen the abdomen muscles in unstable base.</p>	<p><i>Hundred in aerial silk</i></p>  <p>Equipment: Gravity Objective: to strengthen the abdomen muscles in unstable base.</p>	<p><i>Abdominal in Core Skate</i></p>  <p>Equipment: Core Skate and Box Objective: to strengthen the abdomen muscles in unstable base.</p>
<p><i>Twist in Skate</i></p>  <p>Equipment: Core Skate Objective: to work balance, dissociation of waists, coordination and strengthening of the external oblique muscle.</p>	<p><i>Obliques in Skier 5</i></p>  <p>Equipment: Skier Objective: to work coordination and strengthening of the rectus abdominis and external oblique muscles in unstable base.</p>	<p><i>Abdominal in Core Skate (variation 1)</i></p>  <p>Equipment: Core Skate and Box Objective: to strengthen rectus abdominis and external oblique muscles in unstable base.</p>

Exercises for lower extremities		
Beginner	Intermediate	Advanced
<p><i>Alternating lower extremities</i></p>  <p>Equipment: Skier Objective: to work motor coordination and triceps surae stretching.</p>	<p><i>Warm up (variation 1)</i></p>  <p>Equipment: Wall Unit Objective: to work motor coordination, cardio-respiratory conditioning and strengthening of the quadriceps, hamstrings and triceps surae muscles in unstable base.</p>	<p><i>Running</i></p>  <p>Equipment: Skier Objective: to work motor coordination, cardio-respiratory conditioning and strengthening of the quadriceps and triceps surae muscles.</p>
<p><i>Stretching of the muscles of the hip</i></p>  <p>Equipment: Gravity Objective: to stretch the muscles of the hip and hamstrings.</p>	<p><i>Stretching of the muscles of the hip</i></p>  <p>Equipment: Fix Ball Objective: to mobilize the spine and stretch the muscles of the hip and hamstrings.</p>	<p><i>Stretching of the master posterior chain</i></p>  <p>Equipment: Fix Ball Objective: to mobilize the spine and stretch the hamstrings and triceps surae muscles.</p>
<p><i>Mermaid</i></p>  <p>Equipment: Skier Objective: to strengthen the gluteus medius muscle and mobilize the spine in the transverse plan.</p>	<p><i>Hip abduction in ball</i></p>  <p>Equipment: Fix Ball Objective: to work balance, strengthening quadriceps, gluteus medius, rectus abdominis, hamstrings, transverse abdominal muscles.</p>	<p><i>Adduction and abduction in Skier</i></p>  <p>Equipment: Skier Objective: To strengthen hip adductors and abductors depending on resistance.</p>
<p><i>Hip extension in ball</i></p>  <p>Equipment: Fix Ball Objective: to work balance, strengthening of quadriceps, gluteus maximus, rectus abdominis, hamstrings, transversus abdominis muscles.</p>	<p><i>Split squat (variation 1)</i></p>  <p>Equipment: Core Skate Objective: to strengthen the quadriceps, gluteus and hamstrings muscles in unstable base.</p>	<p><i>Split squat</i></p>  <p>Equipment: Skier Objective: To strengthen the quadriceps, gluteus and hamstrings muscles in unstable base.</p>
<p><i>Unstable squat</i></p>  <p>Equipment: Slackline Objective: to work balance and quadriceps strengthening in unstable base.</p>	<p><i>Plantar flexion</i></p>  <p>Equipment: Gravity Objective: to work balance and triceps surae strengthening in unstable base.</p>	<p><i>Plantar flexion (variation 1)</i></p>  <p>Equipment: Slackline Objective: to work balance and triceps surae strengthening in unstable base.</p>

Exercises for upper extremities		
Beginner	Intermediate	Advanced
<p><i>Unstable plank and scapula mobilization (variation 1)</i></p>  <p>Equipment: Skier Objective: to stabilize shoulder and strengthen rectus abdominis, hamstrings, transversus abdominis and gluteus maximus muscles.</p>	<p><i>Push-up</i></p>  <p>Equipment: Slackline Objective: to strengthen pectoralis, triceps brachii, rectus abdominis, hamstrings, transversus abdominis and gluteus maximus in unstable base.</p>	<p><i>Unstable plank and scapula mobilization</i></p>  <p>Equipment: Core Skate Objective: to stabilize shoulder and strengthen the rectus abdominis, hamstrings, transversus abdominis and gluteus maximus muscles.</p>

Beginner	Intermediate	Advanced
<p><i>Rotator cuff stretcher</i></p>  <p>Equipment: Bosu Ball and Kettlebell Objective: To strengthen lateral rotators muscles of the shoulder and gluteus activation.</p>	<p><i>Rotator cuff stretcher</i></p>  <p>Equipment: Bosu and Toning Ball Objective: To strengthen lateral rotators muscles of the shoulder and gluteus activation.</p>	<p><i>Rotator cuff stretcher</i></p>  <p>Equipment: Fix Ball and Toning Ball Objective: To strengthen lateral rotators muscles of the shoulder and gluteus activation.</p>

Exercises from Modern Pilates method

For modern Pilates, the exercises were based on a previously published workbook²². For the spine and torso, the following exercises were used:

- Bridge (beginner in soil);
- Bridge variation (intermediate in Cadillac and advanced in the Reformer);
- Half roll back and roll up (beginner and intermediate in Cadillac);
- Hamstring stretch variation (beginner and intermediate in Chair);
- Hamstring stretch (advanced in Cadillac);
- Stretches front variation (beginner in Barrel);
- Hamstring stretch variation (intermediate in Cadillac);
- Spine Stretch (advanced in Cadillac);
- Swan front (beginner and intermediate in Chair);
- Mermaid (beginner in Cadillac, intermediate in Reformer and advanced in Chair);
- Teaser (beginner in soil);
- Hundred variation (beginner and intermediate in Reformer);
- Hundred (beginner in soil and intermediate in Reformer);
- Exercise on the ball (intermediate and advanced in the soil with ball);
- Sit up (beginner in Cadillac with flexed and extended knees);
- Sit up variation (intermediate in Cadillac and Barrel, and advanced in Cadillac);

For lower extremities, the following exercises were used:

- Running (beginner in the Reformer);
- Tower (intermediate and advanced in Cadillac);
- Stomach massage series (advanced in Reformer);
- Footwork in dorsal decubitus and sitting position (beginner and intermediate in Reformer);

- Tower (advanced in Cadillac);
- Achilles stretch (intermediate in Chair);
- Seated leg pumps (beginner in Chair);
- Pump one leg front (intermediate in Chair);
- Pump one leg (advanced in Chair);
- Side kick up and down (intermediate in the ground);
- Side splits (advanced in Reformer);
- Footwork series (beginner in Reformer);
- Standing and side leg series (beginner, intermediate and advanced in Cadillac);
- Front splits (advanced in Reformer);
- Going up front (advanced in Reformer);
- Leg series on side up and down (intermediate in Cadillac)
- Stretches front (beginner and intermediate in Barrel);

For upper extremities, the following exercises were used:

- Arms pulling up and down (beginner in Cadillac);
- Arms pulling straps (intermediate in Reformer);
- Arm springs variation (advanced in Cadillac);
- Triceps sit (beginner in Chair);
- Seated triceps press (intermediate in Chair).

The version of the article “**Comparison of satisfaction, motivation, flexibility and delayed onset muscle soreness between modern Pilates method and unstable Pilates method**” published in **volume 24, number 4, 2017**, initially available contained an error concerning the author’s name.

Instead of:

Gisela Cristina Miyamoto

Should read:

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