Biomechanics of Assisted Stretching

By

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DISCLAIMER

Biomechanics of Assisted Stretching (BAS) is not intended as a substitution for a primary personal trainer or group exercise instructor certification. The BAS educational programs are intended for implementation and/or use by students that are familiar with basic anatomy, physiology, and biomechanics. The program is designed to increase the student's knowledge of stretching biomechanics and available service tools. Neither Dr. Ashmore nor the BAS program assumes responsibility and/or liability for the actions of trainers that are certified and/or educated through the BAS program. Dr. Ashmore reserves the right to change any terms or provisions at any time.

Contents

Preface

“THEORY INTO PRACTICE”

Biomechanics of Assisted Stretching (BAS) is based on the physics of force. Specifically, how to apply a force during assisted stretching. The idea for the BAS program came from both academics and practice. In the mid 1990’s, I did a doctoral dissertation on force. I understood the concept of force and how it applied to physics and general biomechanics, but it wasn’t until I began my career as a personal trainer that I saw how force applied to assisted stretching.

When I see any trainer, including myself, stretching a client I see the forces that the trainer places on the client. Specifically, I see the torque. Torque is the rotary effect of force. It is dangerous, because it acts similar to ‘grinding’ on the joint. I was concerned about torque on the client during assisted stretching and determined to develop a way to reduce it. Additionally, I wanted to develop a method of assisted stretching that would assist to alleviate chronic lower back pain. My intention was to develop a method of assisted stretching that was safe and effective for all clients, regardless of age, fitness level, or health. The protocol was developed (and used in sessions first) followed by development of the educational program.

The foundation of the BAS program is the Law of Action-Reaction, which states that “*for every action there is an equal and opposite reaction*.” The BAS program is based on the fact that the trainer’s actions cause the client’s reaction.

The client's reaction is his stretching form. To define the actions of the trainer, force is used.

In science, the action of a force is defined by:

1. Point of Application (where)
2. Direction (what direction)
3. Magnitude (how much)

Therefore, the force that the trainer applies to the client during assisted stretching is defined by:

1. **Where**
2. **What direction**
3. **How much**

The BAS program is based on biomechanics research and practice. The program takes force application and breaks in into three easy to apply principles. Any trainer can use the BAS program during any assisted stretching work, and it is safe for all clientele.

The BAS program is not exclusive of PNF (proprioceptive neuromuscular facilitated) stretching, active-isolated stretching, or myofacial release. In fact, BAS complements any type of assisted stretching – even massage therapy and body work.

The BAS program manual is organized into three sections. Part I introduces the basic concepts essential to understanding and applying the BAS program during assisted stretching. Part II shows the stretching mechanics for common stretches for all major muscle groups. Careful consideration was used to show common stretches. Where incorrect stretches are shown, only the most common examples of incorrect mechanics are demonstrated. Each of the force application principles is demonstrated using photos with graphical illustration and text explanations. Stretches are organized into two chapters that are the lower body and the upper body. Part II ends with a section on assisted stretching form errors, how to identify them, and how to correct them. Part III shows the relationship between the BAS Program and back health and includes BAS Backs, a protocol designed specifically to alleviate lower back pain.

Readers will be able to apply the BAS Program quickly and easily. When applied, the BAS program makes stretching safer and more effective for clients immediately. The BAS program is intended to provide trainers with new and innovative methods of training that will increase service base, tools, and revenue. The BAS program will show you how to decrease the risks of assisted stretching to the client and yourself.

It is the intention of the author to enhance the assisted stretching experience for both the client and the trainer. Thank you for your interest in the BAS program and the sincerest wishes for a successful, rewarding career.

Dr. Amy Ashmore, Program Developer

BAS Program Objectives:

1. To educate and promote progressive thought and approach within the health and fitness industry about assisted stretching program design.
2. Provide health and fitness professionals with additional service options to increase client satisfaction, retention, and referrals, resulting in increased revenue.
3. Provide health and fitness professionals with knowledge and techniques to decrease litigation, liability, and loss.
4. Teach health and fitness professionals how the Law of Action – Reaction relates to assisted stretching and how to apply it to assisted stretching.
5. Teach health and fitness professionals how to make stretching clients easier for themselves using the three principles of force application that are where, what direction, and how much.
6. Teach health and fitness professionals how to increase the safety and effectiveness of assisted stretching for clients using the three principles of force application that are where, what direction, and how much.
7. Teach health and fitness professionals how to apply each of the three principles of force application to common assisted stretches.
8. Teach health and fitness professionals how to identify form errors that occur when any of the three principles of force application have been violated during assisted stretching.

9. Teach health and fitness professionals how to correct common form mistakes that occur during assisted stretching using the three principles of force application.
10. Teach health and fitness professionals how to alleviate chronic low back pain and peripheral neuropathies using the BAS Back Protocol.

Part I Foundations for the BAS Program

Introduction:

Biomechanics of Assisted Stretching integrates over 350 years of classical physics with contemporary biomechanics research to develop assisted stretching programs. The program was developed to teach trainers how to apply physics and biomechanics to assisted stretching program design. It is a new way to think about assisted stretching mechanics. It is intended to educate, promote progressive thought and approach within the industry, and provide new service techniques.

Biomechanics of Assisted Stretching is based on Newton's 3rd Law of Motion – the **Law of Action-Reaction**, which states that "*for every action there is an equal and opposite reaction*." The program is based on the fact that the trainer's actions cause the client's reaction. The client's reaction is his stretching

form. The force the trainer applies to the client defines his actions. Force is defined by the three principles of force application that are **where (point of application)**, **what direction**, and **how much (magnitude)**.

The force application principles are:

1. **Where** the trainer's hands should be placed on the client's body during assisted stretching. The emphasis is to place the hands on soft tissues – not joints.
2. **What direction** the trainer should apply the force during assisted stretching. The focus of this section is to minimize torque on the client. What direction to apply a force is illustrated using vectors.
3. **How much** force the trainer should apply to the client during assisted stretching. The emphasis of this section is how much force to apply based on each individual client.

There are six rules that were used to develop the BAS program. These rules can be thought of as guidelines for both learning and for use during assisted stretching. The **six rules are:**

Rule #1: The goal of stretching is to lengthen muscles.

Rule #2: The client's spine and joint position determine stretching.

Rule #3: The trainer's application of force determines the client's spine and joint position.

Rule #4: Place hands on soft tissues during stretching - NOT joints.

Rule #5: DO NOT push down on the client during stretching.

Rule #6: Treat each client as an individual.

These rules are essential to the development and application of the BAS program. They will appear throughout the program. Keep them in mind, and remember that the BAS program requires a new way of thinking about assisted stretching.

Chapter 1 FORCE

Chapter 1 is an introduction to the concepts and terms that are essential to understanding the BAS program. Each concept is defined and its relevancy to the BAS program is explained. How each of these concepts work during assisted stretching is shown in chapters 4 and 5.

After you finish chapter 1, you will be able to:

1. Define the Law of Action – Reaction and understand how it applies to assisted stretching.
2. Identify how basic physics and biomechanics apply to assisted stretching.
3. Identify Giovanni Borelli and define his contribution to assisted stretching.
4. Define force and how it applies to assisted stretching.
5. Define Hooke's Law and how it relates to stretching.
6. Define torque and how it applies to assisted stretching.

Rule #1: The goal of stretching is to lengthen muscles.

Trainer Assisted Stretching

There are two types of stretching. These are self-stretching and trainer assisted stretching. Trainer assisted stretching differs from self-stretching in that the trainer uses his body to move the client's body. Assisted stretching can produce more stretch than self-stretching, because the trainer can cause more stretch than a person can pulling or pushing his own body alone. Assisted stretching is more effective due to the angle of approach of the trainer and the use of body weight by the trainer to apply a force. However, to minimize the risks to the client during assisted stretching the trainer must be responsible for how he uses his body weight. The trainer must calculate every move he makes. To account for the trainer's actions, applied force is used. We will look at applied force in detail later in the chapter, but first, the relationship between the client and trainer during assisted stretching is explained.

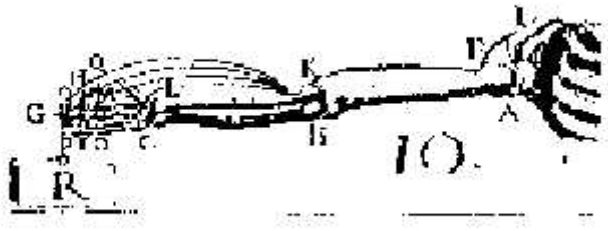
Law of Action-Reaction

The most important concept to understanding the Biomechanics of Assisted Stretching is Newton's 3rd Law of Motion. The **Law of Action-Reaction** states that "*for every action there is an equal and opposite reaction*." During assisted stretching, the trainer produces an action that causes the client to have a reaction. The trainer's actions are defined in terms of how he applies force to the client during stretching. The client's reaction is defined by his stretching form.

Specifically, the client's joint and spine position show his reaction to the trainer's actions during assisted stretching.

When two bodies interact, as in assisted stretching, the resulting interaction is referred to as a **force**. Force is the foundation of the BAS program. Unfortunately, modern usage of the word force has taken force away from its scientific origins. In our modern world, force is a word that is used negatively – for example, forceful or forced entry. For our purposes, we will refer to force in its scientific purity only – as the concept that represents two bodies interacting.

In 1680, Giovanni Borelli first considered how the Law of Action-Reaction applies to biological systems. Borelli acknowledged that forces act on the body and that the body reacts to those forces. The illustrations of his ideas are considered to be the origins of the field of biomechanics (see below).



Borelli's De Motu Animalium, 1680

"The need to balance forces that act on the body."

Force

The concept of force was introduced earlier and we know that it is the result of two bodies interacting. More specific, force is defined as the mechanical interaction between an object and its surroundings. During assisted stretching, the trainer interacts with the client and vice-versa.

The scientific description of FORCE is:

FORCE = MASS x ACCELERATION

For our purposes,

Mass = weight

Acceleration = speed

A force is required to stop, start, or change a movement. In other words, a force pushes or pulls an object into motion, changes that motion, or stops motion. With assisted stretching, the trainer applies a push (and, in some instances a pull) force to the client to change the joint position, lengthen the muscles, and produce stretching. During assisted stretching, the trainer produces a force that is the product of his weight and the speed at which he moves. The key is for the trainer to remember that during assisted stretching he produces a force that causes the client to react.

In science, a force is described by:

1. Point of Application
2. Direction
3. Magnitude

During assisted stretching the action of a force (of the trainer) is defined by:

1. Where (Point of Application)
2. What Direction
3. How Much (Magnitude)

Where, what direction, and how much are the three principles of force application and the core of the BAS program. Chapter 2 covers each of the three principles of force application during assisted stretching in detail and Part II shows the three principles for common assisted stretches.

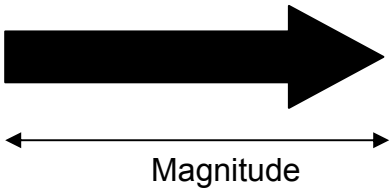
Hooke's Law

Hooke's Law states that "*the extent of stretching of any substance is directly proportional to the applied force*." Hooke's Law tells us that stretching is best approached from a physics perspective and that the key to defining the trainer's actions during stretching is **force**.

Torque

When force is applied torque is produced. Torque is a normal product of movement. It is the rotary effect of a force. When movement occurs (as with assisted stretching), the bone rotates about the joint. The rotation of the bone around the joint produces a torque onto the joint. Torque is dangerous, because it is similar to 'grinding' on the joint. Think about a nail being screwed into a board, and that is how torque acts on joints. If force = mass x acceleration, and torque is the rotary effect of force, then any additional weight or pushing from the trainer will contribute to joint degeneration. Joints deteriorate naturally over time from "wear and tear" and age. Assisted stretching should not contribute to joint deterioration. Trainers should make every effort to protect the client's joints during assisted stretching. When the trainer thinks of the safety of assisted stretching for the client, he should think in terms of torque and how to minimize torque on joints. We will look at how the trainer can reduce torque on the client during assisted stretching in chapter 2.

Force Vectors



A force vector shows us 1. **Direction** and 2. **Magnitude** of a force. It is represented by an arrow (in bold) as shown above.

A vector is used to show a force in action. It shows us the direction and

magnitude of a force. In other words, a vector tells us 1. In what direction a force is applied, and 2. How much force is applied. We will use vectors throughout the BAS program to illustrate in what direction the trainer should apply a force to the client during assisted stretching.

Chapter 2 The Three Principles of Force Application

After you finish Chapter 2, you will be able to:

1. Identify the three principles of force application during assisted stretching.
2. Identify where the trainer's hands should be placed on the client during assisted stretching.
3. Identify in what direction the trainer should apply a force during assisted stretching.
4. Identify how to determine how much force the trainer should apply during assisted stretching.

Rule #2: The client's spine and joint position determine stretching.

Rule #3: The trainer's application of force determines the client's spine and joint position.

Rule #2 states that the client's spine and joint position determine stretching. Rule #3 states that the trainer's application of force determines the client's spine and joint position. Therefore, how the trainer applies force to the client during assisted stretching determines the client's spine and joint position. In other words, the trainer determines the effectiveness and safety of stretching for the client. The next section covers in detail how the trainer defines his actions during assisted stretching.

The Three Principles of Force Application

Earlier, we saw that force is defined by

1. Point of application
2. Direction
3. Magnitude

The force that the trainer applies to the client during assisted stretching is defined by:

1. Where
2. What Direction
3. How Much

Where, what direction, and how much are the **three principles of force application.** In the following section, each principle is explained separately. In chapters 4 and 5, how the principles work during assisted stretching is shown using common stretches.

Where

Rule #4: Place hands on soft tissues during stretching - NOT joints.

Where refers to the trainer's hand placement on the client's body. When a trainer prepares to stretch a client, the first thought he should have is where to place his hands on the client. The trainer should not place his hands on the client's joints. A direct force on the joints is an unnecessary and dangerous force that can produce a torque onto the joint. The safe way to apply force to the client during stretching is for the trainer to place his hands one to 1.5 inches below or above the client's joint. When a trainer places his hands on the soft tissues that support a joint they absorb the stress of the force.

Where the trainer places his hands on the client will influence the client's form. When direct force is applied to the client's joint, the natural tendency is to bend it. A bent joint can render a stretch ineffective.

What Direction

Rule #5: Do NOT push down on the client during stretching.

Once the trainer has his hands placed on the client in preparation for stretching, he should think about in **what direction** he should apply the force to produce stretching. When stretching the client, the trainer should not push downwards on the client. This strategy minimizes the forces that act straight down on the joints and reduces torque on the joints. When doing stretches that have the client lying on his or her back, the trainer should apply the force parallel to the client's body.

The trainer should think about applying a force to the client that is in the general direction of "up and/or away" from the client. This strategy of force application minimizes the likelihood that the trainer is in a "bent over" position and likely to push down on the client. Any time that the trainer pushes downward on the client it increases the torque on the joints and the risk of poor stretching mechanics. Pushing down on the client during stretching increases the risk of poor stretching mechanics, because the client will assume a defensive posture. The client's natural reaction to the trainer pushing down on him is to bend his joints or collapse into a flexed posture, rendering the stretch ineffective.

What direction to apply a force during assisted stretching is stretch specific. It is addressed in detail for each stretch in chapters 4 and 5.

How Much

Rule #6: Treat each client as an individual.

The third force application principle of the BAS program requires the trainer to think about **how much** force to apply to the client during assisted stretching. How much force to apply during assisted stretching varies by client and stretch. The client's genetics and experience determine his flexibility. Before the trainer stretches the client, he should know the following about the client:

1. Age
2. Fitness level
3. Prior experience with flexibility programs like Yoga, general stretching, etc.
4. Any existing and past medical conditions that influence flexibility (these include, but are not limited to pregnancy, joint disease, injuries, etc.)

This is the same information obtained with the Health History Questionnaire or the Medical History. This information is valuable and a place to start, but most trainers find that the best source of information on stretching limits and delimitations are learned during assisted stretching.

Communication before and during stretching is essential. The trainer should familiarize the client with essential terms and concepts prior to assisted stretching. These are:

1. Difference between "muscle tension" and "pain"

2. “Tension” in the muscle is necessary for stretching, but “pain” is not
3. Difference between the “muscle” and “joint”
4. Tension in the muscle is expected during stretching, but joint discomfort is not

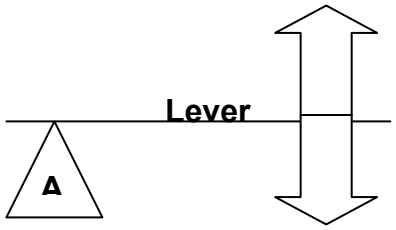
It is the trainer’s responsibility to make certain that the client is comfortable with the terms and concepts prior to assisted stretching. The client should know that he will be asked to answer questions during assisted stretching and that his answers will be used to maximize the safety and effectiveness of stretching for him.

Chapter 3 Gaining Leverage

After you finish Chapter 3, you will be able to:

1. Define lever systems and understand how they apply to assisted stretching.
2. Identify why lever systems make assisted stretching more effective for clients.
3. Identify how the proper use of lever systems can make assisted stretching easier for trainers.
4. Define the difference between active and passive stretching.
5. Identify how the BAS program complements PNF stretching.

Levers



A = Axis Of Rotation = Fulcrum = Joint

All movements of the human body can be described with lever systems. A lever is defined as a rigid bar that turns about an axis of rotation that is termed the fulcrum (see above). In the case of assisted stretching, the lever is the bone and the fulcrum is the joint. During assisted stretching, the lever (bone) rotates about the fulcrum (joint) as the direct result of the force applied by the trainer.

The correct use of lever systems can make assisted stretching safer and more effective for the client. Lever systems are important when the trainer thinks about hand placement on the client. The trainer should determine which joints are involved in the stretch and then place his hands as far as possible from that joint without contact with another joint. This strategy maximizes the use of leverage during assisted stretching and is explained in the following paragraph.

Lever systems are one of the reasons that assisted stretching is a better stretch than self-stretching. When a trainer thinks of levers and how to stretch a client for maximum result, he should think in terms of moving the lever up and out from its axis of rotation. This technique increases the length of a muscle from its insertion point.

By using proper hand placement and application of force, the trainer can lengthen the client's muscles from the axis of rotation and achieve more stretch for the client than the client can get alone. We will see in chapter 7 that levers are particularly relevant to alleviating peripheral neuropathy and chronic lower back pain.

Lever systems can also make stretching easier for the trainer. Careful hand placement on the client increases the leverage a trainer can get during assisted stretching. The greater the distance from the axis of rotation the hands are placed during assisted stretching, the easier it is to rotate the bone about the joint. It is less difficult for the trainer to move the client's leg, arm, or torso the farther away from the fulcrum (axis of rotation) he applies the force. To vision how leverage works, think of a long, heavy timber log. It would be impossible to lift the entire length of the log, but it becomes possible to move the timber log if you place your hands at the end of the log and rotate it with the other end still on the ground. This is a critical concept for smaller trainers or for use when working with overweight or bulky clients. The key here is to remember that by using leverage intelligently, the trainer can gain control over the client's body and produce the desired stretching.

Active versus Passive Stretching

Trainer assisted stretching can be active for the client as with PNF (proprioceptive neuromuscular facilitated) and active-isolated stretching

techniques, or it can be passive. Passive stretching techniques are used in situations where a client has limited capacity to move himself, or can be used in settings where passive relaxation is the goal. The BAS program is applicable to all stretching methods, because the program is based on the biomechanics of stretching. BAS complements all assisted stretching techniques by providing guidelines for force application for the start, stretching, and end positions during assisted stretching.

PNF Stretching and the BAS Program

PNF is the most widely recognized stretching methodology in the world and for good reason. It is based on solid scientific foundations and research, and it works. There are three steps that define PNF stretching. The steps are:

1. Stretch the muscle
2. Contract the muscle isometrically against resistance
3. Stretch the muscle again

The BAS program complements the PNF technique by providing guidelines for preparing the client and trainer for assisted stretching and for force application during the stretching phases of the PNF technique.

Part II Stretching Mechanics

How to Use Part II

Chapters 4 and 5 show the principles of force application for common stretches. The chapters are organized into lower extremity and upper extremity. For select stretches, one or two *incorrect* stretching positions are shown. Not all stretches include the demonstration of an incorrect stretching position. Only the most commonly seen incorrect stretches are shown. Additionally, at the author's discretion, incorrect stretching positions are not shown where the incorrect mechanics would compromise the "client".

In biomechanics, movements are defined by the start, middle, and end positions. The start position is also the end position. For assisted stretching, the middle position is the stretching position. For all stretches, the correct start,

stretch, and end positions are shown. What direction to apply a force during assisted stretching is illustrated per stretch using force vectors.

For each stretch shown, text explanation accompanies the photos. For the incorrect stretches shown, text is broken down into three sections that correspond to the three principles of force application that are where, what direction, and how much. Each section to describe how each of the three principles of force application is violated per incorrect stretch shown.

For correct stretches, the text is broken into four sections that are Start Position, Stretch Position, End Position, and Comments. The Start Position section describes the mechanics of the start position for the client and trainer. The text states where the trainer should place his hands on the client. The what direction text states how the trainer should position his body relevant to the client's in preparation of force application during stretching. The Stretch Position section shows the trainer how to use each principle of force application during stretching and the desired client stretching form. Each of the three principles of force application during stretching is discussed separately. Because, each client differs in flexibility, how much force the trainer should apply is addressed in regard to the individual client. The End Position section states that the trainer should always return the client to the start position. A Comments section details additional information per stretch.

The final chapter of Part II, chapter 6, covers common form errors that occur during assisted stretching. The reader will learn what the common form errors are, how to identify them, and how to correct them.

Chapter 4 Illustrated Stretches - Lower Body

After you finish chapter 4, you will be able to:

1. Apply the three principles of force application to common low body stretches.
2. Immediately improve assisted stretching techniques for common low body stretches.

Incorrect Supine Hamstring Stretch

Why this stretch is incorrect:

Where: Incorrect hand placement. The trainer's hands are on the back of the client's knee.

What Direction: The trainer pushes down on the client.

How Much: Too much force is applied.

The force is applied to the client's knee and hip. As a result, the client lifts his hip off the mat and bends his knee, making the stretch both ineffective and unsafe.

Correct Supine Hamstring Stretch

Start Position

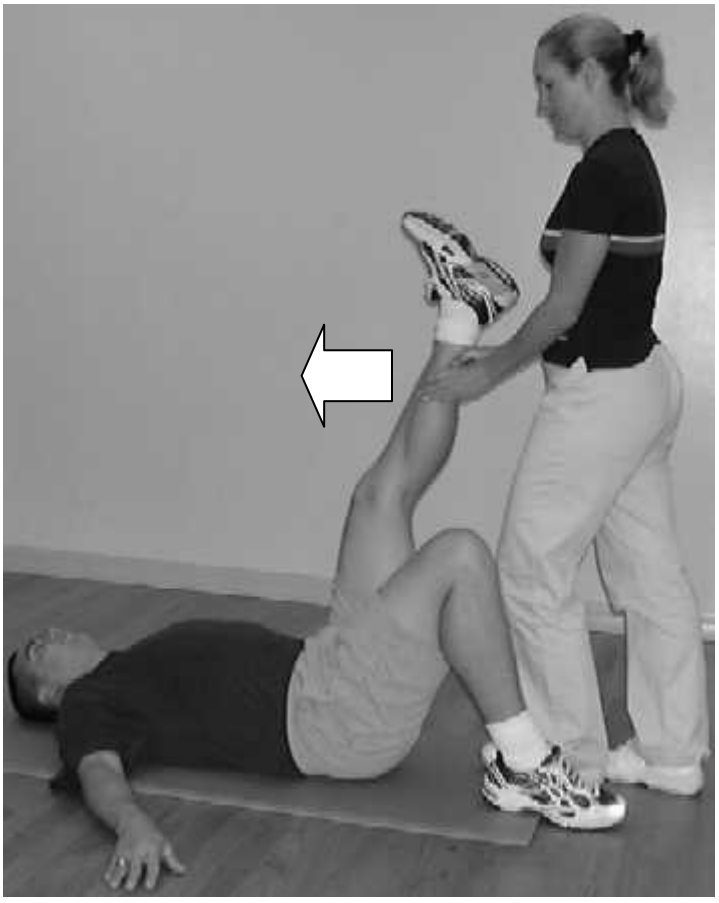
The client is supine with his arm at his side. His spine is neutral – the head, neck, and spine are in alignment. The non-stretching leg is bent and the stretching leg is extended.

Where: The trainer's hands are one to 1.5 inches below the client's ankle.

What Direction: The trainer prepares to stand up and step into the client.

Correct Supine Hamstring Stretch

Stretch Position



The trainer stands up and steps into the client. The trainer lifts the client's leg to a comfortable stretching position for the client.

Where: The trainer's hands are one to 1.5 inches below the client's ankle.

What Direction: The force is applied parallel to the client's body and the floor.

How Much: The trainer applies enough force to cause stretching, but no form errors occur.

End Position

The trainer should return the client's leg to the floor slowly.

Comments

During stretching, the client's knee is "soft", but not bent. The client's back and hips stay in contact with the floor at all times.

Incorrect Piriformis (Deep Hip Rotators) Stretch

Why this stretch is incorrect:

Where: Incorrect hand placement. The trainer's hands are on the outside of the client's knee.

What Direction: The trainer leans into the client and applies force. The trainer pushes down on the client.

How Much: Too much force is applied.

As a result, the force acts on the client's knee and hip. In this position, the client may report knee pain due to either rotation from the knee or pressure on the knee from the trainer.

Correct Piriformis (Deep Hip Rotators) Stretch

Start Position

The client is supine with her arms at her side. The non-stretching leg is extended. The trainer supports the client's stretching leg.

Where: The trainer's hand is one to 1.5 inches below the client's knee on the **inside**. The trainer's hand is on the inside of the client's leg to assure that she ROTATES from the hip. The other hand is one to 1.5 inches above the client's ankle (unable to see).

What Direction: In preparation for the stretch, make certain that the client rotates the leg from the hip, NOT the knee.

Correct Piriformis (Deep Hip Rotators) Stretch

Stretch Position

NOTE: The trainer changes her hand placement. After several sessions, the hand placement on the inside of the leg at the start position will not be necessary. Rotation from the hip should become automatic for the client.

Where: The trainer's hand is one to 1.5 inches below the client's knee on the outside (fingers wrap around leg to pull the leg towards the trainer). The trainer's other hand is above the ankle (unable to see).

What Direction: The trainer applies a dual force parallel to the client's body and the floor to ROTATE from the hip. The trainer does not push down on the client.

How Much: Appropriate amount of force is applied.

End Position

The trainer should return the client's leg to the floor slowly.

Comments

It is essential to rotate the leg from the hip. Do not allow the client to rotate from the knee. If the client reports knee pain, check for rotation from the knee.

Correct Erector Spinae (with Lateral Hip Rotator) Stretch

Start Position

The client is supine with her arms at her side. The non-stretching leg is extended. The stretching leg is bent with the foot at the knee.

NOTE: For added stretch, the client may extend the arms from the shoulder – perpendicular to the body. If the arms are extended and additional stabilization is needed to stop the client from "rolling over" during stretching, a free weight may be placed under the hand or the client may hold onto a bench, table leg, etc.

Where: The trainer's hand is one to 1.5 inches above the client's knee on the hip abductor. The trainer's other hand is on the outside of the client's lower rib cage to stop the client from rolling over during stretching. It is essential to stabilize the torso on the mat during the stretch.

What Direction: The trainer prepares to rotate the client around her spinal cord.

Correct Erector Spinae (with Lateral Hip Rotator) Stretch

Stretch Position

Where: The trainer's hand is one to 1.5 inches above the client's knee on the hip abductor. The other hand is one the lower rib cage.

What Direction: The trainer does not push down on the client. She applies a force that is away from the client's hips.

How Much: Appropriate amount of force is applied to rotate the client around the spinal cord without the shoulders coming off of the mat.

End Position

The trainer should roll the client gently back to a supine position and return the client's leg to the floor slowly.

Comments

Some clients will report discomfort at the hip adductor (inner thigh; femoral nerve) during this stretch. To reduce discomfort, move the stretching leg foot downward towards the other foot or extend the knee slightly. Also, make certain that the client does not "roll" with trainer – keep the shoulders on the mat.

Incorrect Side Quadriceps Stretch

Why this stretch is incorrect: The client's spine is not neutral – his head is elevated and his head, neck, and spine are not in alignment.

Where: Incorrect hand placement. The trainer's hands are on the client's knee.

What Direction: The trainer pushes down on the client and leans into him.

How Much: Too much force is applied.

As a result, the force is applied to the client's lower back and hips.

Incorrect Prone Quadriceps Stretch

Why this stretch is incorrect: The client is not lying flat in the prone position – the spine, neck, and head are not in alignment. Additionally, the knee is not in alignment with the hip.

Where: Incorrect hand placement. The trainer's hands are on the client's ankle.

What Direction: The trainer pushes down on the client.

How Much: Too much force is applied.

As a result, the force acts on the client's knee and lower back.

Correct Prone Quadriceps Stretch

Start Position

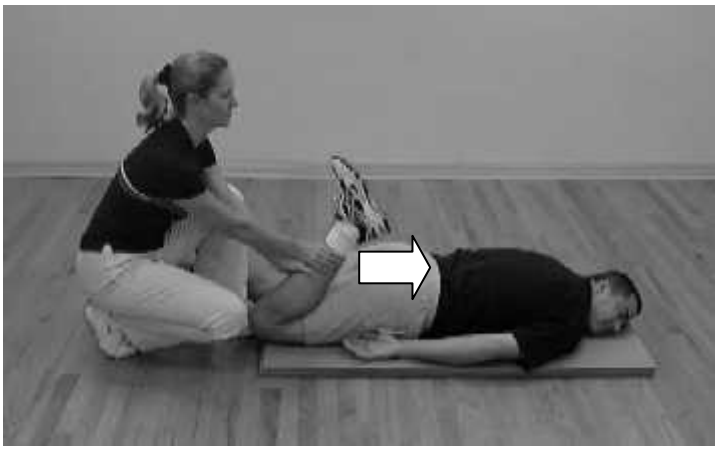
The client is prone and the spine is neutral – head, neck, and spine are in alignment. The client's arms are flat at his side and his knee is in alignment with his hip.

Where: The trainer's hands are one to 1.5 inches from the client's ankle.

What Direction: The trainer prepares to step into the client – prepares to apply a force that is parallel to the client's body.

Correct Prone Quadriceps Stretch

Stretch Position



Where: The trainer's hands are one to 1.5 inches from the client's ankle.

What Direction: The trainer applies force that is parallel to the client's body without pushing down.

How Much: The trainer applies appropriate amount of force.

End Position

The trainer should return the client's leg to the floor slowly.

Comments

During this stretch, think about applying a force that is up and back. This strategy helps to elongate the muscle of the quadriceps and hip flexors and reduces the likelihood of applying a force that acts downward on the client's knee and hips. Make certain that the client maintains a neutral spine in the prone position and that his knee stays in alignment with his hip.

Correct Prone Quadriceps with Hip and Back Support

The use of a towel (see below), small foam roller, or similar object may be placed either under the leg above the knee, at the hip, or both. This safely increases the hip flexor stretch or can be used to reduce low back discomfort in the prone position.

Start Position

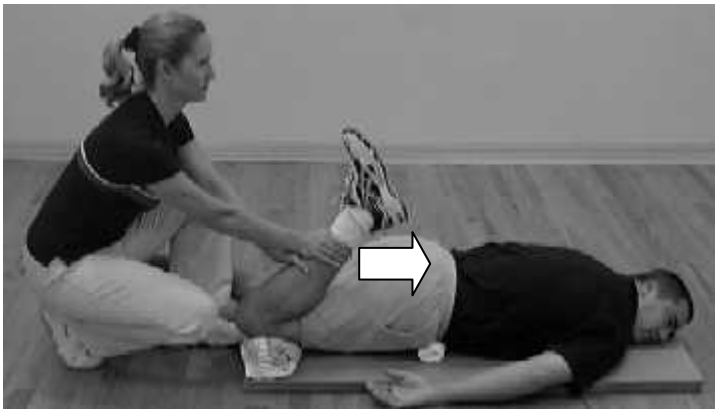
The client is prone. His spine is neutral – head, neck, and spine are in alignment. His arms are flat at his side and his knee is in alignment with his hip.

Where: The trainer's hands are one to 1.5 inches above the client's ankle.

What Direction: The trainer prepares to step into the client – prepares to apply a force that is parallel to the client's body.

Correct Prone Quadriceps with Hip and Back Support

Stretch Position



Where: The trainer's hands are one to 1.5 inches from the client's ankle.

What Direction: The trainer applies force to the client without pushing down on him.

How Much: Trainer applies appropriate amount of force.

End Position

The trainer should return the client's leg to the floor slowly.

Comments

During this stretch, think about applying a force that is up and back. This increases the stretch for the quadriceps and the hip flexors and reduces the likelihood of applying a force that acts downward on the client's knee and hips. Make certain that the client keeps his hips and knee in alignment.

Correct Lumbar (with gluteus) Stretch

Start Position

The client is prone with her arms flat at her side. Her spine is neutral – the head, neck, and spine are in alignment. The stretching leg is positioned at a 90-degree angle. The non-stretching leg is extended.

Where: The trainer's hand is one to 1.5 inches below the client's knee on the hamstring. The other hand is placed in the center of the foot – more for support of the stretching leg than to apply a force.

What Direction: The trainer prepares to apply a force that is parallel to the client's body on the mat.

NOTE: The non-stretching leg may be bent, if client reports lower back pain or is inflexible.

Correct Lumbar (with gluteus) Stretch

Stretch Position

Where: The trainer's hand is one to 1.5 inches below the client's knee on the hamstring. The other hand is placed in the center of the foot – more for support of the stretching leg than to apply a force.

What Direction: The trainer applies force that is parallel to the client without pushing down on her. Use the hand that is on the hamstring to apply the force.

How Much: The trainer applies appropriate amount of force.

End Position

The trainer should return the client's leg to the floor slowly.

Comments

During this stretch, think about applying a force that is up and back. This reduces the likelihood of applying a force that acts downward on the client's lower back and hips. It also increases the stretch from the gluteus to the hamstring at the knee.

Correct Iliotibial Band Stretch

NOTE: The IT band stretch is an advanced stretch and is optional for use at the trainer's discretion. The IT band stretch is particularly relevant for athletes, recreational golfers, and persons that spend a lot of time sitting.

Start Position

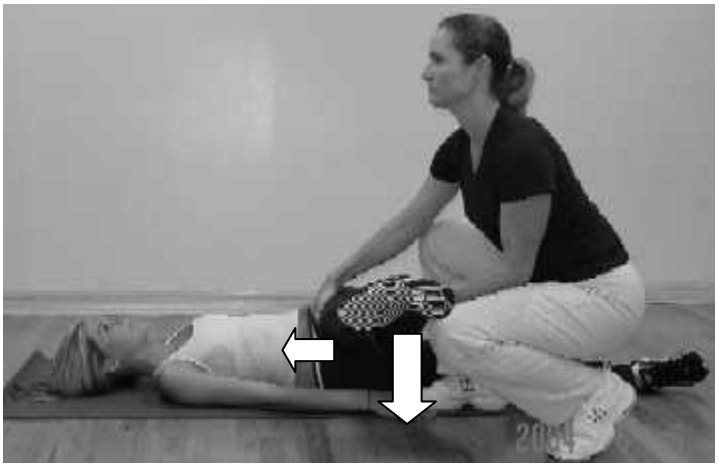
The client is supine with a neutral spine – her head, neck, and spine are in alignment. Her arms are flat at her side and the non-stretching leg is extended (the arms may also be extended perpendicular to the torso). The stretching leg is extended perpendicular to the spine. The leg should be as straight as possible without excessive bend of the knee.

Where: The trainer's hands are one to 1.5 inches below the client's ankle.

What Direction: The trainer prepares to rotate the client's leg to the opposite side of her body. To do this, the trainer should stand with one foot to either side of the non-stretching leg.

Correct Iliotibial Band Stretch

Stretch Position



Where: The trainer's hands are one to 1.5 inches below the client's ankle.

What Direction: The trainer applies a force that is out from the client's hips and downward without pushing down on her. There is also a force that acts parallel to the client's body at the same time (see the arrow from the leg towards the torso). The hand placed on the back of the leg (calf or hamstring) applies this force.

How Much: The trainer applies appropriate amount of force.

End Position

The trainer should return the client's leg to the floor slowly.

Comments

During this stretch, think about applying a force that is out from the client's hip. Think about extending the muscle of the outside of the hip from its origin at the hip towards the foot. This action reduces the likelihood of applying a force that acts downward on the client's hips and low back. Do not allow client to roll over when doing stretch – make certain that hips stay on the mat to elongate the IT Band. To reduce the stretch, bring the stretching leg to the floor at an angle (towards the trainer).

Chapter 5 Illustrated Stretches – Upper Body

After you finish chapter 5, you will be able to:

1. Apply the three principles of force application to common upper body stretches.
2. Immediately improve assisted stretching technique for common upper body stretches.

Correct Seated Scalene Stretch

Start Position

Where: The trainer's hand is one to 1.5 inches on the inside of client's shoulder. Make certain that the hand is on soft tissue. The other hand is on the cranium above the ear.

What Direction: The trainer prepares to apply a force that is up and over. Make certain that the client sits up straight and lifts her chin in preparation for the stretch.

Correct Seated Scalene Stretch

Stretch Position

Where: The trainer's hand is one to 1.5 on the inside of the shoulder. The other is on the cranium above the ear.

What Direction: The trainer applies a force that is up and over.

How Much: Appropriate amount of force is applied.

End Position

The trainer should return the client to the start position slowly.

Comments

Make certain that the client lifts her head and then "bends" the neck during stretching. The most common error for this stretch is for the client to drop her chin forward or for the trainer to push forward, not over. Both errors shorten the scalene muscles, making the stretch ineffective.

Incorrect Chest Stretch

NOTE: It is common to see this stretch done incorrectly, both standing and sitting.

Why this stretch is incorrect:

Where: Incorrect hand placement. The trainer's hands are on the client's wrists.

What Direction: The trainer pushes down on the client.

How Much: Too much force is applied.

As a result, the force acts on the client's spine and hip. Also, the client drops his chin and shoulders to his chest. This shortens the chest muscles, making the stretch ineffective. Additionally, the trainer pinches the client's shoulder blades. This increases peripheral neuropathy at the cervical level of the spinal cord (peripheral neuropathy and BAS are covered in detail in Chapter 7).

Correct Chest and Upper Back Stretch

Start Position

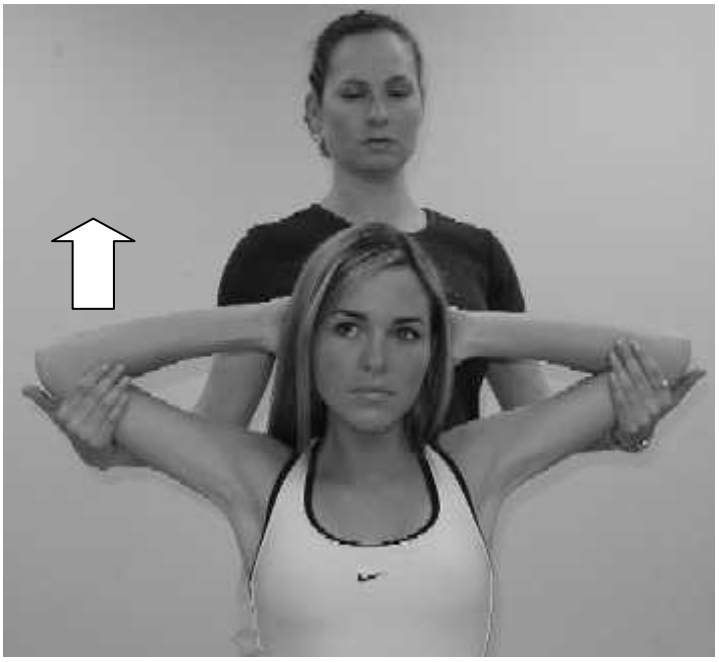
The client is seated with a neutral spine (the trainer may stabilize the client with her torso or knee). The client's elbows are up - in front of face.

Where: The trainer's hands are one to 1.5 inches from the elbow on the outside.

What Direction: The trainer should begin to think about applying a force that is up and back towards herself.

Correct Chest and Upper Back Stretch

Stretch Position



Where: The trainer's hands are one to 1.5 inches from the elbows on the inside.

NOTE: The trainer changes her hand placement from the outside to the inside on the elbows.

What Direction: The trainer applies a force that is up and back (towards the trainer).

How Much: Appropriate amount of force is applied.

End Position

The trainer should return the client to the start position slowly.

Comments

Do not allow the client to collapse forward. The client should not look down or slouch. Both actions shorten the chest muscles, making the stretch ineffective.

Correct Triceps Stretch

Start Position

Where: The trainer's hand is one to 1.5 inches from the elbow. The other is one to 1.5 inches from the wrist.

What Direction: The trainer should begin to the think about applying a force that is up (from shoulder joint) and over towards trainer (mid-line of client's body).

Correct Triceps Stretch

Stretch Position

Where: The trainer's hand is one to 1.5 inches from the elbow. The other is one to 1.5 inches from the wrist.

What Direction: The trainer applies a force that is up (from shoulder joint) and over towards trainer (mid-line of client's body). This technique includes the serratus in the stretch.

How Much: Appropriate amount of force is applied.

End Position

The trainer should return the client to the start position slowly.

Comments

The trainer should not allow client to look down or slouch. Both actions shorten the muscles at the shoulder joint and decrease the triceps stretch.

Correct Biceps and Anterior Shoulder Stretch

Start Position

Where: The trainer's hand is one to 1.5 inches from the wrist. The other rests on the client's opposite shoulder. Use the hand on the opposite shoulder to position the client's shoulders square to the front.

NOTE: Supination of the arm is essential to include the biceps in this stretch. The trainer should have the client supinate prior to the stretch.

What Direction: The trainer should begin to think about applying a force that is up and back (towards the trainer and to the mid-line of the client's body).

Correct Biceps and Anterior Shoulder Stretch

Stretch Position

Where: Trainer's hand is one to 1.5 inches from the client's wrist.

NOTE: The trainer's other hand has moved from the opposite shoulder to the inside of the shoulder of the stretching arm. Use the hand on the shoulder to stabilize the stretching arm shoulder forward and down.

What Direction: The trainer applies a force that is up and back (towards the trainer and to the mid-line of the client's body).

How Much: Appropriate amount of force is applied.

End Position

The trainer should return the client to the start position slowly.

Comments

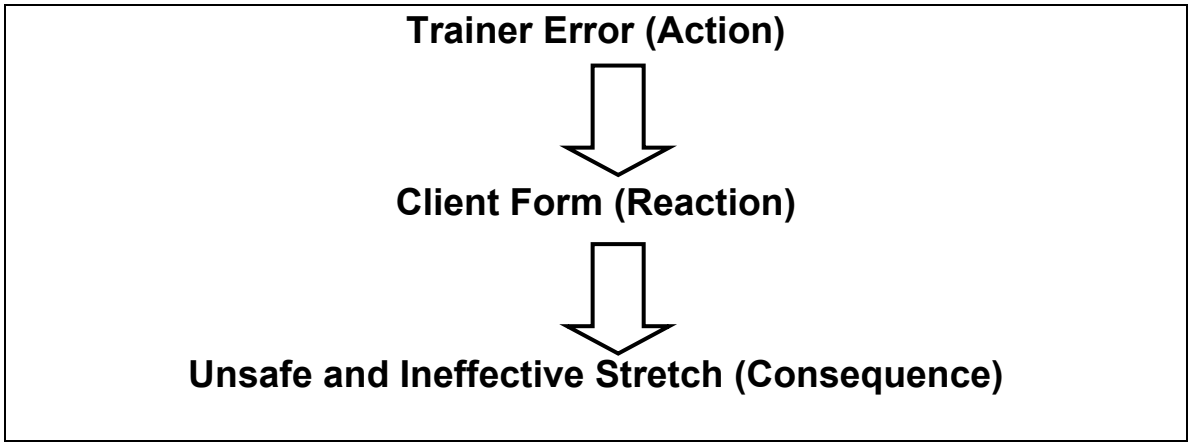
Do not allow the client to drop her head, lean forward, or raise her shoulder. Also, make certain that the client does not rotate her torso towards trainer (both shoulders should face the front at all times during this stretch). Any of these actions shorten the muscles around the shoulder joint and/or change the mechanics of the stretch and render the stretch ineffective.

Chapter 6 Form and Structure

After you finish chapter 6, you will be able to:

1. Identify how the Law of Action-Reaction relates to assisted stretching form errors.
2. Define a dynamic system and how it relates to assisted stretching.
3. Identify common client form errors for most stretches.
4. Correct common form errors for most stretches.

Relationship Between Law of Action-Reaction and Stretching Form Errors



Dynamic systems

A dynamic system, as opposed to a static, non-changing system, is subject to change and does so frequently. The human body is an example of a dynamic system and more so during assisted stretching than at rest. As the trainer, it is your responsibility to monitor how your client's body position changes during assisted stretching. The client reacts to the force that the trainer applies to him. His reaction to the trainer's application of force during stretching is his form. The client's form indicates whether or not the trainer has paid close attention to how he has applied force to the client to produce stretching. To determine if any of the three principles of force have been violated, the trainer looks for evidence of any form violations. The indicators of assisted stretching form errors include:

1. Bent joints (remember, "soft", but not bent is the rule for joint position)
2. Collapse of the head, shoulders, or chest forward during seated stretches
3. Hips coming off of the mat during a lying stretch
4. A shift in body position
5. Any change in facial expression or body language

6. Shallow breathing

The trainer can correct most form errors easily and quickly. Methods to improve the client's stretching form during assisted stretching include:

1. Check the client's spine and joint position
2. Make certain that your hands are not on a joint
3. Make certain that you are not pushing down on the client
4. Reduce how much force you are applying
5. Make certain that the client is breathing

Poor form decreases the safety and effectiveness of stretching for the client. The trainer can assure himself that assisted stretching is safe and effective for the client by paying close attention to how he applies force during assisted stretching and monitoring the client's form. If the trainer does notice a client form error, he can correct that form error quickly using the methods above.

Part III BAS Backs

Chapter 7 The BAS Back Protocol

This chapter is organized into two sections – scientific foundations of the BAS Back Protocol and the stretching protocol. BAS Backs is a series of muscle specific stretches done in a specific order designed to relieve lower back pain. The stretches and their mechanics are shown with a section on how to use the protocol during session. No incorrect stretches are shown.

After you finish Chapter 7, you will be able to:

1. Take the individual stretches shown in chapters 4 and 5 and apply them using BAS Backs.
2. Identify key research that supports the use of BAS Backs to alleviate chronic lower back pain.

3. Define peripheral neuropathy and how BAS Backs alleviates peripheral neuropathies.
4. Identify how BAS Backs differs from other stretching programs.
5. Define specificity of stretch.
6. Define the progressive stretch technique used in BAS Backs.
7. **Alleviate chronic lower back pain** and peripheral neuropathies using BAS Backs.

Peripheral Neuropathy

Stretching reduces lower back pain, because it decreases peripheral neuropathy. Peripheral neuropathy is the compression of the back muscles against the spinal nerves. The compression of the spinal nerves causes back discomfort and pain. Lifestyle factors contribute to the development of peripheral neuropathy. Lifestyle factors that cause peripheral neurpopathy include prolonged sitting, lack of strengthening and flexibility training, and being overweight. Peripheral neuropathy can lead to poor posture, decreased mobility, and a poor quality of life. Stretching alleviates peripheral neuropathy because it elongates muscles, which take the pressure off of the spinal nerves. A single bout of stretching offers immediate relief from peripheral neuropathy by releasing tight muscles. Repeated stretching sessions can increase muscle length by increasing the number of sarcomeres in length and can provide more long-term relief from back pain. In addition to releasing and lengthening muscles, stretching increases joint Range of Motion (ROM) and lubricates the spine and joints. All of which contribute to alleviate peripheral neuropathy and low back pain.

Tight muscles compress against the spinal nerves and cause peripheral neuropathy. Stretching releases and lengthens tight muscles and alleviates nerve compression. BAS Backs is a method of stretching designed to lengthen hip and lower back muscles. BAS Backs is a series of specific stretches done in a specific order designed to lengthen the musculature of the lower back and hips to relieve peripheral neuropathy. Specific stretches used and the intensity of those stretches vary with each client.

Cable Systems

A helpful way to think about the body during assisted stretching is to think of it as a cable and/or pulley system. Pulleys work with two opposing series of cable or a similar substance working opposite one another, but complementary. Cable systems are specific to lower back pain. Remember that one of the most common reasons that persons develop chronic lower back pain is because the hip flexor muscles are tight. This is typically the product of sitting for long periods of time coupled with a lack of flexibility training. When the hip flexor is tight it pulls on the lower back (forward hip rotation). This forward rotation pulls on the muscles of the lower back and causes them and other surrounding muscles to tighten in response to the workload. This leads to an abnormal and uncomfortable posture, and ultimately chronic lower back pain.

The concept of cable systems may be easier to visualize when we think of it in terms of the more popular concept of agonist/antagonist muscle groups. For

both stretching and strength training, the principle of agonist/antagonist muscles is the same, but functionally opposite. For example, during strength training when the biceps muscle contracts the triceps muscle relaxes. For stretching, the concept is opposite. The stretching muscle lengthens and the opposing muscle shortens.

It is essential to remember that the body uses muscles in an opposing manner. The key concept here is that when stretching one muscle the functional opposite is also involved.

Synergism

The concept of synergism or groups of muscles that work together is a common concept in strength training anatomy. It is the same concept for assisted stretching. A muscle works in cooperation with other muscles during strength training and during stretching. BAS Backs is built on synergism. A group of muscles are stretched in a specific order based on functional anatomy to achieve maximal lengthening of the muscles at the hip joint.

Specificity of stretch

Specificity of stretch states that *the induced change is specific to the exercise stress*. In other words, the benefits associated with stretching will only be seen in the muscles stretched.

Specificity of stretch is the same concept as specificity of strength training. For example, when a trainer is faced with the task of strengthening the hamstring muscle, he uses exercises that work the hamstring muscle and muscles that support the hamstring as well. In stretching, when the trainer is faced with a client that has lower back pain, he uses stretches for the muscles of the lower back as well as stretches that increase the length of the muscles that act at the hip joint.

Specificity of stretching may also relate to and reflect the goal of stretching itself. Stretching goals can include, but are not limited to:

1. Relief of peripheral neuropathies
2. Improvement of range of motion (ROM) at a joint
3. Lengthening a specific muscle or group of muscles for sports performance
4. Improved function
5. Post-rehabilitation

Progressive stretch technique

Progressive is defined as continuing by successive steps. BAS Backs is a progressive stretch technique. BAS Backs shows trainers how to guide clients from the most to the least tolerable stretch within the same stretch and from one stretch to another. The idea is take the client from a tolerable stretch that does little to lengthen the muscle(s) and alleviate lower back pain, to a greater stretch

that overloads the muscle(s) and yields relief. The progressive stretch technique is based on the fact that persons should not be taken from a muscle at resting length to maximal stretching without a transition period. The assumption is that with each sequential stretch the muscle is lengthened a little more beyond resting length and that the stretched muscle's length becomes increasingly more tolerable within that session and with successive sessions (see below).

Progressive Stretch Technique (shown between stretches)

Stretch "A"

⇓

Stretch "B"

⇓

Stretch "C"

*This simple diagram illustrates the concept of progressive stretching and can be used for any number of stretches in a series or for a single stretch within a series of stretches.

Before Starting

Many clients, particularly male clients, may report discomfort at the groin area during the IT Band and hip rotator stretches. To reduce likelihood of discomfort, stretch the groin and hip flexor area PRIOR to executing BAS Backs. The trainer may choose from any number of stretches based on his and the client's discretion.

Suggested stretches include:

1. Kneeling hip flexor
2. Seated butterfly groin
3. Long adductor
4. Short adductor

BAS Backs Protocol

BAS Backs is built using the lower body stretches shown in Chapter 4. The mechanics of stretches are the same during BAS Backs as when the stretches are done alone. The BAS Backs stretches are:

1. Lumbar (with gluteus)
2. Supine Hamstring
3. Supine Gastrocnemius
4. Erector Spinae (with lateral hip rotators)
5. Piriformis (deep hip rotators)
6. IT Band (optional)
7. Prone Quadriceps

BAS Backs was designed with functional anatomy in mind. Therefore, the stretches should be done in the order above.

Lumbar (with gluteus) stretch

Start Position

The client is supine with her arms flat at her side. Her spine is neutral – her head, neck, and spine are in alignment. The stretching leg is bent at a 90-degree angle. The non-stretching leg is extended.

Where: The trainer's hand is placed one to 1.5 inches below the knee on the back of the hamstring. The other hand is placed in the center of the foot – more for support of the stretching leg than to apply a force.

What Direction: The trainer prepares to apply a force that is parallel to the client's body on the mat.

NOTE: The non-stretching leg may be bent, if client reports low back pain or is inflexible.

Stretch Position

Where: The trainer's hand is placed one to 1.5 inches below the knee. The other hand remains on the ball of the foot for support of the stretching leg.

What Direction: The trainer applies a force that is parallel to the client's body and the floor.

How Much: The trainer applies enough force to cause stretching, but no form errors occur.

End Position

The trainer should return the client's leg to the floor slowly.

Comments

During stretching, the client's back stays in contact with the floor at all times. The trainer should not push downward on the client to achieve this stretch. The force should be more up from the gluteus and low back than down towards the chest. This technique maximizes the stretch from the gluteus to the hamstring at the knee.

Supine Hamstring

Start Position

The client is supine with her arms at her side. Her spine is neutral – her head, neck, and spine are in alignment. The non-stretching leg is bent with the foot flat on the floor and the stretching leg is extended to the trainer.

Where: The trainer's hands are placed one to 1.5 inches below the ankle.

What Direction: The trainer prepares to step into the client.

Supine Hamstring

Stretch Position

The trainer steps into the client. The trainer lifts the client's leg to a comfortable stretching position.

Where: The trainer's hands are placed one to 1.5 inches below the ankle.

What Direction: The trainer applies a force that is parallel to the client's body and the floor.

NOTE: To increase this stretch, apply a force that is up from the hip joint (to the ceiling) and back towards the torso. This elongates the muscles of the lower back, gluteus, hamstring, and gastrocnemius from the lower back down to the ankle.

How Much: The trainer applies enough force to cause stretching, but no form errors occur. The client's back stays in contact with the floor at all times.

End Position

The trainer should return the client's leg to the floor slowly.

Comments

During stretching, the client's knee is soft, but not bent. The more the bend in the knee, the less stretch there is in the hamstring.

Supine Gastrocnemius Stretch

The gastrocnemius stretch should be done immediately following the supine hamstring stretch. The client remains supine with her arms at her side. Relax the hamstring stretch to a comfortable position. The trainer steps to the side of the client.

Where: One of the trainer's hands remains one to 1.5 inches below the ankle for stabilization. The other hands should be moved to the ball of the foot.

What Direction: The trainer applies a force that is downward to the ball of the client's foot.

How Much: The trainer applies enough force to cause stretching, but no form errors occur.

End Position

The trainer should return the client's leg to the floor slowly.

Comments

During stretching, the client's knee is soft, but not bent. Make certain that client does not bend her knee. The more bend in the knee, the less stretch in the gastrocnemius. To increase the stretch, move the client's stretching leg slowly towards the client's torso.

Erector Spinae (with hip rotator) Stretch

Start Position

The client is supine with her arms at her side – her head, neck, and spine are in alignment. The non-stretching leg is extended. The stretching leg is bent with the foot at the knee.

Where: The trainer's hand is one to 1.5 inches above the client's knee. The other hand is on the client's lower rib cage to assist to stabilize the client's shoulders on the mat.

What Direction: Trainer prepares to rotate the client around her spinal cord.

Erector Spinae (with hip rotator) Stretch

Stretch Position

Where: The trainer's hand is one to 1.5 inches above the client's knee. The other hand is on the client's lower rib cage to assist to stabilize the client's shoulders on the mat.

What Direction: The trainer does not push down on the client. She applies a force that is away from the hip and downward.

How Much: Appropriate amount of force is applied to rotate the client around the spinal cord.

End Position

The trainer should return the client's leg to the floor slowly.

Comments

Some clients will report discomfort at the inner thigh (femoral nerve) during this stretch. To reduce discomfort, move the stretching foot downward towards the foot or extend the knee slightly. Also, make certain that the client does not roll with trainer. Keep the shoulders on the mat.

Piriformis (deep hip rotators) Stretch

Start Position

The client is supine with her arms at her side – her head, neck, and spine are in alignment. The non-stretching leg is extended. The trainer supports the client's stretching leg.

Where: The trainer's hand is one to 1.5 inches below the client's knee. The knee hand placement is on the inside of the thigh to ROTATE the leg from the hip. The other hand is above the ankle (unable to see).

What Direction: The trainer prepares to rotate the client's leg from the hip.

Piriformis (deep hip rotators) Stretch

Stretch Position

NOTE: The trainer changes her hand placement. After several sessions, the hand placement on the inside of the leg at the start position will not be necessary. Rotation from the hip should become automatic for the client.

Where: The trainer's hands are one to 1.5 inches below the client's knee on the outside (fingers wrap around leg to pull the leg towards the trainer). The trainer's other hand is above the ankle (cannot see).

What Direction: The trainer applies a dual force parallel to the client's body and the floor to ROTATE from the hip. The trainer does not push down on the client.

How Much: Appropriate amount of force is applied.

End Position

The trainer should return the client's leg to the floor slowly.

Comments

It is essential to rotate the leg from the hip. Do not allow the client to rotate from the knee. If the client reports knee pain, check for rotation from the knee.

IT Band Stretch

NOTE: The IT Band stretch (as shown here) is an advanced stretch and is an optional stretch that the trainer may use at his discretion. Not using the IT Band stretch with BAS Backs will not reduce the effectiveness of the BAS Backs protocol.

Start Position

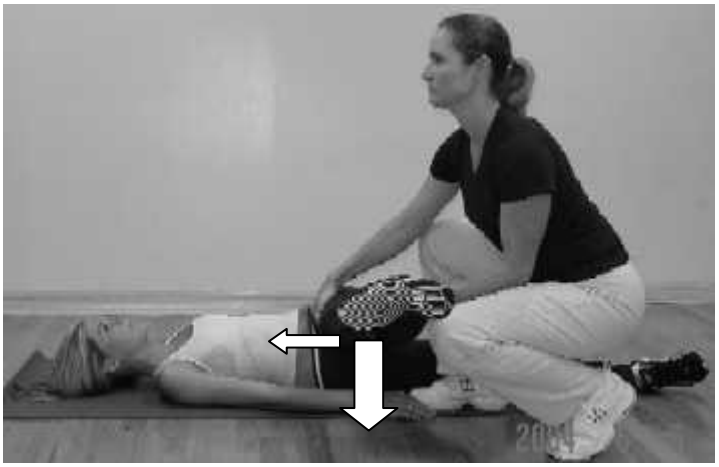
The client is supine with her arms extended from her shoulder – her head, neck, and spine are in alignment. The non-stretching leg is extended and her stretching leg is extended to the ceiling. The knee should be "soft", but not bent. The shoulders should be flat on the mat.

Where: The trainer's hand is one to 1.5 inches below the client's ankle.

What Direction: The trainer prepares to rotate the client's hips around her spinal cord. The trainer should stand on the outside of the client's support leg. The trainer can use her foot (outside of client's non-stretching leg) to stabilize the client. This reduces the likelihood that the client rotates with the trainer.

IT Band Stretch

Stretch Position



Where: The trainer's hand is one to 1.5 inches above the ankle. The other hand moves to above the knee (on the front of the thigh).

What Direction: The trainer does not push down on the client. She applies a force that is up from the hip, away from the hip, and then downward. There is also a secondary force that is applied parallel to the client's body. Apply this force using the hand on the back of the leg (unable to see). The hand can be placed on the calf or the hamstring.

How Much: Appropriate amount of force is applied to rotate the client around the spinal cord.

NOTE: Do not allow client to roll over when doing the stretch. Make certain that the client's hips stay on the mat during the stretching to elongate the IT Band.

End Position

The trainer should return the client's leg to the floor slowly.

Comments

During the IT Band stretch, some clients may report greater stretch down the hamstring and calf than the IT band. To remedy this, allow the client to bend the knee. Another common problem associated with this stretch is discomfort in the femoral nerve (hip flexor) area. Some clients may report “pinch” sensation. To remedy this, bring the leg down at an angle towards the trainer.

Advanced IT Band Stretch Position

NOTE: The increased hip rotation increases the difficulty of this stretch (note foot position). The increased rotation from the hip involves the deeper musculature of the hip in addition to the gluteus in this stretch.

Where: The trainer's hand is one to 1.5 inches above the knee on the front of the thigh. The other is above the ankle behind the leg (unable to see).

What Direction: The trainer moves closer to client to increase the rotation from the hip. The trainer does not push down on the client. She applies a force that is out from the hip (towards the foot), and then downward. There is also a secondary force that is applied towards and parallel to the client's body. Apply this force using the hand placed on the back of the leg at the hamstring or calf (unable to see).

How Much: Appropriate amount of force is applied to rotate the client around the spinal cord.

End Position

The trainer should return the client's leg to the floor slowly.

Comments

Do not allow the client to roll over during this stretch. If the client is unable to remain supine and rotate around the spine, the stretch is too difficult.

Returning to Resting Length

At the end of the stretching series, the trainer should repeat the Lumbar Stretch. Repeating the Lumbar Stretch is consistent with the progressive stretch technique and helps to guide the client's muscle back to a comfortable resting length.

Prone Quadriceps Stretch

Start Position

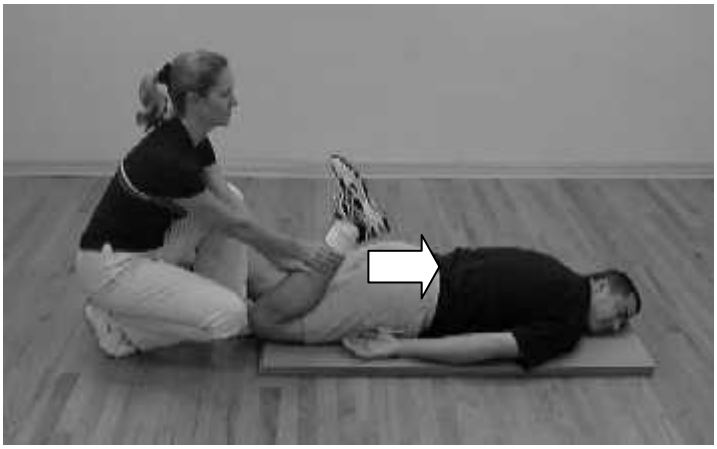
The client is prone with the spine neutral – head, neck, and spine in alignment. His arms are flat at his side and his knee is in alignment with his hip.

Where: The trainer's hands are one to 1.5 inches from the client's ankle on the leg.

What Direction: The trainer prepares to step into the client.

Prone Quadriceps Stretch

Stretch Position



Where: The trainer's hands are 1 to 1.5 inches from the client's ankle.

What Direction: The trainer applies a force without pushing down on client.

How Much: The trainer applies appropriate amount of force.

End Position

The trainer should return the client's leg to the floor slowly.

Comments

The trainer should think about applying a force that is up and back. This reduces the likelihood of applying a force that acts downward on the client's knee and hips. Additionally, the use of a towel placed either under the knee or the hip may be used safely to increase the hip flexor stretch, or in the case of persons with back discomfort in the prone position.

NOTE: The trainer can replace the prone quadriceps stretch with the kneeling hip flexor stretch or runner's stretch for more advanced clients.

BAS Backs Stretching Guidelines

For each stretch, the trainer should go through the following steps to ensure effectiveness and safety of the stretch. **The general steps for each stretch for BAS Backs are:**

1. Check the initial body position of the client, paying close to attention to the joints and the spine
2. Determine **where** to place hands on the client
3. Determine **what direction** to apply the force
4. Determine **how much** force to apply during stretching
5. Hold each stretch for 30 seconds to one minute.
6. Encourage the client to breathe deeply (suggest that the client inhale through the nose and exhale through the mouth)
7. Slowly release the stretched muscle back to the starting position

Stretches are done unilaterally. The same sequence should be done for each leg.

Frequency

There are numerous opinions on the frequency of which stretching should be done to improve flexibility. Few studies have been done on the topic of frequency of stretching for results and fewer, if any, have been done on the topic of assisted stretching. One study has shown that stretching must be done five days per week for at least six weeks before improvements in flexibility are seen

(Wiley, et; al., 2001). This frequency is unrealistic in most training settings. At best, trainers can expect to stretch clients two to three days per week. But, again we do not know how often assisted stretching should be done to see improvements in flexibility or to reduce back pain. The current recommendation is that trainers incorporate assisted stretching into each session and encourage clients to stretch alone as well.

Afterward

The future of the health and fitness industry lies within the successful integration of biomechanics into exercise program design. Specifically, the future will require that trainers are able to determine what forces act on the body, how to measure those forces, and how to account for them during exercise program design and execution. The BAS program is a good place to start. As trends develop and market demand shows where the needs are, Dr. Ashmore will continue to develop biomechanics education programs to help trainers stay ahead of the industry. Look for Advanced Biomechanics of Assisted Stretching soon. Advanced Biomechanics of Assisted Stretching builds on Biomechanics of Assisted Stretching, teaching trainers how to design assisted stretching programs for hip, lower back, shoulder, and/or neck function and/or pain relief.

Bibliography

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