

Improving Postural Thoracic Hyperkyphosis with Pilates

Kyphosis
(excessive backward curve)

The healthy spine has natural curves. When curves become excessive, there can be problems.



Kyphosis

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ABSTRACT

The focus is on postural thoracic hyperkyphosis, related to poor posture, more specifically a fatigue posture. This condition is characterized by an excessively rounded thoracic spine, with the pelvis tilted forward, shoulders rounded forward and a hyperextended neck. As a result, the posture is out of balance and out of ideal alignment.

The aim of the case study is to determine the extent to which the client's poor posture, which is causing the hyperkyphosis, may be improved by using pilates, specifically the BASI Block System.

The paper deals, with reference to figures, with the various muscles which are affected by this condition.

The paper sets out in great detail the two exercise programs which were followed over a period of three months. The purpose of each exercise is explained with reference to the various muscles and parts of the body involved.

The progress made by the client and the outcomes after the study period are discussed. The overall result is positive, indicating improvement in the client's body alignment and increased awareness of her incorrect habitual posture. Of note is that the client is free from neck and lower back pains suffered as a result of the hyperkyphosis before the exercise regime was implemented.

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ANATOMICAL DESCRIPTION

Introduction

The spinal cord is divided into several segments, three of which are relevant for purposes of this paper. They are, from the top to the lower end of the spine, (i) the cervical spine, (ii) the thoracic spine, and (iii) the lumbar spine.

The word “kyphosis”, stems from the Greek term “kyphos”, referring to a hump. “Kyphosis” is used to describe a C-shaped curve in the spine. A “kyphosis” curve has the opening of the “C” facing to the front of the body, when viewed from the side. On the other hand, a “lordotic” curve has the opening of the “C” facing towards the back of the body, i.e. to the opposite direction from the kyphotic curve.

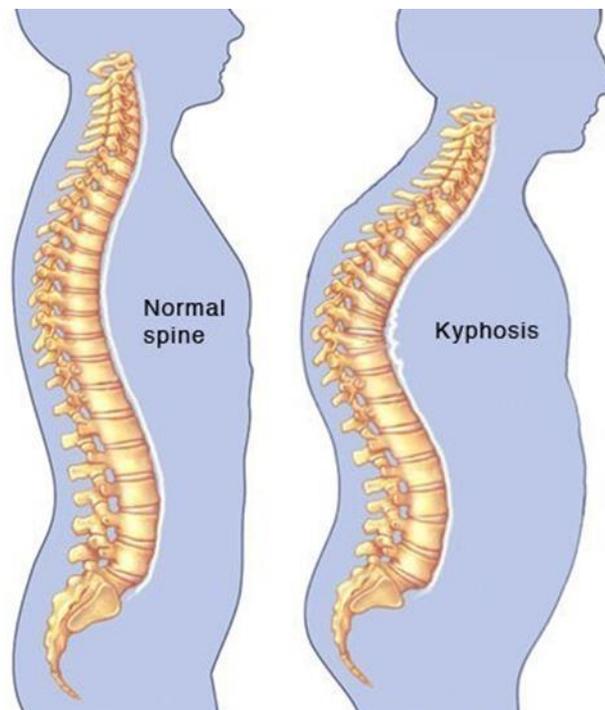
If these C-shaped curves are observed in relation to the above-mentioned three spine segments, one can see that the natural C-curve of the cervical spine and the lumbar spine are lordotic and that the natural C-curve of the thoracic spine is kyphotic.

When these natural curves are kept in balance and alignment, the person maintains the ideal posture known as the “plumb line posture” (see fig. 2 below). However, when a curve becomes too large or too short, the posture will develop imbalance and go out of alignment.

The thoracic spine should have a natural kyphosis between 20 to 45 degrees. Postural or structural abnormalities can result in a curve that is outside this normal range. The medical term for a curve that is greater than normal (more than 50 degrees) is actually “hyperkyphosis,” but the term “kyphosis” is commonly used to refer to the clinical condition of excessive curvature in the thoracic spine that leads to a rounded upper back.¹ In other words, hyperkyphosis is a spinal deformity which is characterized by an excessive outward, or convex, curve the thoracic spine known as “roundback” or, in the case of a severe curve, as “hunchback.” (See fig. 1)

¹ This usage may cause confusion. In order to avoid this, the term “hyperkyphosis” is used in this paper when referring to an abnormal curve, except where figures copied from reference material do not make this distinction. Such figures should be interpreted subject to the distinction pointed in the main text.

Figure 1 (Source: Kyphosis (Roundback of the Spine - OrthoInfo – AAOS)



Postural thoracic hyperkyphosis

There are several types of hyperkyphosis, e.g. Scheuermann's kyphosis, congenital kyphosis and postural hyperkyphosis, the latter being the most common type of kyphosis. It is rarely painful and it is not associated with structural abnormalities of the spine. This means that it can be corrected through a re-education of the muscles, so that the person can achieve an awareness of a correct sitting and standing position.

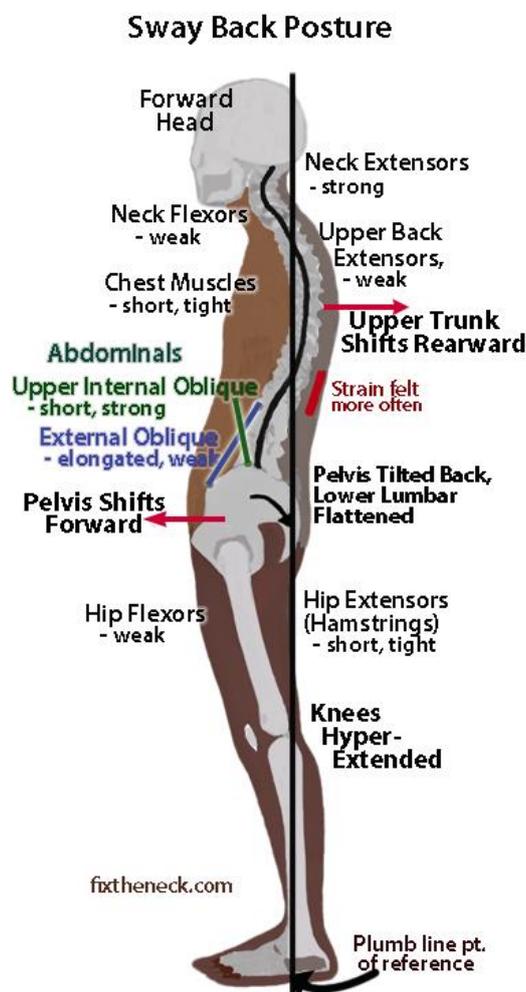
A postural hyperkyphosis can be developed at any age, although it commonly occurs during adolescence when rapid bone growth is taking place. The condition may also be caused by osteoporosis, especially in the case of older women.

Another frequent cause for the development of postural hyperkyphosis, (as occurred in the case study under discussion) is a sedentary lifestyle, especially sitting with

rounded back at the computer or work place for hours over years, thereby becoming used to bad posture that is being pulled down by the forces of gravity.

The focus of this paper is on postural hyperkyphosis of the thoracic spine and, more specifically, related to a “fatigue” posture or a “sway back” posture (see fig. 2). In this case the pelvis is pushed forward, causing hyperkyphosis of the thoracic curve. Another effect caused is the condition of hyperlordosis because the cervical and lumbar curves develop inward (or forward) at the lower back and neck area. Therefore, the head is tilting forward, bringing the person out of balance and sometimes causing lower back pain as the lower back has to work harder.

Figure 2 (Source: posturedirect.com)



Sway back (Lordosis)

The symptoms of postural thoracic hyperkyphosis vary from person to person according to the intensity of the hyperkyphosis, as well as the imbalances in the spinal

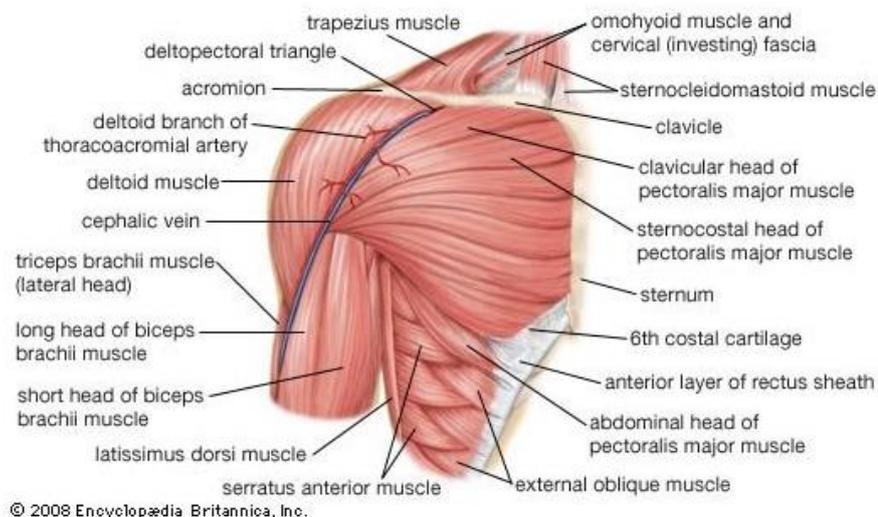
cord, that normally lead to a fatigue posture. The most common symptoms are as follows: (i) rounded shoulders; (ii) a visible hump on the back; (iii) mild back pain, specifically lower back pain; (iv) spine stiffness; and (v) tight hamstrings, all of these leading to a fatigue posture in the person affected.

The muscles involved

Common characteristics of kyphosis usually involve tightness and shortened anterior shoulder muscles and long, weakened muscles in the upper back. This situation translates into a poor range of motion of the muscles. Therefore, the correction would be, in general, to stretch the shoulder flexors, and to strengthen the back and shoulder extensors.

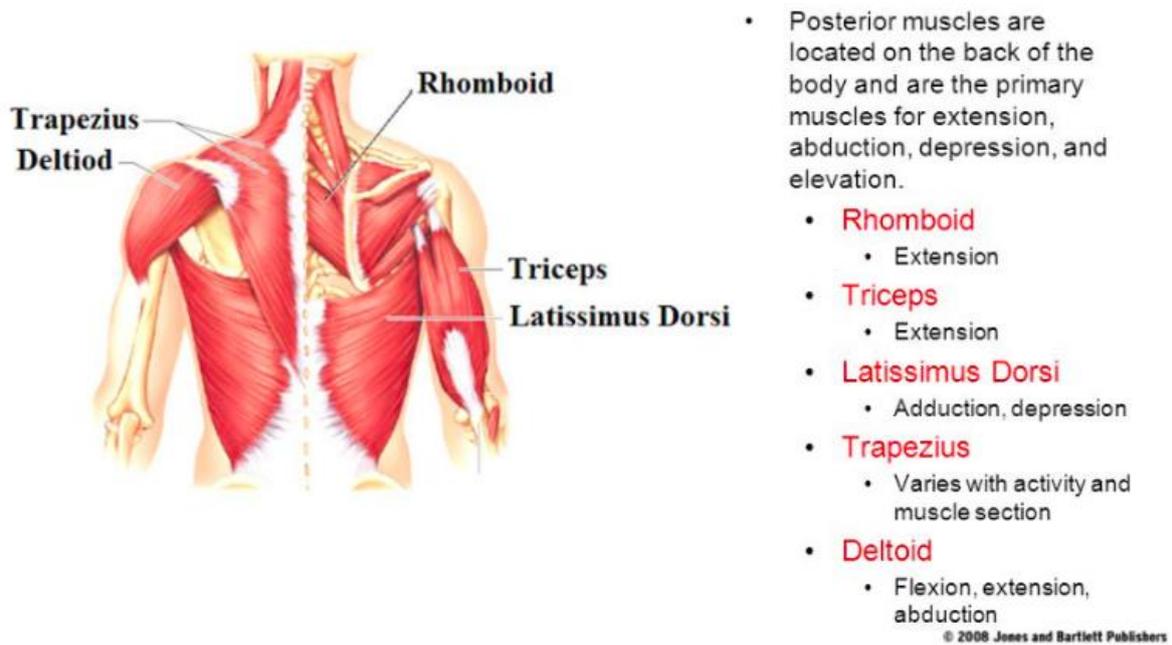
The shoulder flexors are: the *pectoralis minor* and *major*, *anterior deltoid*, *triceps* long head and *coracobrachialis*. The *teres major* and *subscapularis* are generally included as synergist muscles. (See figures 3 and 4).

Figure 3 (Source: <https://tony.gentilcore.com>)



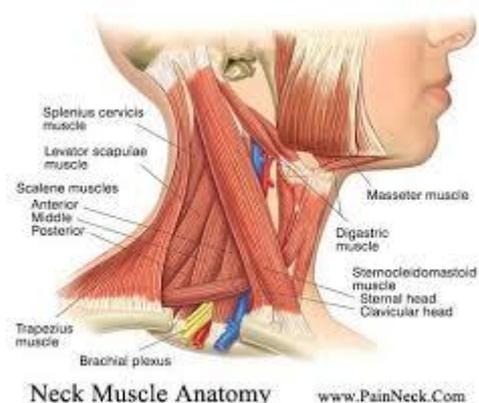
The shoulder extensors are: the *trapezius*, *latissimus dorsi*, *levator scapulae*, *rhomboid minor* and *major*, *teres minor* and *major*, *serratus anterior*, posterior deltoid muscles and the rotator cuff muscles. (See figures 3 and 4)

Figure 4 (Source: www.pilates.fitness.com)



In addition, as an abnormal kyphotic curve affects the alignment of the spine, causing a fatigue posture, it is necessary to correct the tightness of the neck extensors and the weakness of the neck flexors, in order to correct the posture of the head. (See fig.5)

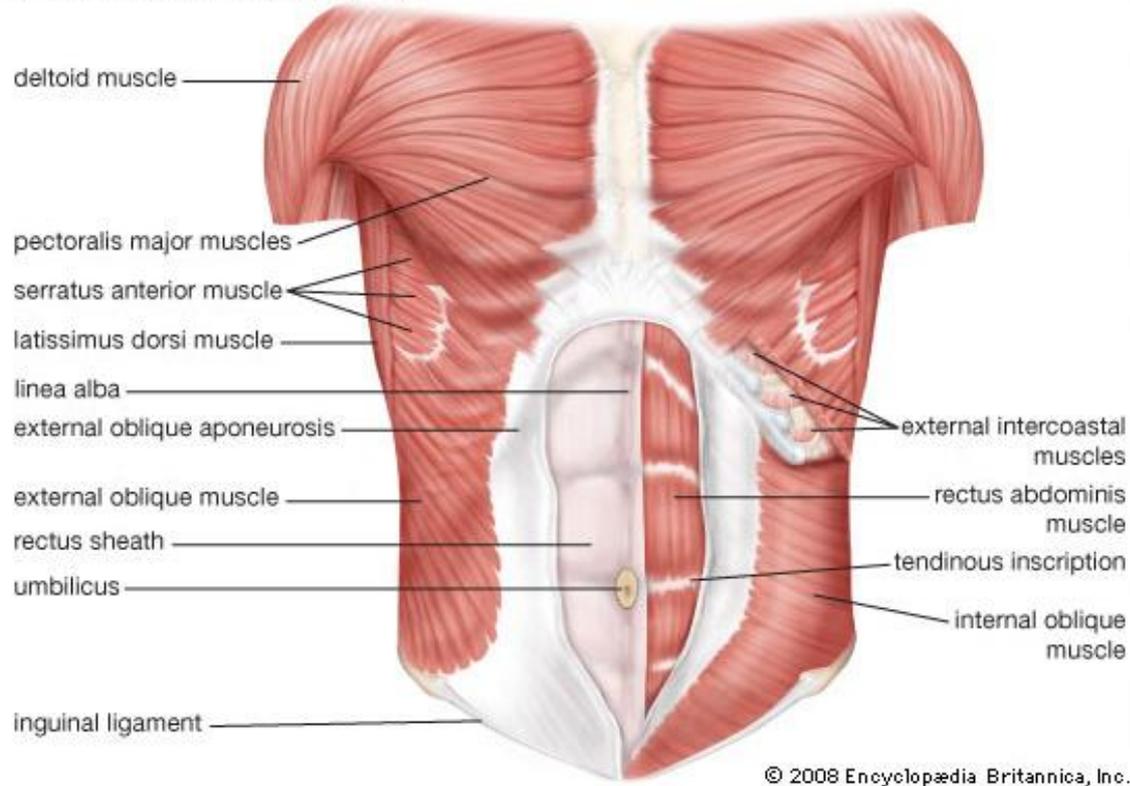
Figure 5 (Source: www.PainNeck.com)



As the abdominals are weakened by the fatigue posture, it is necessary to strengthen them in order to avoid lower back pain. (See fig. 6)

Figure 6 (Source: <https://heatlhack.com>)

Muscles of the abdominal wall



Another characteristic of the fatigue posture, is the tightness of the hamstrings, and the weakness of the hip flexors.

Re-education of the muscles

Physical re-education of the muscles involved by regular performance of comprehensive BASI Pilates Block System exercises, should lead to learning correct body mechanics and improving alignment, while addressing all the muscles or parts of the body mentioned above. By these means the client should be able to improve or diminish the common symptoms of her hyperkyphosis, depending on the cause and severity of the excessive spinal curve.

CASE STUDY

The client

Gisi is 61 years old and has been working while sitting behind her office desk for 35 years. As a typical “victim” of a sedentary life, Gisi developed bad posture by sitting and standing without proper muscle recruitment, causing her lower back pain and neck pain, apart from weakened muscles as set out above.

She started some years ago with BASI pilates mat classes, which helped to mobilize her body, specifically her spinal cord, and to begin to connect to her abdominals in an effort to get rid of the tightness and pain in her lower back.

When I evaluated her alignment in March 2019, her posture corresponded to a fatigue posture, as described above, and I noticed that her breathing was shallow. Awareness of her posture was very poor, and I noticed that the body-mind connection should be addressed, following the 10 principles of BASI pilates.

Goals of case study

The main goals of the case study were -

- The achievement of a neuro-muscular re-education by applying the BASI Block System as an excellent body-mind technique in order to prevent a worsening of the postural imbalance. This requires special attention to addressing her body as a whole, with special focus to her upper body. i.e. the back muscles (*erector spinae*), especially the upper back muscles (*trapezius, rhomboids, latissimus dorsi* and the rotator cuff (*subscapularis, supraspinatus, infraspinatus, teres minor* and *major*), as well as stretching her shoulder flexors, basically the pectoral muscles (*pectoralis minor* and *major*).

- The development and realignment of the neck muscles and the core strength, (*transversus abdominus*, internal and external obliques, *multifidus* and *rectus abdominus*), not forgetting the hip flexors and extensors, in order to increase her stability and flexibility.

The general guiding principle adopted was the favourite approach expressed by Joseph Pilates that “you are as young or old as your spinal cord is flexible” and that “we have to address spinal articulation in order to get the spine flexible, by mobilizing the lumbar and thoracic spine.”

To me it was clear that, following the integration of the ten principles of BASI pilates, there was a high probability of success. The ten principles are: awareness, balance, breath, concentration, centre, control, efficiency, flow, harmony and precision.

By improving the client’s stability, strength and flexibility, the aim was to achieve a healthy alignment and better her habitual posture. By re-educating her muscles, the aim was that her muscle activity becomes more efficient and functional, thereby eliminating the stress in her spine. In other words, efficiency and functional muscular activity and movement mechanics are key points, so that the client obtains an optimal pain free level in her daily live that will lead to mental wellbeing.

The exercise program

The specific pilates exercise program followed is based on the BASI Block System. The program is divided into two parts, namely a first program at fundamental level and a second at an intermediate level. The two programs are set out in detail below.

BASI BLOCK SYSTEM EXERCISE PROGRAM 1 – FUNDAMENTAL

<p><u>WARM UP</u> <u>FUNDAMENTAL – MAT</u></p>	<ul style="list-style-type: none"> • ROLL DOWN • PELVIC CURL • SPINE TWIST SUPINE • CHEST LIFT • CHEST LIFT WITH ROTATION 	<p>To start connecting to abdominals, <i>transversus abdominus</i> and obliques. Spinal articulation by mobilizing and bringing awareness to mobility of spine and stabilization of pelvis.</p>
<p><u>FOOTWORK</u> <u>REFORMER</u></p>	<ul style="list-style-type: none"> • PARALLEL HEELS • PARALLEL TOES • V POSITION TOES • OPEN V HEELS • OPEN V TOES • CALF RAISES • PRANCES 	<p>Reformer helps provide awareness of pelvic stability via connection to carriage, while focusing on hamstrings and quadriceps, and strengthening knee extensors. Sliding in carriage helps to connect to smooth rhythmic breathing, which helps to connect to <i>transversus abdominus</i>.</p>
<p><u>ABDOMINALS</u> <u>REFORMER</u></p>	<ul style="list-style-type: none"> • HUNDRED PREP • COORDINATION 	<p>Helps to focus on pelvic stability, while improving abdominal strength and shoulder extensors control.</p>
<p><u>HIPWORK</u> REFORMER</p>	<ul style="list-style-type: none"> • FROG • CIRCLES DOWN • CIRCLES UP • OPENINGS 	<p>Helps strengthen adductors, while focusing on pelvic stabilization so there is no strain in lower back muscles.</p>
<p><u>SPINAL ARTICULATION</u> <u>REFORMER</u></p>	<ul style="list-style-type: none"> • BOTTOM LIFT • BOTTOM LIFT WITH EXTENSION 	<p>Good exercises to connect to abdominals and hamstrings to develop spinal articulation and strengthen hip extensors.</p>
<p><u>STRETCHES</u> <u>LADDER BARREL</u></p>	<ul style="list-style-type: none"> • SHOULDER STRETCH 1 • SHOULDER STRETCH 2 	<p>Good for tight shoulders due to hyperkyphotic curve; excellent to connect to shoulder extensors, stretching them while maintaining scapula stabilization in shoulder stretch 1. In shoulder stretch 2 shoulder flexors are stretched, while maintaining scapula stabilization; neutral spine and abdominals engaged.</p>
<p><u>FULL BODY</u> <u>INTEGRATION</u> <u>CADILLAC</u></p>	<ul style="list-style-type: none"> • PUSH TROUGH SITTING FORWARD 	<p>Excellent exercise combining focus in abdominal muscles and back extensors. Develops control of back and shoulder extensors. Helps differentiate movement of trunk from that of arms.</p>
<p><u>ARM WORK</u> <u>CADILLAC: ARM</u> <u>STANDING SERIES</u></p>	<ul style="list-style-type: none"> • CHEST EXPANSION • HUG A TREE • CIRCLES UP • CIRCLES DOWN • PUNCHES • BICEPS 	<p>Good for awareness in trunk stabilization, strengthening shoulder and elbow extensors. <i>Latissimus dorsi</i>, triceps, <i>pectoralis major</i> are strengthened to get awareness</p>

		of muscle recruitment, whilst stretching anterior part of chest and shoulders.
<u>LEGWORK</u> <u>WUNDA CHAIR</u>	<ul style="list-style-type: none"> • HAMSTRING CURLS • HIP OPENER 	Focus is on hamstrings, while strengthening knee flexors; awareness of maintaining pelvic lumbar stability. In hip opener focus is on hip external rotators controlling hip extensors and controlling rotators.
<u>LATERAL FLEXION AND ROTATION</u> 1. <u>REFORMER</u> 2. <u>WUNDA CHAIR</u>	<ul style="list-style-type: none"> • MERMAID • SIDE STRETCH 	With these exercises we improve abdominals and obliques' stretch while maintaining core control. Scapular stabilization must be maintained. Client must develop spinal mobility.
<u>BACK EXTENSION</u> 1. <u>REFORMER</u> 2. <u>WUNDA CHAIR</u>	<ul style="list-style-type: none"> • BREASTSTROKE PREP • SWAN BASIC 	Back extensors are strengthened, whilst scapular stabilization and abdominal control is taking place. These objectives are very important to develop in client.

BASI BLOCK SYSTEM EXERCISE PROGRAM 2 - INTERMEDIATE

<u>WARM UP</u> <u>INTERMEDIATE - MAT</u>	<ul style="list-style-type: none"> • STANDING ROLL DOWN • ROLLUP • SPINE TWIST SUPINE • DOUBLE LEG STRETCH • SINGLE LEG STRETCH • CRISS CROSS 	<p>Focusing on neutral pelvis, core engagement and strong connection to breathing patterns while using abdominals. In spine twist supine and criss cross special focus is obliques.</p>
<u>FOOTWORK</u> <u>WUNDA CHAIR</u>	<ul style="list-style-type: none"> • PARALLEL HEELS • PARALLEL TOES • V POSITION TOES • OPEN V HEELS • OPEN V TOES • CLAF RAISES • SINGLE LEG HEELS • SINGLE LEG TOES 	<p>Necessary focus on trunk stability by contracting abdominals and back extensors to correct alignment. Further focus on hip extensors control, and strengthening quadriceps and hamstrings. Client has to put special focus on neck muscles to develop awareness of head position.</p>
<u>ABDOMINALS</u> <u>STEP BARREL</u>	<ul style="list-style-type: none"> • CHEST LIFT • REACH • OVERHEAD STRETCH 	<p>Focus on abdominal strengthening, while encouraging thoracic spine and shoulders to stretch and mobilize. Control of neck flexors and extensors is being developed.</p>
<u>HIP WORK</u> <u>CADILLAC: BASIC LEG SPRINGS SERIES</u>	<ul style="list-style-type: none"> • FROG • CIRCLES DOWN • CIRCLES UP • WALKING • BICYCLE • BICYCLE REVERSE 	<p>Client must achieve pelvic lumbar stability while focusing on hamstrings and hip adductor control. Awareness of hip disassociation is important.</p>
<u>SPINAL ARTICULATION</u> <u>REFORMER</u>	<ul style="list-style-type: none"> • SHORT SPINE • LONG SPINE 	<p>Hamstrings and lower back are being stretched and spinal articulation is taking place, while maintaining awareness of mobility of thoracic spine and lumbar spine flexion.</p>
<u>STRETCHES</u> <u>CADILLAC</u>	<ul style="list-style-type: none"> • SHOULDER STRETCH 	<p>Ideal exercise for focusing purely on shoulder stretch and mobility with deep connection to the breathing pattern. Opportunity to focus on full range of motion in internal and external rotation of shoulders,</p>

		thereby increasing shoulder mobility.
<u>STRETCHES</u> <u>POLE SERIES</u>	<ul style="list-style-type: none"> • SHOULDER STRETCH • OVERHEAD STRETCH • SIDE STRETCH • SPINE TWIST 	Excellent approach to maintain trunk (by co-contraction of abdominals and back extensors) and scapula stability. Focus on mobility of shoulders, especially anterior part; oblique control and stretch. Good for maintaining neutral head position.
<u>FULL BODY INTEGRATION</u> <u>REFORMER</u>	<ul style="list-style-type: none"> • DOWN STRETCH 	Excellent opportunity to focus on abdominals and back extensors, especially <i>latissimus dorsi</i> , while controlling trunk and shoulder extensor stability. Extensors of hips and shoulders are working throughout.
<u>ARM WORK</u> <u>AVALON :</u> <u>ARM SITTING SERIES</u>	<ul style="list-style-type: none"> • CHEST EXPANSION • BICEPS • RHOMBOIDS • HUG A TREE • CIRCLES UP • CIRCLES DOWN • SALUTE 	To relearn good shoulder mechanics supported by Avalon for trunk stabilization during the arm work series (except first 3 exercises listed). Focus on muscles such as <i>latissimus dorsi</i> , pectorals, rhomboids, deltoids, triceps and biceps. All these muscles are important to develop better posture.
<u>LEG WORK</u> <u>CADILLAC</u>	<ul style="list-style-type: none"> • SQUATS 	Client is challenged to strengthen quadriceps and biceps, while maintaining good knee stabilization, keeping arms stable and co-contracting abdominals and back extensors to keep trunk upright when moving up and down imaginary wall.
<u>LATERAL FLEXION AND</u> <u>ROTATION</u> <u>WUNDA CHAIR</u>	<ul style="list-style-type: none"> • SIDE STRETCH • SIDE STRETCH KNEELING 	Focus on abdominal control and obliques while maintaining pelvic and scapula stability. Opportunity to improve awareness of correct head position and balancing neck flexors and extensors by instructing client to move as if between two glass panes.

<p><u>BACK EXTENSION REFORMER</u></p>	<ul style="list-style-type: none"> • BREASTSTROKE PREP • BREASTSTROKE • PULLING STRAPS 1 	<p>All 3 exercises aim to strengthen back extensors. Breaststrokes demand abdominal control, scapula stabilization, and back extensors engagement throughout to increase awareness of upper back muscles recruitment. Elbow extensors must be in control. Pulling Straps 1 strengthens back and shoulder extensors and keeps neck muscles in control.</p>
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Progress and outcomes

My client started her exercise program with very poor awareness of her posture in general. She felt unhappy with herself and her physical appearance, especially with the hyperkyphotic curve. She realized after the first few sessions, that it would be a gradual process to follow with discipline and patience, in order to achieve a new neuromuscular connection. Basically, almost all principles of BASI pilates were not developed in her, and it took time to establish a connection between mind and body.

She tried her best to concentrate on her general muscular recruitment and slowly, but surely, developed greater awareness of her body with the repetition of the exercise program.

Her breathing patterns that were so short and shallow, improved, and now she can connect to the proper pilates breathing rhythm while performing her exercises. During the weeks I noticed that she slowly also gained more control in her movements, and developed more precision in her performance.

I used several techniques to assist Gisi to understand and properly follow my instructions and to maintain her interest and motivation in the program. By my cueing constantly, using a lot of imagery, applying humor and challenging her, as well as giving her some homework to apply in her daily life, she was helped considerably to put in effort to perform with precision during classes. The performance of some exercises that I knew were a big challenge for her and which she did not like, also became much better. With time, the repetitions in the exercises, started to go smoothly and she managed to stop using momentum.

She reported that she has developed an awareness in her sitting and head posture in her daily life, especially at work.

The frustration caused by her kyphotic curve, her incapacity of mobility and stiffness of the upper back improved much after the three months we have been working together.

In general, her core stability as well as trunk stability developed very well. Especially the connection to her upper back extensors is there and the muscles around her

shoulders are strengthened. The range of motion and rebalancing improved week by week. Her upper back became more flexible as the chest muscles have been stretched.

At first, her head was “hanging out” in most of the exercises. Now she corrects herself most of the times and reports that her neck pain disappeared. I have noticed a better balance between neck flexors and extensors.

We went through the complete program of BASI Block System but our main focus was to strengthen her back extensors, abdominals, neck flexors and hip flexors.

She gained remarkable flexibility in her tight muscles, specially her hamstrings and lower back muscles. She also managed to develop stronger hip and lower back muscles that relieves the pain she suffered as a result of the pressure on the spine.

CONCLUSION

The success of this experience and the path I followed with Gisi, over three months, is a proof for me, that pilates is the “ passport “ for a healthy, well balanced life. Working with the body as a “whole” by applying the 10 BASI pilates principles is the proof of success in the mind-body connection, and now Gisi is more conscious in her posture in her everyday life, without having pain.

I am confident that the progress we achieved in general in beginning to correct her hyperkyphotic is remarkable and I am very happy to recognize that this hard work has being worthwhile and has enriched my life in all senses. I love being able to help people to feel better and healthier in their daily lives!

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