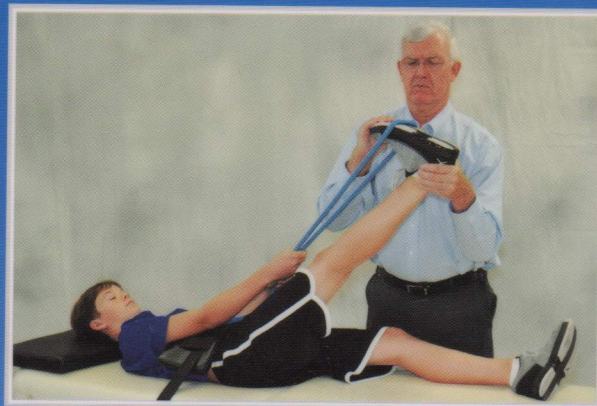
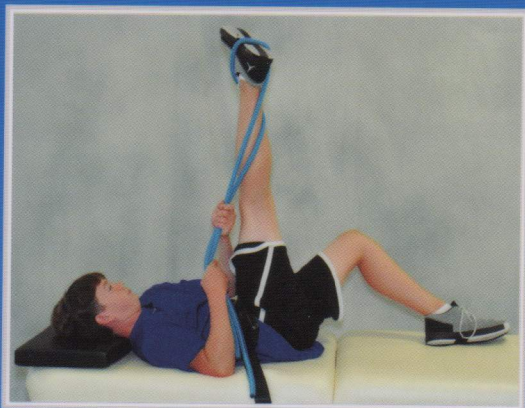


AARON MATTES' ACTIVE ISOLATED STRETCHING



By
AARON L. MATTES

AARON MATTES' ACTIVE ISOLATED STRETCHING

By
Aaron L. Mattes, MS., R.K.T., L.M.T.
Registered Kinesiotherapist and Licensed Massage Therapist
Sarasota, FL

Published By:
Aaron L. Mattes
P.O. Box 17217
Sarasota, FL 34276-0217

AARON MATTES' ACTIVE ISOLATED STRETCHING

Copyright c 2012 by Aaron L. Mattes

All rights reserved. No part of this publication
May be reproduced, stored in a retrieval system, or
Transmitted, in any form or by any means, electronic
Mechanical, photocopy, recording or otherwise,
Without the prior written permission of Aaron L. Mattes

Published By: Aaron L. Mattes
P.O. Box 17217
Sarasota, FL 34276-0217

If you are unable to order this book from your local
Bookseller, you may order directly from the publisher:

Call: (941) 922-1939
Fax: (941) 927-6121
Email: stretchingusa@comcast.net
Web site: www.stretchingusa.com

ISBN 0-9656396-4-9

Printed in the United States of America

DEDICATION

In appreciation for 42 years of love, great patience, kindness and hard work from my wife Judy. To my son Lance and his wife Suzanne for their great assistance and encouragement. Their daughters Juliana and Alexia for many outstanding moments with grandpa Aaron and grandma Judy. My grandson Tyler, my buddy and demonstrator of the exercises in this book. To my son Troy and his wife Kera for their love and encouragement. Their daughters Ella and Eva for their many bright smiles and happy moments. To my mother-in-law Irene Hryniewicki-Heinle for her love and assistance for over 42 years. To my father-in-law Rudolph "Buster" Heinle for his sense of humor and kindness. To my brother-in-law Wally Hryniewicki for his many years of help, kindness and support. His daughters Hailey and Leah and their families for many years of happiness and joy.

To my sister Myrna Meinholdt for over 60 years of sincere love, help and constant encouragement. To her husband Lee, for a lifetime of support and friendship. Their son Chad, my only nephew, and his wife Jen for many years of kindness and encouragement. To Sara Meinholdt whose bright smile and friendship have brightened my life.

In gratitude to the hundreds of therapists, doctors, trainers and instructors who have taught, practiced and helped develop the evolutionary process of *Active Isolated Stretching*, making it a world recognized modality.

TABLE OF CONTENTS

PREFACE	1
INTRODUCTION	3
OBSTACLES TO OPTIMAL FLEXIBILITY	6
BENEFITS OF STRETCHING	6
ACTIVE ISOLATED STRETCHING (A.I.S.) PRINCIPLES	7
FASCIA EMBRYOLOGY	8
FASCIA AND WELL-BEING	10
FASCIA AND AUTONOMIC NERVOUS SYSTEM	11
PHYSICAL PROPERTIES OF CONNECTIVE TISSUE	11
CENTER OF GRAVITY	12
BREATHING AND FASCIA	12
FASCIA AND MUSCLE IMBALANCE	12
EMOTIONAL MEMORY	13
MUSCLE MEMORY	13
PHYSIOLOGIC WARM-UP AND COOL DOWN PERIODS	13
ATHLETIC PERFORMANCE	14
BENEFITS OF AN OPTIMAL FLEXIBILITY PROGRAM	15
MAJOR ANTERIOR MUSCLES	18
MAJOR POSTERIOR MUSCLES	19

ACTIVE ISOLATED STRETCHING 21

SHOULDER FLEXIBILITY: ACTIVE	22
SHOULDER CIRCUMDUCTION:CIRCLES	22
HORIZONTAL (ABDUCTION) EXTENSION I	22
SHOULDER (ABDUCTION) EXTENSION II	23
HYPEREXTENSION: SINGLE ARMS	24
SHOULDER HYPEREXTENSION: (HANDS CLASPED)	24
LONGHEAD BICEPS BRACHII: SINGLE ARM	25
SHOULDER ABDUCTION: POSTERIOR OBLIQUE	26
SHOULDER ADDUCTION: POSTERIOR OBLIQUE	27
SHOULDER HORIZONTAL ABDUCTION: POSTERIOR	28
ROTATOR CUFF STRETCHES	28
SHOULDER EXTERNAL ROTATION	28
SHOULDER INTERNAL ROTATION	30
SHOULDER HORIZONTAL FLEXION I	31
SHOULDER HORIZONTAL FLEXION II	32
DELTOID STRETCH	32
SHOULDER TRICEPS STRETCH	33
SHOULDER FORWARD ELEVATION	34
SHOULDER SIDEWARD ELEVATION	35
POSTERIOR HAND CLASP (APLEY SCRATCH TEST)	37
ELBOW, RADIAL-ULNAR, WRIST, FINGER, AND THUMB FLEXIBILITY: ACTIVE	38
ELBOW FLEXOR STRETCH	38
TRICEPS STRETCH	39
RADIAL-ULNAR PRONATION	40
RADIAL-ULNAR SUPINATION	40

WRIST EXTENSION: PRONE	41
WRIST EXTENSION: SUPINE	42
WRIST FLEXION	42
WRIST-FINGER EXTENSOR STRETCH	43
WRIST RADIAL FLEXION (ABDUCTION)	44
WRIST ULNAR FLEXION (ADDUCTION)	44
FINGER EXTENSOR STRETCH	45
FINGER FLEXOR STRETCH	46
FINGER FLEXOR-JOINT STRETCH	47
FINGER-WRIST FLEXOR STRETCH	47
FINGER ADDUCTOR (WEB) STRETCH	47
FINGER ABDUCTOR STRETCH	48
INTERPHALANGEAL JOINTS	48
THUMB STRETCHING: ACTIVE	49
THUMB OPPOSITION STRETCH	49
THUMB ADDUCTOR (WEB) STRETCH	49
THUMB ABDUCTOR STRETCH	50
THUMB EXTENSOR STRETCH	51
NECK FLEXIBILITY: ACTIVE	52
ANTERIOR SEMI-CIRCLES	52
CERVICAL FLEXION	52
CERVICAL HYPEREXTENSION	53
CERVICAL OBLIQUE HYPEREXTENSION	53
CERVICAL LATERAL FLEXION: RIGHT	54
CERVICAL LATERAL FLEXION: FORWARD OBLIQUE RIGHT	55
CERVICAL FLEXION: FORWARD OBLIQUE RIGHT	55
CERVICAL ROTATION: RIGHT	56
CERVICAL LATERAL FLEXION: LEFT	56
CERVICAL LATERAL FLEXION: FORWARD OBLIQUE LEFT	57
CERVICAL FLEXION: FORWARD OBLIQUE LEFT	57
CERVICAL ROTATION: LEFT	58
NECK FLEXIBILITY: ACTIVE GRAVITY	58
CERVICAL ANTERIOR SEMI-CIRCLES	58
CERVICAL HYPEREXTENSION	59
CERVICAL HYPEREXTENSION: OBLIQUE	60
CERVICAL LATERAL FLEXION: RIGHT	60
CERVICAL ROTATION: RIGHT	61
CERVICAL LATERAL FLEXION: LEFT	61
CERVICAL ROTATION: LEFT	62
CERVICAL FLEXION	62
CERVICAL FLEXION: OBLIQUE	63
CERVICAL FLEXION: FORWARD OBLIQUE	63
HIP-BACK PROTOCOL: ACTIVE	64
PSOAS-ILIACUS STRETCH: PRONE	64
PSOAS-ILIACUS STRETCH: SIDE LYING	65
PSOAS-ILIACUS STRETCH: SUPINE	65

PSOAS-ILIACUS-SARTORIUS: KNEELING	66
QUADRICEPS STRETCH: SIDE LYING	66
QUADRICEPS STRETCH: STANDING OR SITTING	67
HIP ADDUCTOR STRETCH (GROIN) SUPINE	68
HIP ADDUCTOR STRETCH (GROIN) SEATED	69
SINGLE LEG PELVIC TILT	69
HIP FLEXION	70
LATERAL GLUTEUS MAXIMUS STRETCH	70
OBLIQUE GLUTEUS MAXIMUS STRETCH	71
DOUBLE LEG PELVIC TILT	71
REVERSE CURL	72
OBLIQUE DOUBLE LEG PELVIC TILT	72
PIRIFORMIS FEMORAL ATTACHMENT	73
PIRIFORMIS: SACRAL	73
GASTROCNEMIUS (CALF) STRETCH	74
OUTER GASTROCNEMIUS STRETCH	74
INNER GASTROCNEMIUS STRETCH	75
BENT KNEE HAMSTRING STRETCH	75
HAMSTRING STRETCH: BENT KNEE SEATED	76
BENT KNEE "INNER HAMSTRING STRETCH"	77
BENT KNEE "OUTER HAMSTRING STRETCH"	77
STRAIGHT LEG HAMSTRING STRETCH-NEUTRAL	78
STRAIGHT LEG "INNER HAMSTRING STRETCH"	78
STRAIGHT LEG "OUTER HAMSTRING STRETCH"	79
HAMSTRING STRETCH: STRAIGHT LEGS, SEATED	80
HAMSTRING STRETCH: STANDING	80
HIP ABDUCTOR STRETCH	81
EXTERNAL HIP ROTATOR STRETCH: PRONE	82
EXTERNAL HIP ROTATOR STRETCH: SUPINE	82
EXTERNAL HIP ROTATOR STRETCH: SEATED	83
INTERNAL HIP ROTATOR STRETCH: PRONE	83
INTERNAL HIP ROTATOR STRETCH WITH ROPE: SEATED	84
INTERNAL HIP ROTATOR STRETCH WITH HAND: SEATED	84
INTERNAL HIP ROTATOR STRETCH: SUPINE	85
MEDIAL HIP-THIGH MUSCLES STRETCH	86
BENT KNEE TRUNK FLEXION	86
SEATED TRUNK ROTATION	87
THORACIC-LUMBAR ROTATION – SEATED	88
LATERAL TRUNK FLEXION (SEATED OR STANDING)	88
LATERAL TRUNK FLEXION – FORWARD OBLIQUE	89
TRUNK EXTENSION	90
UPPER TRUNK EXTENSION	91
TRUNK EXTENSION – POSTERIOR OBLIQUE	91
THORACIC EXTENSION	92
ANKLE-FOOT FLEXIBILITY: ACTIVE	93
DORSAL ANKLE STRETCH	93
SOLEUS STRETCH	94
ACHILLES TENDON STRETCH	95
GASTROCNEMIUS (CALF) STRETCH	95

OUTER GASTROCNEMIUS STRETCH	96
INNER GASTROCNEMIUS STRETCH	96
EVERTOR STRETCH	97
INVERTOR STRETCH	97
FOOT PRONATOR STRETCH	98
FOOT SUPINATOR STRETCH	98
METATARSAL ARCH FLEXORS	99
METATARSAL ARCH EXTENSORS	99
TOE ADDUCTOR (WEB) STRETCH	100
GREAT (BIG) TOE STRETCH (FLEXORS)	100
GREAT (BIG) TOE STRETCH (EXTENSORS)	101
GREAT (BIG) TOE STRETCH (ADDUCTORS)	102
LITTLE TOE STRETCH	103

ASSISTED ISOLATED STRETCHING

104

SHOULDER FLEXIBILITY: ASSISTED	104
SHOULDER CIRCUMDUCTION	104
WEIGHTED SHOULDER WARMUP	104
HORIZONTAL (ABDUCTION) SINGLE ARM	105
HORIZONTAL (ABDUCTION) SIDE LYING	106
HORIZONTAL (ABDUCTION) EXTENSION I	106
HORIZONTAL (ABDUCTION) EXTENSION II	106
SHOULDER HYPEREXTENSION: SINGLE ARMS	107
SHOULDER HYPEREXTENSION: PALM OUTWARD	108
SHOULDER ABDUCTION: POSTERIOR OBLIQUE	108
SHOULDER ADDUCTION: POSTERIOR OBLIQUE	109
HORIZONTAL ABDUCTION: POSTERIOR	110
SHOULDER EXTERNAL ROTATION	110
SHOULDER EXTERNAL ROTATION: PRONE	111
SHOULDER: INTERNAL ROTATION	112
HORIZONTAL FLEXION I	113
HORIZONTAL FLEXION: II	114
TRICEPS BRACHII STRETCH: ASSISTED	115
SHOULDER FORWARD ELEVATION (A)	116
SHOULDER FORWARD ELEVATION: SIDE LYING (B)	117
SHOULDER FORWARD ELEVATION: PRONE	117
SHOULDER SIDEWARD ELEVATION (A)	118
SIDEWARD ELEVATION: PALM DOWN (B)	118
SIDEWARD ELEVATION: PALM BACKWARD (C)	119
LATERAL TRUNK FLEXION: SEATED	119
SHOULDER: POSTERIOR HAND CLASP	121
NECK FLEXIBILITY: ASSISTED SEATED	122
ANTERIOR SEMI-CIRCLES	122
CERVICAL FLEXION	122
CERVICAL EXTENSION (HYPEREXTENSION)	123
CERVICAL LATERAL FLEXION	124
CERVICAL ROTATION	124
CERVICAL ANTERIOR OBLIQUE	125
CERVICAL POSTERIOR OBLIQUE	126

NECK FLEXIBILITY: ASSISTED GRAVITY	127
CERVICAL HYPEREXTENSION	127
CERVICAL HYPEREXTENSION: OBLIQUE	128
CERVICAL LATERAL FLEXION: RIGHT	128
CERVICAL ROTATION: RIGHT	129
CERVICAL LATERAL FLEXION: LEFT	130
CERVICAL ROTATION: LEFT	131
CERVICAL FLEXION: SUPINE	132
CERVICAL FLEXION: OBLIQUE	132
DIGASTRIC TECHNIQUE	133
 ELBOW, RADIOULNAR, WRIST, FINGER AND THUMB FLEXIBILITY: ASSISTED	 135
ELBOW FLEXOR STRETCH	135
TRICEPS STRETCH	136
RADIAL-ULNAR PRONATION	137
RADIAL-ULNAR SUPINATION	137
WRIST EXTENSION: PRONE	138
WRIST EXTENSION: SUPINE	138
WRIST FLEXION	139
WRIST RADIAL FLEXION (ABDUCTION)	139
WRIST ULNAR FLEXION (ADDUCTION)	140
WRIST-FINGER EXTENSOR STRETCH	140
FINGER EXTENSOR STRETCH	141
FINGER FLEXOR STRETCH	142
FINGER ADDUCTION (WEB) STRETCH	143
FINGER ABDUCTOR STRETCH	143
 THUMB STRETCHING	 144
THUMB ADDUCTOR (WEB) STRETCH	144
THUMB ABDUCTOR STRETCH	144
THUMB OPPOSITION STRETCH	145
THUMB EXTENSOR STRETCH	145
 HIP/KNEE/TRUNK FLEXIBILITY: ASSISTED	 147
HIP FLEXORS-PSOAS-ILIACUS-SARTORIUS	147
PSOAS-ILIACUS PRONE (ON TABLE)	148
PSOAS-ILIACUS STRETCH (SIDE LYING)	149
HIP ADDUCTORS (GROIN) STRETCH: SINGLE	149
SINGLE LEG PELVIC TILT-HIP FLEXION	151
LATERAL GLUTEAL STRETCH	151
OBLIQUE GLUTEUS MAXIMUS STRETCH	152
PIRIFORMIS STRETCH: FEMORAL ATTACHMENT	152
PIRIFORMIS STRETCH: SACRAL ATTACHMENT	153
DOUBLE LEG PELVIC TILT	153
OBLIQUE DOUBLE LEG PELVIC TILT	154
GASTROCNEMIUS (CALF) STRETCH	155
HAMSTRING STRETCH: BENT KNEE	156
BENT KNEE "INNER" HAMSTRINGS	156
BENT KNEE "OUTER" HAMSTRINGS	157
HAMSTRING STRETCH: STRAIGHT LEG-NEUTRAL	157

STRAIGHT LEG "INNER" HAMSTRING	158
STRAIGHT LEG "OUTER" HAMSTRINGS	159
HIP ABDUCTOR STRETCH	159
QUADRICEPS SIDE LYING	161
RECTUS FEMORIS: PRONE	162
EXTERNAL HIP ROTATORS: SUPINE	163
EXTERNAL HIP ROTATORS: PRONE	164
EXTERNAL HIP ROTATOR STRETCH: SITTING	165
INTERNAL HIP ROTATOR STRETCH: SUPINE	166
INTERNAL HIP ROTATOR STRETCH: SITTING	167
INTERNAL HIP ROTATOR STRETCH: PRONE	167
MEDIAL HIP-THIGH MUSCLES STRETCH	168
BIG THREE	169
LATERAL TRUNK FLEXION	171
ANTERIOR OBLIQUE TRUNK FLEXION	171
POSTERIOR OBLIQUE TRUNK FLEXION	172
BENT KNEE TRUNK FLEXION	172
LUMBAR-SACRAL SPINE STRETCH	173
LUMBAR-SACRAL SPINE STRETCH	173
SEATED TRUNK ROTATION	174
THORACIC-LUMBAR ROTATION "SEATED"	174
SACROLILIAC STRETCH.....	175
THORACIC EXTENSION.....	176
ANKLE-FOOT FLEXIBILITY: ASSISTED	177
SOLEUS STRETCH: PRONE	177
SOLEUS STRETCH: SUPINE	177
ACHILLES STRETCH: PRONE	178
ACHILLES STRETCH SUPINE	178
GASTROCNEMIUS (CALF) STRETCH	179
ANKLE INVERTOR STRETCH	180
ANKLE EVERTOR STRETCH	181
FOOT PRONATOR STRETCH	181
FOOT SUPINATOR STRETCH	182
DORSAL ANKLE STRETCH	182
METATARSAL ARCH STRETCH: FOOT FLEXORS	183
TOE (WEB) ADDUCTOR STRETCH	184
METATARSAL ARCH STRETCH: FOOT EXTENSORS	184
GREAT (BIG) TOE STRETCH (FLEXORS)	185
GREAT (BIG) TOE STRETCH (EXTENSORS)	186
GREAT (BIG) TOE STRETCH (ADDUCTORS)	186
LITTLE TOE STRETCH	187
GLOSSARY	189
BIBLIOGRAPHY	191
ACTIVE PROTOCOLS	193
ASSISTED PROTOCOLS	195

Aaron Mattes continues to refine his thinking and hone his work. *Active Isolated Stretching and Strengthening (AIS) – The Mattes Method* – is a program for everyone!

Over forty years ago, Aaron Mattes began to develop exercise protocols to increase flexibility and strengthen specific muscles and muscle groups. His combined flexibility and strength training - AIS – employs physiologically principled exercises that are systemic, progressive, and unsurpassed in effectiveness when delivered in an instructive and positively reinforcing environment.

Together, they comprise a complete package for everyday wellness, sports training or rehabilitation.

The Mattes Method employs full range of motion movements to contract and strengthen targeted muscles while at the same time stretch the opposing (*antagonist*) muscles. This simultaneous strength and flexibility training develops potency in the newly-established range of motion, making it functional and safe, while balancing soft tissue tone across the joint.

Mattes exercises promote range of motion, restore or develop brain-muscle connectivity, and increase muscle strength, as well as that of all other soft tissues, including fascia, tendons, and ligaments. In fact, as a strength exercise, AIS promotes healthy bones.

I have known Aaron Mattes for more than twenty-five years. He has been my mentor, colleague, and friend. I believe in his work and the effectiveness of its results. I became a physician with Aaron's encouragement, knowing that I would have AIS, one of the most effective therapeutic tools ever developed, in my toolbox. It has been my dream to bring AIS to the medical setting.

In my clinic, QuistMD-The Flexibility, Sports, and Rehabilitation Clinic in Washington, DC, I use AIS with my patients to treat a range of musculoskeletal conditions – from multiple sclerosis to scoliosis, from carpal tunnel syndrome to lower back problems – to relieve pain and facilitate the healing process. I've been impressed with the effectiveness of AIS for neuromusculoskeletal re-conditioning to bring about movement in limbs and digits damaged by stroke. I use it with my hypermobility patients, to strengthen areas that are strained from compensation patterns.

At QuistMD, we rehabilitate after surgery using AIS with strong outcomes, but some of the most impressive results using AIS have been in pre-habilitation. Using AIS to prepare for surgery, many patients have realized substantial benefits:

- *Average recovery time after surgery is generally 50% of the predicted timeframe,
- *pre-habilitation facilitates alleviation of pain symptoms, and
- *in some cases, conditions have improved to the point of making surgery unnecessary.

continued next page

PREFACE *continued*

I also treat lots of athletes, as does Aaron, who want to prevent or recover from an injury, or who want to enhance their performance. We have rowers, runners, soccer and lacrosse players, cyclists, pitchers, and tri-athletes. As an athlete myself, I know how important AIS is for me, before and after training and events.

But AIS can do even more! AIS is an approach to the body, which, when employed with adjunctive methods to address specific issues, can offer a complete approach to health and well-being - the AIS approach.

Aaron Mattes is moving AIS forward. Having long dreamed of a national certification program for AIS practitioners, Aaron has delegated the necessary tasks for its development. The program will create a professional path for AIS practitioners, with a standardized education and training program, leading to multiple levels of practitioner certification.

Aaron also supports efforts to conduct much-needed research, to build the evidence base for AIS. One of the most important research imperatives is demonstrating the efficacy of the two-second hold. My clinic has undertaken a promising, but small, pilot study, but much more data is needed, accompanied by the necessary resources to conduct large-scale trials. In addition, I have begun a formal clinical research study to determine the effectiveness of using AIS in combination with manual therapies to treat cervical strain and sprain in the rehabilitation setting. Because effective stretching is the foundation of flexibility training, defining it may change the way we develop flexibility programs.

AIS is growing and I'm excited to be part of the next generation of leadership! I hope all of you who read this book and learn Aaron's craft will dedicate your practice of it to his experience, knowledge and foresight these many years ago. It is my belief that AIS can and will change medicine.

Dr. Jeffrey P. Haggquist, DO

INTRODUCTION

Human movement is more enjoyable when the body is flexible and capable of performing without restriction. Active people understand the importance of good health and seek methods to improve their abilities by including stretching techniques into their daily schedules.

Throughout my work with thousands of people, including athletes at all levels, I have found that the vast majorities know little about proper stretching techniques. Flexibility varies considerably between individuals of the same age.

Specific movement also helps relieve symptoms of stress. Stress touches all of our lives. Gentle stretching movements can invigorate the circulatory, respiratory, and neuromuscular systems, which help alleviate many of the symptoms of stress.

Flexibility is not a general factor but is specific to each joint. Work or exercise that produce repeated overuse of the same muscles day after day confines joints within a restricted range of motion and tends to reduce flexibility. Every activity requires unique flexibility characteristics. Flexibility developed in one kind of exercise may not be adequate for utilization in another activity.

This book has been produced to illustrate how an individual can stretch properly without endangering the joints, muscles or connective tissues. It is also designed to illustrate how an individual may safely assist others in the stretching process.

Flexibility and proper stretching have played a very important role for enhancing performance, rehabilitation and wellness. Athletic performance and science have converged and established flexibility as the prime determinant among top athletes. The analysis and study of Kinesiology, muscle contractions, muscle metabolism and training have helped athletes set multiple records. Understanding the anatomy and attachments of individual muscles, their effects upon the joint and coordinating movement provides the basis for optimal speed, agility, coordination, but most importantly, flexibility.

Sports super stars and newborns share one thing in common - optimal flexibility. This optimal flexibility is found at the time of birth. For an infant to survive childbirth, an infant must pass through a very narrow birth canal within the mother's pelvis without trauma. As any physician or midwife knows, the most critical moment in birth is the passing of the infant's front shoulder. This point marks the greatest girth of the infant's body. Tragically, if the shoulder fails to pass through, both the mother and infant are at great risk of injury but more importantly death. It is imperative that the shoulder be flexible enough to rotate into the proper birthing position. Therefore, it is no surprise that the most flexible joint in the body is the shoulder.

Athletic achievements and records have been elevated to new heights through the knowledge of kinesiology and resulting increased flexibility. It is of no surprise that flexibility provides for maximal strength performance factors, such as momentum, acceleration, force, inertia, levers and angles of muscle contraction and stretch. Additionally, flexibility is possibly the most important factor in the longevity of an athlete and is key in the prevention and recovery of sports injuries.

continued next page

INTRODUCTION *continued*

The primary obstacle to flexibility is the tightness of the surrounding muscles and fascia of a joint.

Strong tensile forces of the muscle and fascia surrounding the specific joint determine flexibility. Optimizing flexibility through reduction of fascial tension has long been a goal for many manual therapists. Pioneers such as Ida Rolf, Moshe Feldenkrais, Dr. David Simons, and Dr. Janet Travell, have all developed techniques for restoring proper physiological myofascial tension. The manual stretch of muscles and fascia creates mechanical, bioelectrical and bio-chemical responses that promote improved vascular and lymphatic circulation, increased oxygenation, removal of body's toxins, and a more efficient nervous system.¹

In order to better understand our body's health and performance of our bodies we need to have an understanding the nature of fascia and the role it plays in wellness. Fascia is a three dimensional fibrous matrix that provides interconnections throughout all cells of the body. Fascia surrounds muscles, bones and joints, which gives our body structural integrity and strength. Being continuous throughout the body, fascia encompasses the sensory organs of the nervous system, blood vessels and lymph channels. Fascia also serves as an extensive water storage system. Oxygenation of the cells and tissues are regulated by fascia. Furthermore, this fascial network facilitates the removal of our body's toxins. Distortion of the fascial matrix by trauma, aging, posture, hormonal or metabolic imbalances, injury and toxins disrupts the homeostasis of the body. These conditions left untreated promote detrimental contractures, inflammation, lymphatic congestion, peripheral vascular obstruction, hypertension, and a host of other disease states.

Trauma, overuse and age are the most common causes of muscle tightness resulting in protective flexor postures. Our upright biped stance and constricted gait patterns further contribute to functional muscle weaknesses and contractures.²

For the past 42 years, Aaron L. Mattes training and education of functional anatomy and kinesiology provided a basis for his innovative therapeutic technique-Active Isolated Stretching (AIS). Active Isolated Stretching has been incorporated into a therapeutic myofascial technique termed the Mattes Method. The Mattes Method promotes functional and physiological restoration of muscles, tendons, vertebrae, ligaments and joints facilitating healthier superficial and deep fascial planes.

The Mattes Method incorporates a key concept, which states that only relaxed myofascial structures will allow themselves to be optimally stretched. Adhering to Wolff's and Sherrington's Laws, the Mattes Method facilitates optimal myofascial stretching of isolated muscles without activating a protective myotatic reflex contraction. The Mattes Method utilizes a gradual stretch of no greater than 2.0 seconds promoting full range of motion and flexibility without activating antagonistic muscle group contraction.

The Mattes Method is a manual technique that isolates muscles that are to be stretched by contracting the opposing muscles. The clinical success of the Mattes Method are based on sound scientific principles that adhere to the practical application of Wolff's and Sherrington's Laws.

Facilitated stretch based on anatomical knowledge of muscle tendon origin and insertion provides for optimal flexibility without trauma. Although myofascial planes are continuous, there are some

underlying differences. These sheets of fascia are laid down in a very precise way and fall under the general rule called Wolff's Law. Wolff's Law states, "*The form of the bone being given, the bone elements place or displace themselves in the direction of the functional pressure and increase or decrease their mass to reflect the amount of functional pressure.*"³ Therefore, the fibers are laid down along the lines of stress within the body and adhere to proper anatomical positioning. As one tries to stretch a muscle or tendon outside the proper plane of attachments, tension and friction is increased and resistance is encountered that will ultimately prevent full flexibility. Even more detrimental is the potential for injury and muscle tear. The body responds to inappropriate tension by recruiting the opposite muscle groups to contract and deter the stretched muscle from any potential injury.

Sherrington's Law of reciprocal inhibition and muscle contraction states that when a muscle on one side of a joint is contracted, the muscle on the opposite side sends a neurological signal to relax or release.⁴ Incorporating Sherrington's Law in combination with a slow controlled rhythmic stretch of no greater than two seconds provides for a neurologically sound technique that does not trigger a reflexive antagonistic contraction which inhibits the stretch potential of the muscle.

Muscles have the capacity to be stretched up to 1.6 times their resting length.⁵ However, muscles tear and rupture if stretched beyond this length. All muscle tears result in bleeding at the site of the tear. Bleeding promotes scar tissue formation, which is how a body naturally heals itself. The scar tissue is stiff being less flexible than non-scarred muscles or tendons. Wherever flexibility is compromised, muscle weakness and contractures develop.⁶

Our bodies have incorporated a defensive mechanism in order to protect from over stretch and trauma. This protective mechanism involves the stretch sensors within the muscles and tendons. In the muscles, these sensors are termed muscle spindles. In the tendon attachments, these sensors are the Golgi bodies.

Both of these stretch sensors provide a complex protective mechanism known as the myotatic stretch reflex. This myotatic stretch reflex prevents a muscle or tendon from over stretching too far or too fast, thus, preventing injury.

The stretch reflex of the muscle spindles and Golgi bodies are the body's sensors for coordinated muscle contraction and relaxation. Both sensors respond to the changes within every movement that our body performs and processes this sensory input on many levels.

The most basic level that these sensors respond to differentially is within the rapid ballistic movement. The rapid ballistic movement creates premature firing of the stretch reflex causing the opposing muscle to contract. This reciprocal antagonistic muscle contraction protects muscles and tendons from over-stretch and accelerated shearing; both of which result in muscle tears and bleeding.

These stretch sensors relay the information up the nervous system through specialized neurons called gamma fibers. The gamma fibers encode the velocity of the muscle tendon stretch. This information is processed in the spinal cord. When the velocity of the stretch is deemed potentially harmful to the muscles or tendons, the spinal cord reflexively sends input for a protective contraction of the antagonistic muscles.

OBSTACLES TO OPTIMAL FLEXIBILITY

- 1. Underlying medical or physical conditions.** Inflammation, overuse, trauma, hormonal, vascular or neurological injuries can promote fascia, muscle, tendon, ligament and joint tightness resulting in contractures.
- 2. Chronic abnormal posturing.** Wearing of high-heeled shoes, stooping forward and running on the balls of the feet can cause muscle and tendon shortening seen with tight achilles tendon and hamstrings.
- 3. Muscle imbalances.** Muscle building frequently leads to one muscle group being stronger than the opposing muscle. In such cases, one muscle group accelerates the motion whereas the other muscle group decelerates. In overhand throwing, many strains and tears of the shoulder muscles occur during the deceleration phase of the pitching arm, of which the posterior rotator cuff and triceps muscle are usually under strengthened.
- 4. Effects of aging.** Aging promotes atrophy with lost elasticity of muscle and connective tissue. Inactivity further leads to muscle weaknesses. Weaknesses lead to strength and flexibility imbalances between antagonistic muscle groups, which create adverse strains on the skeletal system and resulting postural abnormalities. An increase in the concentration of connective tissue within the muscle belly is noted (endomysium, perimysium). There is also increased collagen cross-linking with age.
- 5. Rapid growth periods during adolescence.** Rapid changes in height or weight result in diminished muscle and tendon flexibility that fails to keep up with the long bone growth.

BENEFITS OF STRETCHING

- 1. Improve preparation for athletic activity.** Warm-up stretches facilitate increased blood shunting to muscles, increased body temperature, reduced muscle tension, heightened neuromuscular integration and improved connective tissue pliability.
- 2. Optimize muscle and tendon range of motion up to 1.6 times resting length.** At muscle lengths greater than 1.6 times its resting muscle length, muscles will begin to tear and bleed. In general, females are more flexible than males.
- 3. Facilitate the removal of metabolic waste products.** Improved oxygenation eliminates carbon dioxide formation; whereas, improved circulation eliminates lactic acid build up.
- 4. Reduce risk of muscle, tendon, ligament and joint injuries.** Improved flexibility optimizes physiologic functions and decreases local ischemic effects.
- 5. Reduced postural tightness due to aging.** Kyphosis, scoliosis, and flexor contractures are created by tightness of myofascial structures supporting the spine as we stand in a forward biped stance.
- 6. Rehabilitate muscle, tendon, and ligament injuries.** Flexibility promotes improved blood circulation and oxygenation, nourishing cells, tissues and organs restoring health and wellness.
- 7. Facilitate the flow of lymphatic fluid.** Optimal stretch stimulates the flow of lymphatic fluid that allows the body to channel waste and toxic products out of the body.
- 8. Enhance athletic performance in conditioning.** Optimal flexibility requires less energy expenditure in movement allowing for increased stamina and performance enhancement of speed, agility and strength.
- 9. Maximize potential and level of athletic performance.** Stretching, flexibility and the use of pliometrics have promoted higher performance abilities, especially noted in jumpers, as a result of increased muscle power and elasticity by virtue of neuromuscular integration and optimization.

ACTIVE ISOLATED STRETCHING (A.I.S.) PRINCIPLES

1. The Five I's of Active Isolated Stretching (A.I.S.)

a. Identify the specific muscles to be stretched.

b. Isolate the muscles to be stretched by using precise localized movements.

c. Intensify the contractile effort of the agonist muscles opposite to the antagonist muscles that are reciprocally relaxing and lengthening on the opposite side of the joint. Reciprocal innervation of the muscles to contract will also simultaneously reciprocally inhibit the opposite side muscle to relax and lengthen.

d. Innervation Reciprocal innervation (*tissue signaled to contract*) contracting action of a muscle or muscle group (*agonist*) which is neurologically encouraged to contract while the opposite side (*antagonist*) muscles are neurologically prepared to relax.

e. Inhibition Reciprocal inhibition reaction of a muscle or muscle group which is neurologically signaled to relax while the opposite side (*agonist*) muscles receive nerve signal to contract.

2. Increase local blood flow, oxygen, and nutrition to tissues before and after activity. The contracting muscles are major vehicles used to deliver blood and oxygen. Repetitive isotonic muscle contractions deliver greater amounts of blood, lymph, and nutrition to specific regions than static or isometric muscle contractions. Numerous repetitions are an important consideration in a thorough warm-up or post activity recovery process.

3. The fuel for muscular action comes from the burning of fatty acids and glucose in the presence of oxygen. The glucose comes from stored muscle fuel (*glucose*) and from the blood. If oxygen is lacking the muscles get energy by converting glucose to lactic acid, a waste product that causes muscle to fatigue. Regular breathing during muscular exertion decreases this fatigue. Breathe regularly and avoid holding your breath, even for short periods. Establish the following breathing rhythm when stretching: Exhale during the work phase of stretching. Exhalation encourages muscle relaxation. Inhale as the body part returns to the starting posture.

4. For maximum safety, stretch the muscles and connective tissue (*fascia*) to the degree where the myotatic (stretch) reflex is activated and move beyond to the point of light irritation. Stretch gently for 1 1/2 to 2 seconds providing less than one pound of assistance, release the pressure, return to the starting position and repeat the prescribed number of repetitions. Releasing the pressure on the tissues being stretched at the point of light irritation helps prevent the reversal contraction of the tissue triggered by the stretch reflex. Intentional prolonged violation of the stretch reflex may result in soreness from overstretching or scar tissue from tissue tearing.

5. Stretching is a daily requirement. Muscles shorten, stiffen, or become tense from work, training, posture, gravity, or stress. Tissue can be revitalized by proper nutrition, rest, and exercise. Exercises such as Active Isolated Stretching help restore full joint movement, decrease tissue soreness and fatigue, increase tissue pliability and improve posture.

6. Overstretched Principle: Range of movement will not be maintained unless the existing limit is reached regularly (*daily*), nor will it be improved unless that limit is exceeded. Increased flexibility is achieved by properly implementing a movement that exceeds the momentarily existing range of motion.

continued next page

7. Reversibility: The cessation of regular specific training causes more loss in mobility (*flexibility, joint R.O.M.*) than other elements such as strength and endurance. Gross flexibility is lost gradually. Specific isolated flexibility should be included as part of the training routine, exercise session, or as a separate specific unit.

8. Comparing and Competing: There is great potential for overstretching in exercise class and during team flexibility workouts, where a wide range of abilities exists. Individuals should not be competitive when it comes to stretching; instead they should stay tuned to their own bodies. Comparing and competing against others in stretching can lead to soreness or injury.

9. Gradualism: The development of flexibility takes time. Some people develop flexibility quite rapidly, while others may require many sessions to reach the same level. Set realistic goals for yourself and progress with consistent, daily effort. Active Isolated Stretching epitomises efficient stretching with maximum results.

10. Relaxation: Other than stretching itself, relaxation is the most important factor in developing flexibility. Fatigue results from tension in contracted muscles, inflexibility, insufficient blood and oxygen and limited nutritional supply to the tissues. The ability to relax is important because it decreases tension, which increases the ability to function effectively and efficiently.

11. Mindset: A positive mental attitude is important. Without a positive mindset, the best possible results cannot be achieved. Believing it is possible, knowing specifically how and what to do as you work for consistency of effort and exactness of detail.

FASCIA EMBRYOLOGY

The embryo differentiates into three functional tissue types: ectoderm, endoderm, and mesoderm.⁷ The ectoderm continues to differentiate and develop structures that give rise to the skin, nervous system, parts of the eyes, the lining of the nose, mouth and anus. The endoderm differentiates into the lining of the alimentary canal, larynx, trachea, bronchi, and the lining of the bladder. The mesoderm, which comprises more than 90% of the entire human body, differentiates into mesenchyme cells that give rise to our internal organs, blood and lymph vessels, bones, muscles, ligaments, cartilage and fascia.

Mesoderm differentiation begins early in the fertilized egg. Cell differentiation is guided by embryonic polar magnetic and electric fields that guide the development into specific tissues and integrate them with neural and hormonal pathways.^{8,9} At the points where the mesoderm divides, migrates or differentiates, mesenchymal nodes are created.¹⁰ These mesenchymal nodes represent relay switches for the neurologic, neurovascular, and piezoelectric systems. These mesenchymal nodes crisscross our body creating longitudes and latitudes that are described in eastern medicine as meridian lines.¹¹ Specific points along these meridian lines are termed meridian points. Meridian points effectively utilized by acupuncturists needling techniques to provide the opening of energy channels to the internal systems of the body. The opening of channels correlate to reintegrating and restabilizing neurovascular and lymphatic channels, rebalancing secondary electric and magnetic fields.¹²

Mesenchyme differentiation provides a protective sheath to the underlying cells, tissues, organs, and body cavities. Early in embryonic differentiation, the primary role of the mesenchyme tissue provides a structural and protective mechanism. Later in life, this mesenchyme tissue, specifically fascia, promotes the internal homeostasis providing nutrition, oxygenation, and removal of metabolic wastes for all cells, tissues, and organs.¹³

Fascia as a protective layer is much more stable than muscle tissue. The fascia is divided into two basic types and layers-subcutaneous and subserous. Subcutaneous fascia connects skin, muscles and skeletal structures. Subserous fascia lines the body cavities.

The subcutaneous fascia has two distinct layers that form continuous sheets over the entire body, superficial and deep. The superficial layer is a double layer that is fused and continuous. This superficial layer is thicker in the abdomen, whereas, it is thinner in the hands.¹⁴

Superficial fascia is very elastic due to the crisscrossing pattern network of fibers. The integrity and proper tensile tone promotes well being. Trauma creates microbleeding that heals into aberrant scar tissue, which change the tensile tension of the musculoskeletal system. Additionally, this scar tissue interferes with the communication channels similar to a snag in a silk sweater that distorts the pattern of the sweater at the point of the snag as well as to points distant. These disruptions in the fascial web create tensile forces where pressure points or trigger points become manifest. If the disruption manifests within the internal organs, disruption of physiological function may result in a disease state.

Deep fascia is denser than superficial fascia. Deep fascia is a deeper layer that protects vital internal organs from trauma. It envelops the muscle (*with the exception of the superficial muscles of the head, neck, and palmar brevis*), nerves, blood vessels, lymph vessels, nodes and glands. The deeper layer nourishes the skin and regulates body temperature, thus maintaining homeostasis. The deep fascial system is continuous with the subcutaneous fascial system connecting the superficial layer to the interior, integrating within the deeper body cavities, spinal canal, dura and meninges. A woman who experiences pain of menses through uterine congestion creates fascial tension that disrupts the normal tensile forces and refers pain to as far away as the top of her head.¹⁵

Deep fascia is able to store water.¹⁶ Hydrated fibrous tissue creates a smooth coating allowing fascial structures to glide over each other without friction.¹⁷ Dehydration, inflammatory processes and trauma deplete the smooth hydrated matrix creating adherence to tissues as if they were partially glued. This gluing creates tension, fatigue and leads to ischemia and build up of metabolic toxins.

Subserous fascia of the thoracic cavity is called the pleura. In the abdominal cavity, it is the peritoneum. The subserous layers of the thorax and abdomen are separated by the diaphragm that stretches between these cavities. Subserous fascia differentiates into other visceral fascial layers that envelop and connect to various internal organs. Not only do the subcutaneous and subserous fascial layers connect creating a matrix continuum from the surface of the skin into the deep visceral interior; but, additionally, connect all cells, tissues and organs inside the body to the exterior of the skin layers. Through this fascial network, pathways connect one part of the body to any other, running up to down, down to up, inside to outside and outside to inside.

FASCIA AND WELL-BEING

Health, as defined by an individual, is usually a matter of feeling good. From this perspective, health is the absence of disease - disease being some recognizable form of discomfort. In modern medicine, health is usually defined in terms of homeostasis. Homeostasis consists of an inter balancing of body chemistry and cellular function as measured by laboratory findings, and other diagnostic evaluations which are then compared to statistical norms of larger populations. The relationship of fascia to health has two aspects: response to the external environment and response to the internal environment.

The fascial network plays an integral role in maintaining this homeostatic state. Homeostasis is facilitated by proper integration of biochemical functioning in response to changes in the internal and external environments. The fascial network of the body responds effectively to external forces such as trauma, overuse syndromes, and poor physical mechanics. In these circumstances, external forces affect the body over short and long periods of time, challenging the fascia to maintain functional integrity and homeostasis. External environmental trauma alter both the contractile force of the collagenous fibers and the thixotropic hardening of the ground substance.¹⁸ This causes a disruption in the movement of muscular tissue, neurological impulses, channeling of blood and lymphatic fluids, hydration, oxygenation, and nutritional homeostasis. Restoring the physiological process continually require adaptations within the three-dimensional fascial fibrous matrix primarily on the subcutaneous fascial plane. Myofascial motion facilitates hydration, oxygenation, and removal of toxins and promotes healing.

The second relationship of fascia to health relates to how fascia responds to the challenges within the internal environment of the body. Various disease states such as diabetes, peripheral vascular disease, hypertension and inflammatory conditions of rheumatologic diseases create significant changes within the deeper fascial matrix. These internal derangement's create similar physical symptoms like those of external trauma with secondary range of motion limitations, disrupted neurovascular lymphatic channels, functional weaknesses, postural imbalances and secondary contractures. These internal derangement's cause a greater disruption in the subserous layers and the deeper fascial layers than the external factors, whereas, external trauma creates more disruption to the superficial subcutaneous fascial layer.

The superficial subcutaneous and the deeper subserous fascial layers respond differently to therapeutic modalities. The subcutaneous fascial layer is very superficial and provides the protective fibrous layer for our body. With any external trauma this fibrous matrix stretches and subsequently tears as it absorbs impact and heals through forming secondary scar tissue. Therapeutic modalities such as heat, ultrasound, magnetics and massage promote restoration of energy fields allowing for facilitation of flexibility and movement. These physical modalities are only effective on the more superficial layers of the subcutaneous fascial plane. Unfortunately, the deeper layers in the subserous and the deeper fascial structures within the pelvis and the spine do not benefit from these superficial modalities-heat, cold, ultrasound, magnetics, electrical currents and massage.

The deeper subserous layers, as well as the deeper myofascial structures close to the pelvis and spine, fail to respond to these physical modalities. This deeper fascial plane needs stimulation of the fibrous fascial matrix through sound knowledge and application of functional anatomy and kinesiology. Additionally, the sequence of myofascial release must be done with precision, releasing the outer myofascial structures in proper order with the goal of releasing the deeper fascial structures surrounding the joints and visceral structures.

The Mattes Method is an efficient and effective method of restoring both superficial and deep fascial wellness. This method of release is well described and detailed in subsequent chapters of this book.

In summary, at all levels within the body, connective tissue forms a continuous fibrous network that allows muscles, bones, and blood vessels to communicate down into individual cells, coordinating and restoring proper physiological function in order to maintain homeostatic wellness.¹⁹

FASCIA AND AUTONOMIC NERVOUS SYSTEM

Fascia the autonomic nervous system has a close anatomical relationship to the extent that autonomic ganglia are embedded into the fascial matrix. Studies suggest that autonomic dysfunction may arise from fascial dysfunction. Fascial disruption affects circulation and nourishment of these autonomic ganglia resulting in aberrant dysfunction.

Research shows that connective tissue is capable of communication, connection, and energy conduction in the form of electron and proton transmission.²⁰

Dr. James Oschman provides insight to the fascia as a semiconducting communication network conveying bioelectric signals between every part of the body. The connective tissue and fascia form a mechanical continuum, extending throughout the entire body. All systems of the body are enheathed in connective tissues. All movements of the body as a whole or any of its smallest parts create tensions that are manifest in the connective tissue fabric. Each tension, each compression, each movement, causes the connective tissue crystalline lattice to generate bioelectric signals that precisely describe and encode each tension, compression and resultant movement. This semiconducting bioelectric communication network channels information along fascial lines that correlate with the meridian system of Eastern Medicine.²¹

These created mechanical bioelectric and biomagnetic signals travel through the connective fabric and network, providing information for each cell and tissue to properly respond to every tension, compression, and movement we make.²²

PHYSICAL PROPERTIES OF CONNECTIVE TISSUE

The connective tissue matrix is a very important water storage compartment and needs to be well hydrated. Hydration promotes smooth, non-friction mechanical movement of muscle over bone. The more hydrated the connective fibrous matrix, the more effective the magnetic, electrical and neurological conduction is in transmission.²³ The drier the matrix, the less conductive transmission. Respiratory movements expedite the absorption of water in the upper part of the peritoneum, whereas, deep abdominal breathing promotes the water absorptive and storage process.²⁴

Therapists and healers have recognized that a well-hydrated individual responds quicker and better to manual therapy and massage. Water consumption before, during, and after therapy is important in maintaining a well-hydrated fascial matrix.

CENTER OF GRAVITY

The Chinese have felt that the relative symmetry of the body is extremely important in channeling inner energy referred as "Qi or Chi". Qi is an important element in restoring and maintaining the health of an individual.

If the body is imbalanced or distorted for whatever condition, the center of gravity will shift slightly and lie off the center. The center of gravity of a person lies somewhere in the abdomen below the umbilicus. The location is roughly two inches in front of the second sacral vertebra. During normal gait, this center of gravity oscillates up to two inches in a vertical direction.²⁵

Alterations in the symmetry create imbalances which affect the underlying electrodynamic fields, thus disrupting the nourishing channels within the various organs and tissues. Consequently, a person who has a slightly curved spine, one shoulder higher than the other, or the hips and pelvis slightly tilted will experience a shift from the center of gravity and develop an abnormal contracted flexed gait pattern. These musculoskeletal distortions promote changes in structural tensions that lead to increased joint degeneration, obstruction of lymphatic channels and neurovascular congestion.²⁶

BREATHING AND FASCIA

Proper breathing techniques have been important in maintaining health. Yoga embraces proper breathing stating that if a person has a perfect breath, they will have perfect health. Many other therapy and conditioning programs follow specific breathing techniques.

With every breath in and out, the body responds in synchronicity with that movement. Muscles expand and contract pumping blood to the heart and pumping lymph through the body. Each vertebra in the spine moves in synchronicity with the breathing cycle in order to maintain integrity of the spine and the spinal cord. Correspondingly, cranial bones make very small movements that alter the pressure inside the cranial vault promoting cerebrospinal fluids circulation. This proper cerebrospinal fluid circulation nourishes and promotes optimal neurological functioning.

The principle of Chinese medicine states that more powerful our breath cycle, the more powerful the flow of energy through the meridian channels.

FASCIA AND MUSCLE IMBALANCE

One muscle acts as an antagonist to the other and will often be stronger, placing the balance of stress on the joint capsule. This phenomenon frequently occurs in the hamstrings-quadriceps group. The basic muscle imbalance between the quadriceps and the hamstrings results in cramping and spasms with secondary hamstring tightness. Usually the quadriceps is stronger, with less emphasis being placed on hamstrings strengthening. The athletes hamstring pulls and tears are frequent phenomena which may limit one's career. Correction is done through strength training of the hamstring muscle groups. There will always be a slight imbalance as the quadriceps are 30-40 percent stronger than the hamstrings. Through proper hamstring stretching, and strengthening one can reduce the risk of hamstring pull or tear.

Why do some muscles strain or tear more frequently than others? Unbalanced over-training or under-training of muscle groups leads to strains or tears, especially through quick acceleration-deceleration movements. The origin of a muscle or tendon is the attachment that is immovable, on the trunk, or nearest the trunk. The insertion of the muscle or tendon is the furthest point away from the trunk. The origin and insertion are never on the same bone. Another factor that contributes to tearing is the number of joints a muscle transverses. Two joint muscles, such as the hamstrings, quadriceps, tensor-fascial band, hip adductors, hip flexors, and gastrocnemius (*calf*) are the more likely to be torn than single joint muscles. Muscles that have proper conditioning, flexibility and balance have significantly lower incidences of straining or tear.

EMOTIONAL MEMORY

Our bodies have an innate protective mechanism in that any type of trauma, i.e., physical, metabolic, nutritional, mental or psychological, can be encoded into our memory stores such that we learn to avoid this trauma again.²⁷ This coding of traumatic experiences is termed "emotional memory".²⁸ A simple example of this phenomenon is seen in children who normally enjoy full range of motion. As a child experiences pain while performing leg splits, this unpleasant painful activity will be remembered and encoded into emotional memory. Any further attempt to repeat this motion will be discouraged by the conscious and subconscious.

MUSCLE MEMORY

Peak athletic performance is achieved through proper instruction in biomechanics and conditioning. Most importantly, the value of kinetic analysis is benefited only when the athlete has encoded muscular movements to memory.²⁹ Muscle memory is identical to mind memory. Perform a physical movement repetitively and the same phenomenon will occur. Gymnasts memorize their movements, therefore, performing many acrobatic feats automatically.

PHYSIOLOGIC WARM-UP & COOL DOWN PERIODS

The body responds optimally when proper integration of information is processed and appropriate physiological responses are coordinated. Scientists have mapped the brain with the benefit of PET scanning, which monitors and quantifies glucose utilization. When specific areas of the brain are functioning, there is a shunting of cerebral blood that occurs which increases the blood supply and glucose utilization within that area. This visualization of enhanced blood flow and glucose utilization helps to map the brain control mechanisms.

Studies have demonstrated that athletes in physical activity increase blood flow in the cerebellum and the motor cortex. A sharp shooter marksman who aims a rifle toward a target shows increased blood flow in the occiput when he views through the lens of his telescope. A singer shows increased uptake in the non-dominant parietal hemisphere, the control center for singing in the brain.

continued next page

PHYSIOLOGIC WARM-UP & COOL DOWN PERIODS *continued*

This physiologic cerebral blood shunting for specific activities occurs within minutes. For activities such as digestion of food, or approximately 20% of the blood supply is routed toward the gastrointestinal tract within a 20-minute period. This 20-minute period is important since it quantifies the amount of time required to provide the proper blood flow for digestion - a complex physiological process.

Correlating this 20-minute time period for digestion relates to the wisdom of an athletic warm-up period prior to any strenuous exercise. The body requires a controlled warm-up period to prepare itself physiologically with proper body temperature, increased vascularity, and neuro-sensitization. This results in increased fascial and connective tissue pliability.

Additionally, the brain and neurofilaments are primed with increased blood flow, which promotes more effective and efficient neuroelectrical firing within specific neural tracts and the autonomic ganglia within the fascia. The fascial autonomic ganglia regulate vascular elasticity, hormonal releases, and coordinate piezoelectric fields.

A cool down period is also important but frequently under appreciated by many individuals and athletes. The cool down period facilitates the removal of metabolic waste products (*lactic acid and carbon dioxide*), improves oxygenation, allows for gradual cooling of local tissue and reduces post exercise ischemia that creates secondary stiffness and soreness of muscles and joints. Utilizing a proper system of stretching myofascial structures after exercise allows the body's muscles, ligaments and tendons to maintain their optimal range of motion and well being.

ATHLETIC PERFORMANCE

The efficiency, precision, and freedom with which the athlete is able to move will help regulate athletic performance. Efficiency is dependent upon training and conditioning. Facilitated stretching allows for more intense training. Restrictions from pain, spasms, and tension inhibit freedom of movement. Without freedom of movement, precision is adversely affected. The Mattes Method with Active Isolated Stretching (AIS) reduces many of these restrictions.

Some beneficial effects of the Mattes Method are:

1. Active Isolated Stretching improves oxygenation and nutrition of myofascial structures promoting growth and repair.
2. Active Isolated Stretching stimulates the circulation and drainage of lymph, which helps eliminate metabolic wastes.
3. Active Isolated Stretching improves flexibility and health of muscles, tendons, and ligaments.
4. Active Isolated Stretching breaks down the friction and "gluing" among fascial sheathes.
5. Active Isolated Stretching separates fibrosis and breaks down adhesions that may result from trauma or inflammation.
6. Active Isolated Stretching realigns collagen fibers.
7. Active Isolated Stretching reduces muscle spasm.
8. Active Isolated Stretching reduces the risk of muscle strain and tear.

BENEFITS OF AN OPTIMAL FLEXIBILITY PROGRAM

1. Athletes reach peak performance sooner and sustain it longer.
2. Muscles respond more quickly and powerfully.
3. Performance is improved with reduced chance of injury.
4. Muscle stiffness is reduced as excess lactic acid buildup is removed. Reduction in metabolic wastes allow muscles to rejuvenate quicker after intense workouts or athletic events.
5. Athletes recuperate more quickly. Healing of injuries is faster and stronger without the loss of power due to the development of transverse fibrosis.
6. Reduction in spasms, splinting, and tension as a result of ischemia.
7. Athletes increase their career span and level of performance.

In spite of our best attempts to avoid the inevitable aging process, we succumb to a constricted flexor posture in our torso and four extremities. Fortunately, through proper stretching and restoration of flexibility, we can maintain a healthier homeostatic, pain free state, and enjoy a better quality of lifestyle within the three dimensional physical plane.

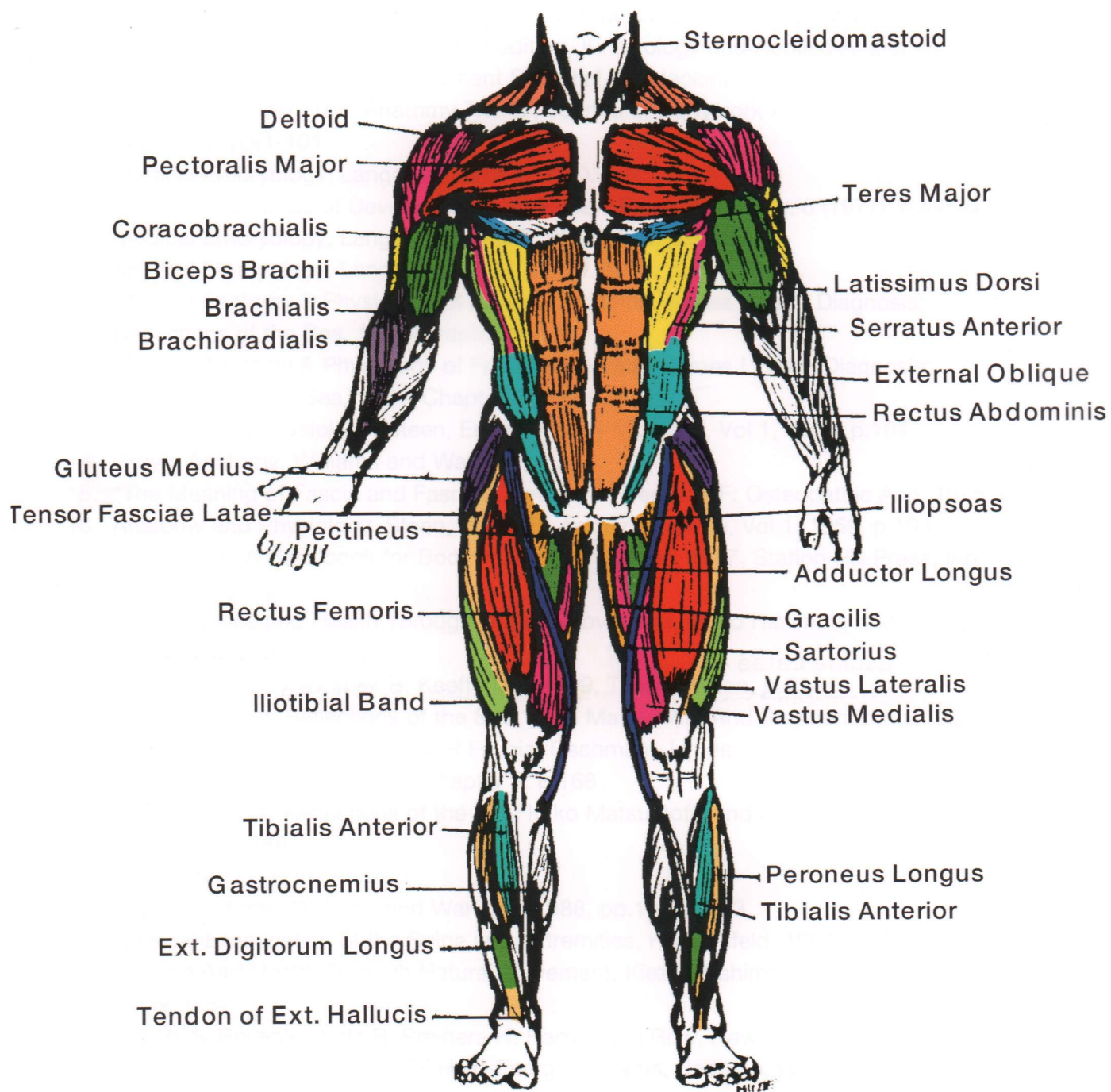
The influence of Professor Robert E. Shelton, University of Illinois, Champaign-Urbana, contributed greatly, both directly and indirectly, to the evolution of my basic theory for teaching musculoskeletal evaluation and flexibility techniques.

This book is a guide to teaching the specific methods of isolated stretching exercises, both active and active-assisted. Active Isolated Stretching (AIS) is a result of my 42 years of laboratory research; experimentation; and experience in clinical treatment, sports medicine, and teaching. During this time, I have refined and added to these techniques on a regular basis, as I continued updating this work. One of the models that has helped me persevere in developing better techniques are the words of the great inventor and industrialist, Henry Ford: *"Thinking always ahead, thinking of always trying to do more, brings a state of mind in which nothing seems impossible."* This statement has become part of my personal philosophy in which I believe that exceptional skill in performing a procedure is an art, and knowledge evolved and formulated in the search for truth is a science.

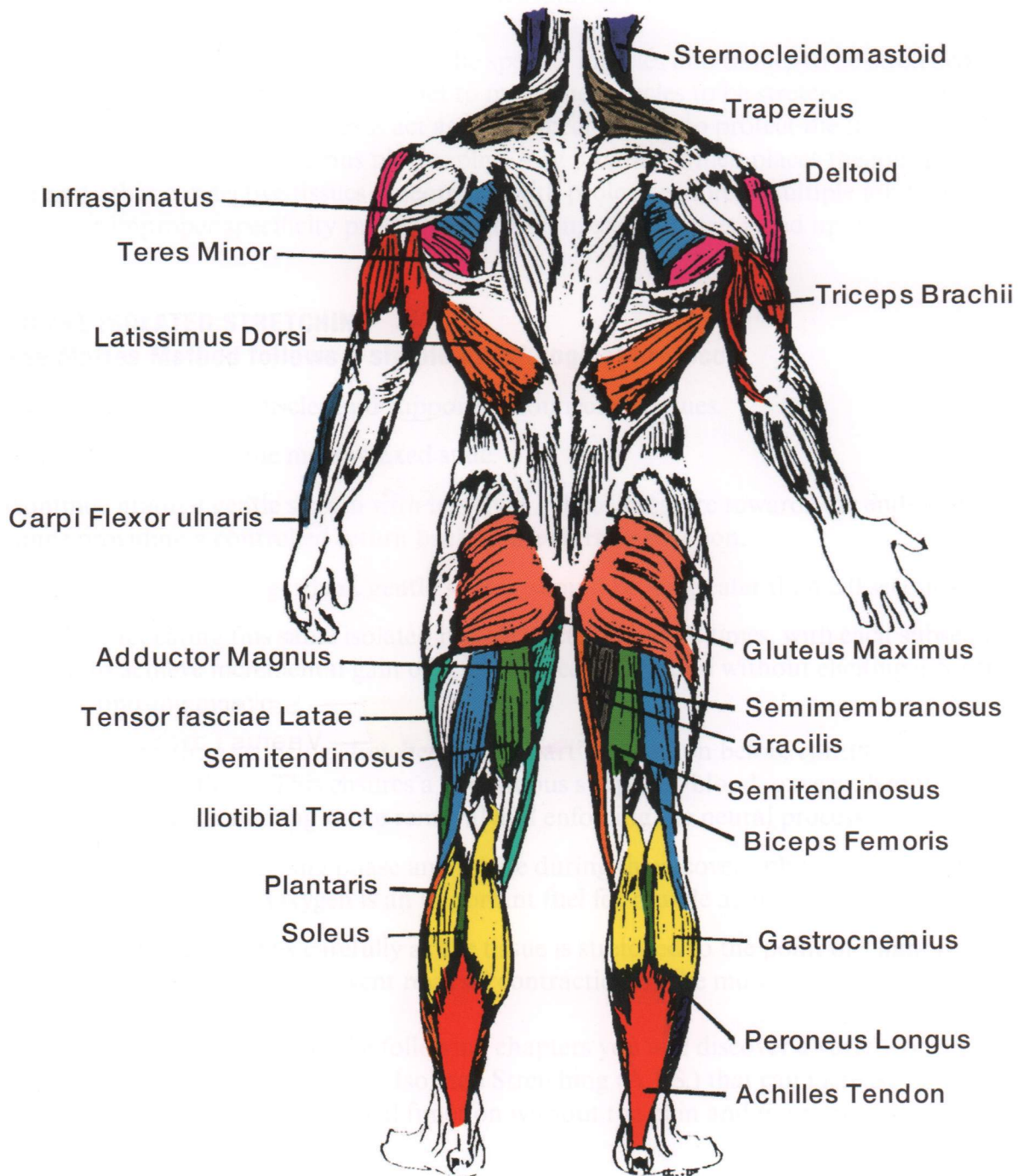
REFERENCE

1. "Effects Of Skeletal Muscle Fiber Deformation On Lymphatic Volumes," Majjoni MC, Skalak TC, Schmid-Chonbein LW, AM J. Physiol 1990, Sec: 259 (6Pt 2): H 1860-8
2. Smythe HA (1989) Nonarticular Rheumatism and Pschogenic Musculoskeletal Syndromes In McCarthy DJ (ed) Arthritis And Allied Conditions: A Textbook Of Rheumetology pp.1241-1254, Philadelphia: Lea & Febiger
3. Wolff, J., 1892, Dastiesetz der Transformation der Kochen. A. Hirschwald, Berlin
4. Rasch, Philip J, Roger K. Burke. 6th edition, Kinesiology and Applied Anatomy, p.63
5. Sweigard, Lulu F. Human Movement Potential, Its Ideokinetic Facilitation. p.139
6. Myers, T.W. 1997. The 'Anatomy Trains', Journal of Bodywork And Movement Therapies: p.91-101
7. Medical Embryology, Langman, Jan MD, PhD. 1975. p.51
8. "Electrical Controls of Development", Ann. Rev. Biophys. Bioeng. 6 (1977): p.445-476
9. Medical Embryology, Langman, Jan MD, PhD. 1975. p.39
10. Medical Embryology, Langman, Jan MD, PhD. 1975. p.39
11. Modern Anatomy & Physiology of Fascia, Oschman, James L. Hara Diagnosis: Reflections of the Sea, 1988 Chapter 8, p.164
12. Modern Anatomy & Physiology of Fascia, Oschman, James L. Hara Diagnosis: Reflections of the Sea, 1988, Chapter 8, p.164
13. Anatomy and Physiology, Steen, Edwin, Ashley Montagu, Vol 1, 1959, p.104.
14. Gray's Anatomy, Williams and Warwick, p.523
15. "The Meaning of Fascia and Fascial Continuity", Becker RF: Osteopathic Ann. 1975; p.35-46
16. Anatomy and Physiology, Steen, Edwin B. Ashley Montagu, Vol 1, 1959, p.104
17. Job's Body: A Handbook for Bodywork, Juhan Deane, 1987, Station Hill Press, Inc. New York. p.81
18. Sotai-Balance and Health Through Natural Movement. Kiezo Hasimoto and Y. Kawakami. p.63-64
19. Know Your Body, Emmek B. Keeffe MD, 1999, Times Edition, p.21
20. Hara Diagnosis: Reflections of the Sea, Kiiko Matsumofo And Stephen Birch, 1988, p.163
21. Modern Anatomy & Physiology of Fascia, Oschman, James L. Hara Diagnosis: Reflections of the Sea, 1988, Chapter 8. p.168
22. Hara Diagnosis: Reflections of the Sea, Kiiko Matsumofo And Stephen Birch, 1988, Chapter 8, p.188
23. Ibid: p.190
24. Gray's Anatomy, Williams and Warwick, 1988, pp.1332-1333
25. Physical Examination of the Spine and Extremities, Hoppenfeld, 1988, p.135-136
26. Balance And Health Through Natural Movement. Kiezo Hashimoto and Y. Kawakami, Sotae. p.57
27. The Body Reveals, Jurtz R. Prestera H. Harper and Row, New York. 1976. p.42
28. Trauma Energetics: A Study Of Held-Energy Systems, Redpath, WM, Barberry Press, Lexington, MA. p.2
29. Science "Increased Cortical Representation Of The Fingers Of The Left Hand In String Players: Elbert T., Panter C., Weinbruch C., Rockstroh B., Taub E., 1995. 270: p.305-307

MAJOR ANTERIOR MUSCLES



MAJOR POSTERIOR MUSCLES



ACTIVE ISOLATED STRETCHING

Active Isolated Stretching (A.I.S.) is an important part of warm-up, warm-down, training or rehabilitation. Specificity is important to achieve maximum circulation, oxygenation, relaxation, lymphatic circulation, nutritional deliverance and tissue elongation.

The process begins with identification of the specific muscles and tissues to be stretched. The opposite side antagonist muscles contract to move the muscles to be stretched. The golgi tendon and myotatic stretch reflexes act as safety mechanisms to protect the tissues acted upon. "No pain, no gain" is a dangerous philosophy. Any program which places the joints, muscles, fascia and other connective tissues in jeopardy with prolonged force, multiple joint stretching exercises or improper specificity protocols will endanger the tissues acted upon.

ACTIVE ISOLATED STRETCHING

The Mattes Method follows a simple physiological protocol:

1. Identification of the muscles and supportive connective tissues.
2. Isolate the muscle in the most relaxed state.
3. Continue gradual gentle stretch with less than 1 lb. of pressure towards the end point of range providing a controlled return back to the starting position.
4. The entire duration of gradual, gentle stretch should be no greater than 2.0 seconds.
5. Continue repeating this same isolated muscle stretch up to 10 times, with each subsequent stretch to achieve incremental gain of a few degrees of motion without eliciting a contraction of the opposing muscle.
6. Always return the area being stretched to the starting position before continuing the prescribed repetitions. This ensures a continuous supply of blood, oxygen, lymph and nutrition, while stimulating waste removal and enforcing the neural process.
7. Exhale during the stretching phase and inhale during the recovery phase (*during the return to the starting position*). Oxygen is an important fuel for muscle action.
8. Monitor the stretch reflex carefully as the tissue is stretched to the point of "light irritation" then release the tension to prevent reversal contraction of the muscles-fascia being stretched.

As you examine the exercises in the following chapters you will discover a variety of detailed specific exercise protocols for Active Isolated Stretching (A.I.S.) that can increase tissue-joint movement and improve physiological function without the pain and injury potential that exists in many programs.

Active Isolated Stretching (A.I.S.) is a vital component of injury prevention, rehabilitation, sports training and performance, longevity enhancement and in general a healthier lifestyle.

SHOULDER FLEXIBILITY : ACTIVE

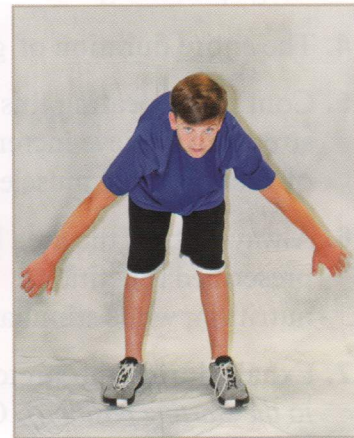
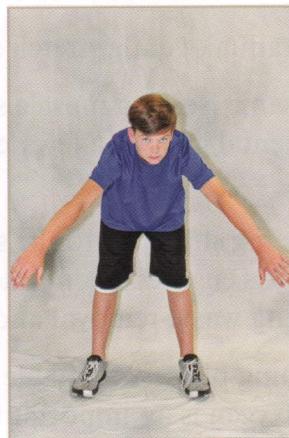
The following exercises are specially designed to stretch glenohumeral, acromioclavicular, sternoclavicular, scapular musculature and connective tissue. They are intended to help prevent muscle strains, joint sprains, and joint dislocations; help improve performance of the shoulder regions; and are beneficial post-injury and post-surgery. These flexibility exercises isolate each muscle of the shoulder and should be performed carefully for maximum results. These exercises may be done sitting or standing. Stretching is most effective if performed 1½-2 second's maximum, and released to the starting position and repeated. For maximum effectiveness exhale while stretching; inhale while returning to the starting position. Mild pressure (less than one pound) is most effective in releasing muscle joint capsule and connective tissues. Too much pressure in stretching will often result in injury or residual soreness later on. For Assistance see assisted section titled: Shoulder Flexibility Assisted. When stretching the shoulder region the neck stretching exercises should be included. Many muscles of the shoulder affect the neck and certain neck muscles affect shoulder function. (See *Shoulder Protocol* listed in *Appendix*)

SHOULDER CIRCUMDUCTION: CIRCLES

Introduction: Circumduction increases circulation in the shoulder complex and arm. Perform arm circles toward and away from the body midline. The arms should hang like wet noodles when doing bent-over circumduction.

Method: Lean the body forward 45 degrees, bend the knees, and tighten the stomach muscles. Begin with small circles and gradually increase in size. When completed, change directions and repeat the effort. You may also perform some upright giant arm circles (*circumduction*) from a standing position if the shoulder is not sore or injured. Giant circles are often performed prior to athletic practice or performance. Keep the arm close to the body both forward and backward

Repetitions: 10-15 in each direction.

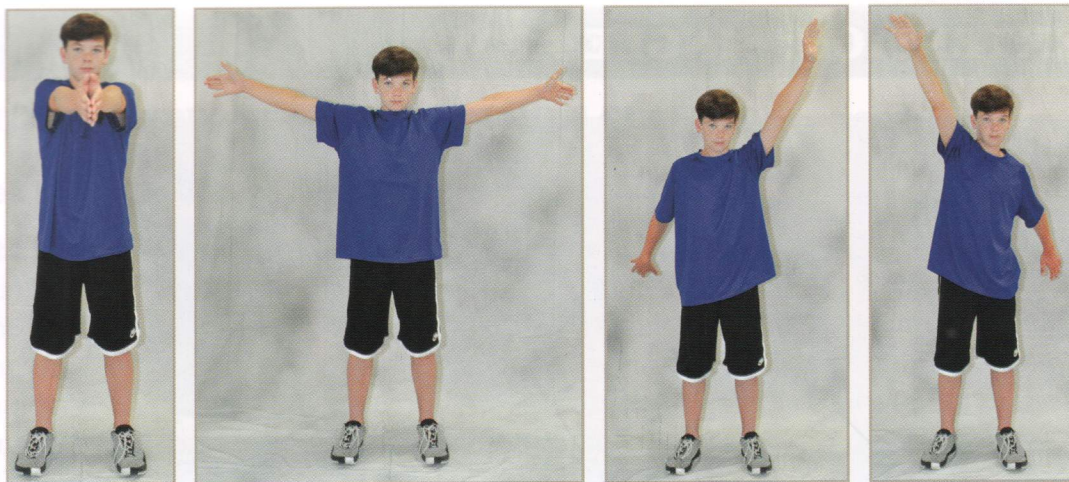


HORIZONTAL (ABDUCTION): EXTENSION I

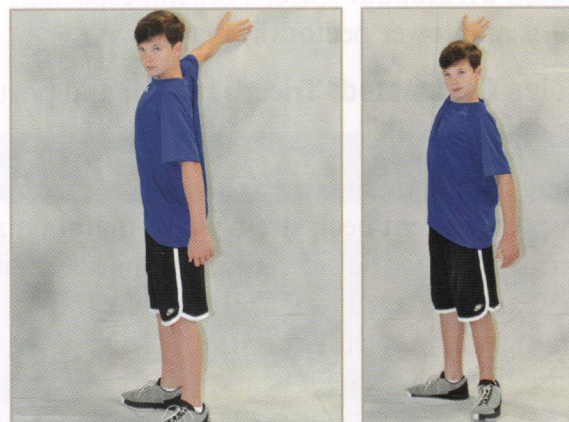
Muscles Stretched: Anterior chest and shoulder muscles including the pectoralis major, pectoralis minor, teres major, anterior deltoid and coracobrachialis.

Muscles Contracted: Trapezius, infraspinatus, teres minor, rhomboid major and rhomboid minor muscles.

Method: Face the palms forward with the arms slightly below shoulder height. Reach backward, keeping the arms straight, and draw the shoulder blades (*scapulae*) as close together as possible.



Return to the starting position with the palms together. Repeat the exercise, raising the level of the arms with each repetition in order to include the upper pectoral fibers. Eventually the arms will be 18-24 inches above shoulder height when stretching the upper fibers. You may incorporate the use of a wall, doorway, or suitable stabilizing surface to assist with the stretch. To properly stretch these muscles, exhale and with your hand in contact with the surface, contract the posterior shoulder muscles and reach backward with the arm as you rotate the body (*pivot*) away from the stabilizing surface. The feet point 180 degrees away from the table. Inhale while returning to the starting position and repeat the movement. Gradually, elevate the arm in order to lengthen the fibers above those previously stretched.

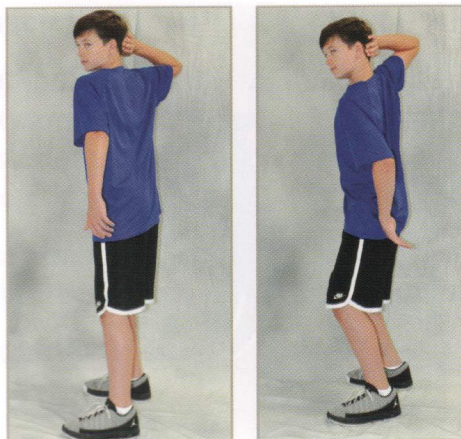


Repetitions: 10 or more if needed.

SHOULDER (ABDUCTION): EXTENSION II

Muscles Contracted: Trapezius, infraspinatus, teres minor, rhomboid major and rhomboid minor.

Muscles Stretched: Pectoralis minor, anterior deltoid, pectoralis major, especially clavicular fibers, and long head biceps.



Method: Place one hand behind the head with the elbow bent 45 degrees. Place the elbow against a stabilizing surface such as a wall or a doorway. The feet are facing 180 degrees away from the arm. Squat a few inches as you pivot away from your arm. Return to the starting position and repeat the movement, gradually increasing the range. Repeat another series if necessary and switch to the opposite side. An important exercise for the neck, shoulder and thoracic limitations. Excellent pectoralis minor stretch.

Repetitions: 1-2 sets of 5-10.

HYPEREXTENSION: SINGLE ARMS

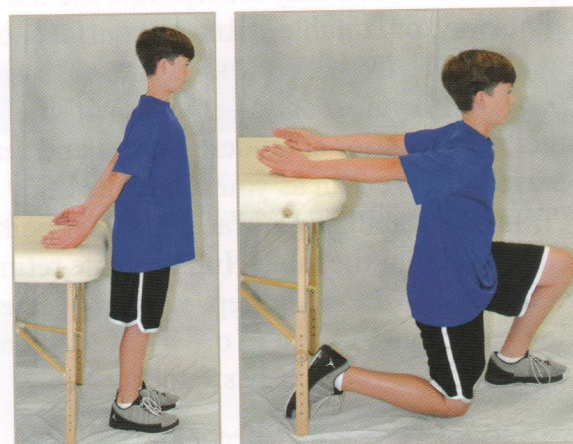


Muscles Stretched: Biceps brachii especially short head and insertion, anterior deltoid, anterior serratus and lower pectoralis major.

Muscles Contracted: Triceps brachii and posterior deltoid muscles.

Method: Stand or sit erect. The head is forward 15 degrees to prevent neck stress while, maintaining the arms close to the side. Exhale while reaching both arms backward as far as possible. Inhale, when returning to the starting position. This is an excellent exercise to free the short head of the biceps brachii muscle. Exercise may be assisted with the arms on the top of a table, counter, bench press etc. Place with one leg 18 inches in front of the other and squat while lifting the arms. Also, perform this exercise with the palms facing both downward and then upward. Stand erect and repeat the effort.

Repetitions: 6-10.



SHOULDER HYPEREXTENSION: HANDS CLASPED



SHOULDER HYPEREXTENSION (HANDS CLASPED) *continued*

Muscles Stretched: Biceps brachii and anterior deltoid.

Muscles Contracted: Triceps brachii and posterior deltoid.

Following single arm shoulder hyperextension, clasp the hands (*interlace fingers*), palms facing away from the body (*which keeps the shoulder blades apart*), while maintaining your elbows in an extended position. Exhale and reach back as far as possible without bending the trunk forward or allowing the shoulder blades to come together (*adduct*). Release, inhale and return to the starting position. Positioning the humerus in an internal rotated position is a most specific method to isolate the long head of the biceps. If unable to do the long head bilaterally, perform one arm at a time unilateral with the thumb facing upward and the palm facing away from the midline. For Active Assistance use a table, counter bench press unit, etc. and perform gentle squat with the feet spread 18 inches, one ahead of the other, while raising arm(s). Stand erect and repeat.

Repetitions: 1-2 sets of 5-10.

LONGHEAD BICEPS BRACHII: SINGLE ARM



Muscles Stretched: Anterior deltoid and especially long head of biceps.

Muscles Contracted: Triceps brachii and posterior deltoid.

Method: The arm is fully extended and the humerus is rotated inward (medially) with the palm facing outward and the thumb pointed upward. Maintaining the elbow close to the side and lift the arm posterior toward shoulder level to stretch the long head of the biceps brachii. The long head of the biceps is often inflamed and is almost always involved with rotator cuff problems.

The arm may be placed on a counter or stabilizing surface and the subject may squat while attempting to lift the arm and apply additional stretch. Stand and repeat the action.

Repetitions: 1-2 sets of 5-8.

SHOULDER ABDUCTION: POSTERIOR OBLIQUE

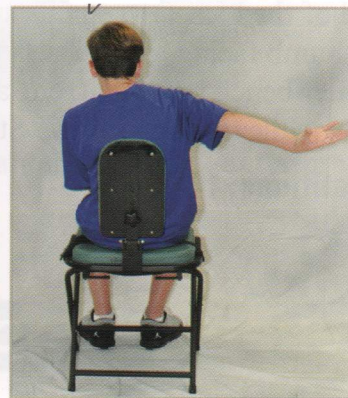
Muscles Stretched: Medial belly biceps brachii, coracobrachialis and anterior deltoid.

Muscles Contracted: Posterior deltoid, and triceps brachii.

Method: Begin exercising with the palm facing forward and against the side of the body. Do not allow the opposite side of the shoulder girdle to move forward. The movement is a combination abduction and hyperextension at a 45 degree angle moving towards shoulder level. This will isolate the medial belly of the biceps brachii. Perform the same exercise with the palm facing backward moving at the same 45 degree angle. This will stretch the remaining medial biceps fibers and coracobrachialis muscle.



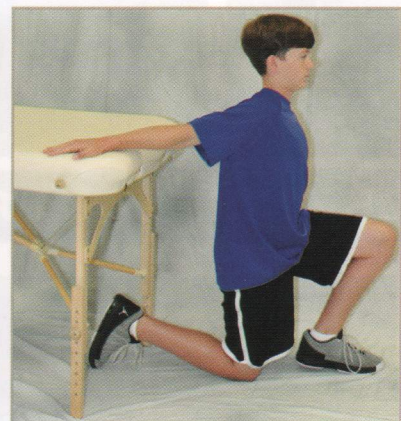
Palm Down



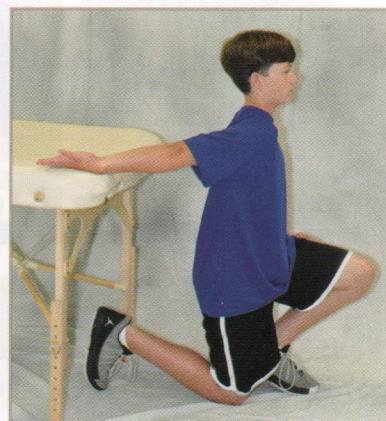
Palm Up

Active assistance is performed with the arm on a counter or elevated surface. Reach up with the arm and squat down to assist. Perform having the palm face forward and the palm facing backward.

Repetitions: 1-2 sets of 5-10 reps.



Palm Down Kneeling



Palm Up Kneeling

SHOULDER ADDUCTION: POSTERIOR OBLIQUE

Muscles Stretched: Lateral biceps brachii belly, supraspinatus, pectoralis major, pectoralis minor, latissimus dorsi, teres major, and subscapularis.

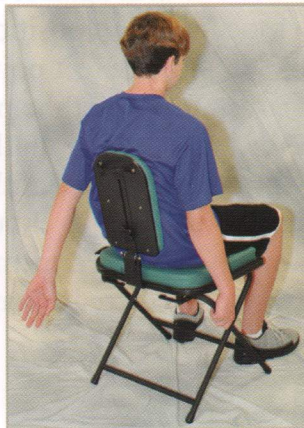
Muscles Contracting: Posterior deltoid, triceps brachii, infraspinatus, and teres minor.

Method: Begin exercising the arm with the palm facing forward and against the lateral hip. Do not allow the opposite side of the shoulder girdle to move forward. From the side of the posterior hip move the arm across the back of the body into adduction and hyperextension at a 45 degree angle toward shoulder level. The movement is first performed with the palm facing forward and stretches the lateral biceps belly. The exercise is then performed with the palm facing backward, releasing the proximal end of the latissimus dorsi and the remaining fibers of the lateral biceps brachii. Begin from the side and move posterior and upward at a 45 degree angle. This is also an excellent stretch of the supraspinatus, pectoralis major, pectoralis minor, subscapularis and teres major.

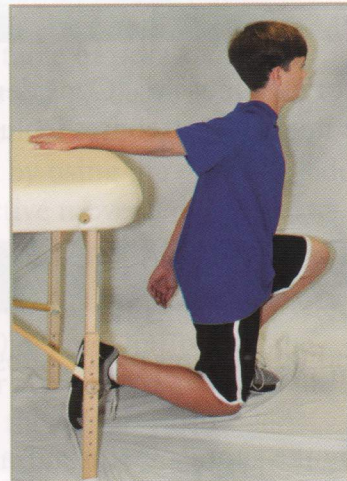
Repetitions: 1-2 sets of 5-10.



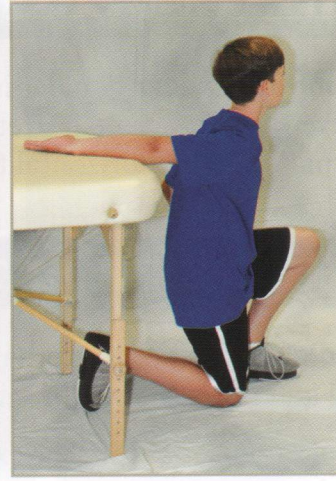
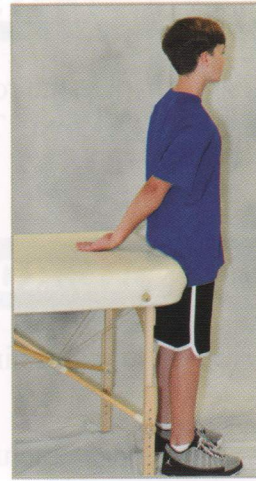
Palm Down



Palm Up



Kneel Palm Down



Kneel Palm Up

SHOULDER HORIZONTAL ABDUCTION: POSTERIOR

Muscles

Stretched:

Anterior deltoid, subclavius, pectoralis minor and clavicular portion of the pectoralis major.

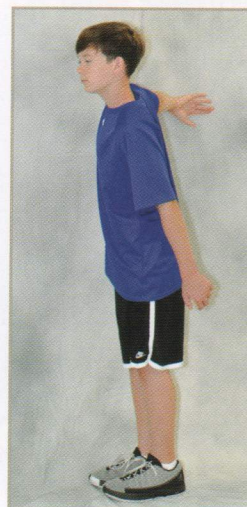
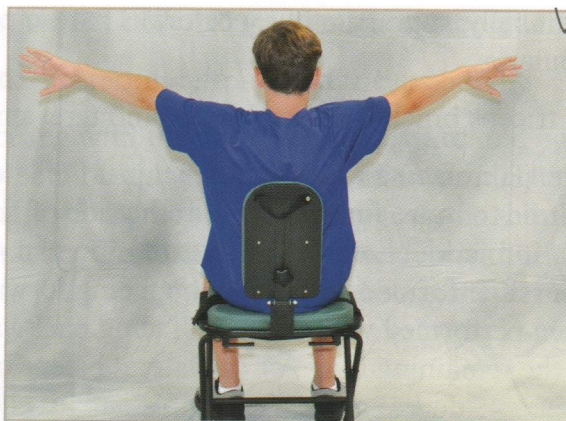
Muscles

Contracted:

Trapezius, rhomboid major, rhomboid minor, infraspinatus and teres minor.

Method: The subject will place one arm against a supportive surface rotating the shoulder medially and positioning the thumb pointing downward. Stabilize the feet pointing away from the body nearly 180 degrees. Contract the posterior shoulder muscles and pivot the body away from the supporting arm. Return to the starting position and repeat the movement. The arm should be positioned at shoulder level but not above the shoulder level for a maximum result. Performing this exercise thumb up and moving to the extreme may irritate or injure the shoulder.

Repetitions: 1-2 sets of 5-8.



Wall Assist

ROTATOR CUFF STRETCHES

The most frequent shoulder injuries involve the rotator cuff muscles. Considerable attention must be given to the thorough stretching of this area. The important exercises include external rotation, internal rotation, horizontal flexion I and II.

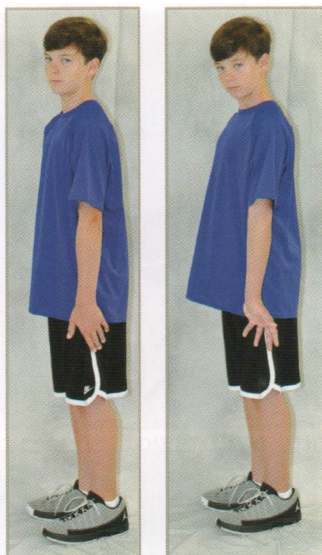
SHOULDER EXTERNAL ROTATION

Muscles Stretched: Internal shoulder rotators including the teres major, subscapularis, latissimus dorsi and pectoralis major muscles.

Muscles Contracted: The external rotators including the supraspinatus, infraspinatus and teres minor muscles.

Method: 1. Stand or sit maintaining the arm completely extended with the palm facing the body. Rotate the arm laterally (*outward*) as far as possible. Return to the starting neutral position and repeat the movements. This is especially good for frozen shoulders, capsule problems or post-operative conditions.

SHOULDER EXTERNAL ROTATION *continued*



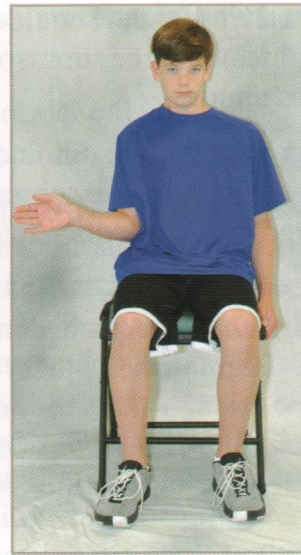
1.

2. Place the arm against the side. Bend the arm 95 degrees at the elbow. Contract the posterior shoulder muscles and rotate the arm outward away from the body. Repeat a number of repetitions. Excellent stretch for rotator cuff problems, tight joint capsule or shoulder pain.

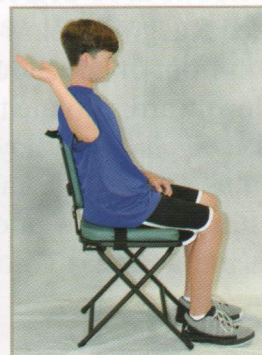
3. The arm(s) are placed at 95 degree angle. Position the arm 5 degrees below shoulder level and 5 degrees in front of the shoulder. Actively rotate the shoulder backward by contracting the external rotators. Repeat a number of repetitions.

4. Position the elbow at a 95 degree angle, supporting the arm on a table or desk. You may position the supported arm 5-45 degrees in front of the shoulder. Contract the external shoulder muscles and gently assist by using the opposite side hand at the end of the active movement. Repeat a number of repetitions.

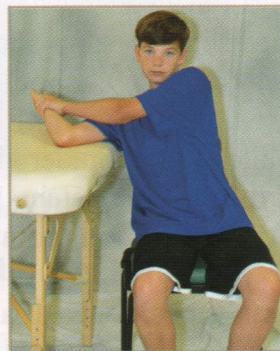
5. The elbow is positioned at a 95 degree angle, maintaining the arm 5-20 degrees in front of the shoulder. Place a rope or strap in the palm of the hand. The remainder of the rope is positioned under the elbow region and placed in the opposite hand. Assist the external motion and return to the starting position after each repetition. Rotate around the axis of the shoulder preventing the humerus from moving posterior during the stretching action. Repeat 1-2 sets of repetitions.



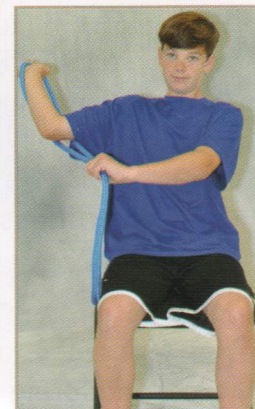
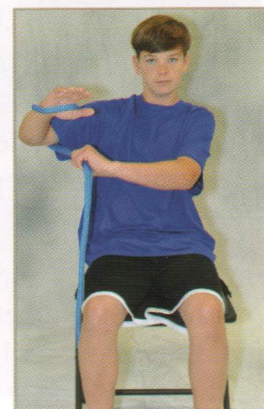
2.



3.



4.



5.

SHOULDER INTERNAL ROTATION

Muscles Stretched: Shoulder external rotator muscles including the supraspinatus, infraspinatus and teres minor.

Muscles Contracted: Shoulder internal rotators include the teres major, subscapularis, pectoralis major and latissimus dorsi muscles.

Method:

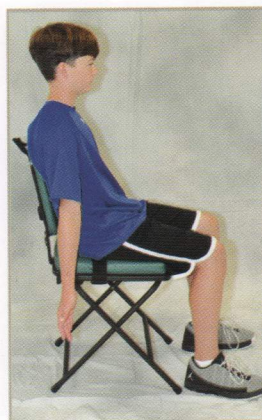
a. The arm is fully extended in a sitting or standing posture. Begin with the palm facing forward in a supine position. Rotate inward as far as possible in a vertical or horizontal position. Excellent for pain, post-operative, joint capsule or post-injury program.

b. Bend elbows at 95 degree angle. The arm is positioned 5 degrees below the shoulder and 5-10 degrees in front of the shoulder with the palms facing downward. Rotate the shoulders (*humerus*) forward (*internally*) employing the shoulder internal rotator muscles. Exhale and perform a slow steady stretch at the end of the movement. Rotate the ball inward without the ball moving out of the axis or shrugging upward.

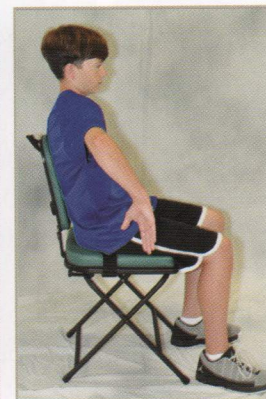
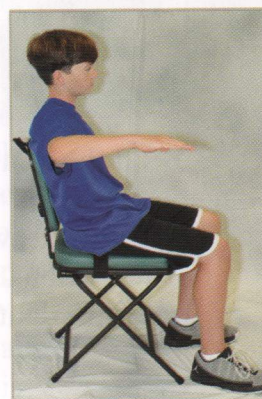
c. Support the 95 degree flexed elbow that is positioned slightly below shoulder level and 5-45 degrees in front of the shoulder. Internally rotate the humerus and assist with the opposite side hand. Do not allow the shoulder girdle to shrug or move forward during the stretch. Keep the blade flat against the body during rotation.

d. The arm is positioned at a 95 degree angle, 5 degrees below shoulder level and 5-10 degrees in front of the shoulder. Place a loop of rope or strap over the thumb along the back of the arm and over the elbow. The free hand will clasp the rope in front of the shoulder and assist as the humerus rotates inward. Release to the starting position and repeat 1-2 sets of 5-10 repetitions.

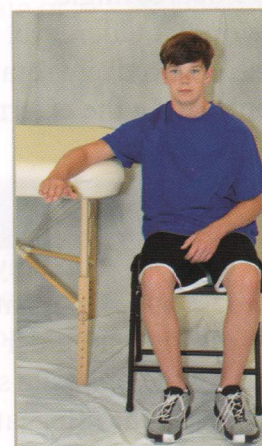
Compensation Check: Prevent the scapula from compensating upward or the head of the humerus from moving forward. Maintain the shoulder blade (*scapula*) quite flat during the stretch exercises.



a.



b.



c.



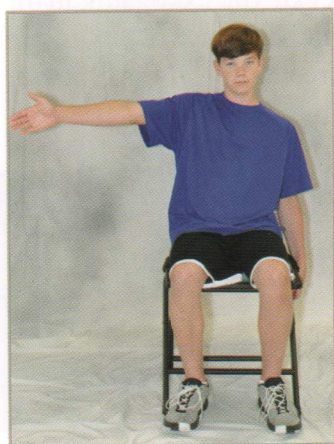
d.

SHOULDER HORIZONTAL FLEXION I

Muscles Stretched: Rhomboid major, rhomboid minor and external rotators, especially the teres minor and infraspinatus, and distal end of triceps.

Muscles Contracted: Pectoralis major, teres major, subscapularis, anterior deltoid, and coracobrachialis.

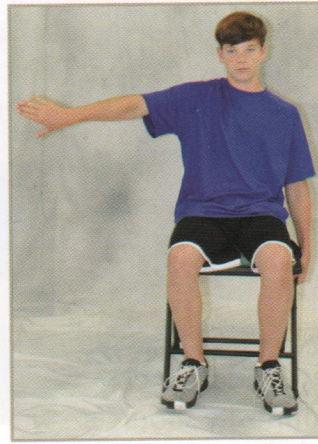
Method: Exercise with a straight elbow. Begin with the thumb pointing upward and the palm facing the body. Exhale and reach the arm toward the top of the opposite shoulder. Be sure the exercising arm clears the top of the same side pectoral tissue; however, do not shrug the exercising shoulder or allow the same shoulder to roll forward (*maintain the shoulder blade against a surface*) as the extended arm reaches to touch the top of the opposite shoulder. Use the opposite hand around the elbow to assist the stretching movement. The exercise is also performed with the thumb pointed downward, assisting with the stretching movement. Do this slowly and gently to prevent tissue irritation. Another excellent technique is to assist with the use of a stable surface and pivoting the body toward the non-moving shoulder as you are reaching with the exercising arm is helpful. Perform this from both the thumb up and thumb down positions. Inhale, while returning your arm to the starting position at your side after each repetition. Keep the shoulder blade as flat against the body as possible during the exercise. This exercise may also be executed in a side lying position on the table.



Thumb Up



Thumb Down



This exercise may also be executed in a side lying position on the table **Repetitions:** 1-2 sets of 5-10.

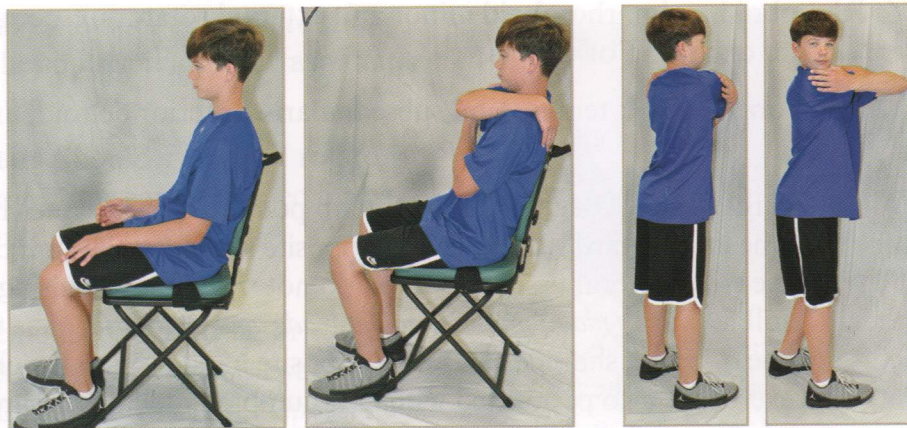


Use of Wall



On Table

SHOULDER HORIZONTAL FLEXION II

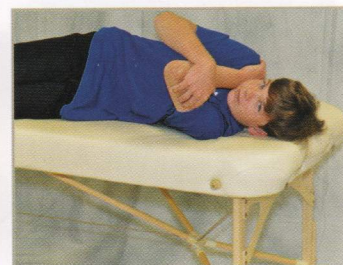


Reach
down
blade

Muscles Stretched: Trapezius, rhomboid major, rhomboid minor, and rotator cuff, including supraspinatus, infraspinatus, and teres minor muscles.

Muscles Contracted: Pectoralis major, anterior deltoid, and coracobrachialis.

Method: Reach around to the opposite side of the neck. Place the hand on top of the shoulder; raise the elbow to shoulder height without elevating (*shrugging*) the shoulder of the exercising arm. Exhale and walk the fingers down the upper back as far as possible while maintaining the shoulder blade back against a surface to prevent scapular compensation. Place the free hand on the elbow of the exercising arm for gentle assistance at the end of movement. The subject may assist the movement by resting the top arm (*elbow*) against a surface while rotating the body inward toward the exercising arm. Inhale while returning your arm to the side after each repetition. This exercise may also be performed on the table by lying on the side in a $\frac{3}{4}$ position with the scapula flat on the surface and reach over the opposite shoulder blade with the free hand assisting.



Compensation Check: Do not allow the exercising shoulder to shrug or move forward during this exercise.

Repetitions: 8-10.

DELTOID STRETCH

Muscles Stretched: Middle deltoid, posterior deltoid, and supraspinatus.

Muscles Contracted: Pectoralis major, subscapularis, and teres major.

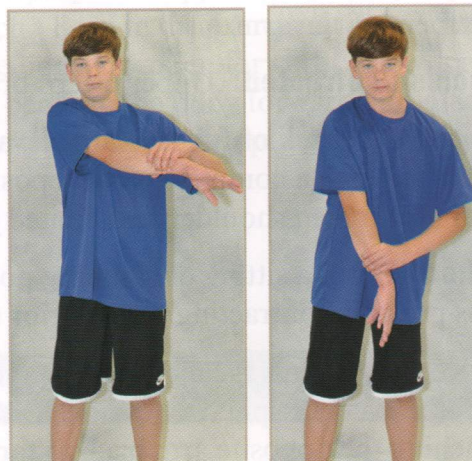
Method: Place the arm in a horizontal position with the elbow extended and the palm facing toward the floor. The free hand will apply traction to the moving arm, as the arm moves downward. Do not allow the exercising shoulder to move forward by keeping the shoulder blade near the spine throughout the exercise. Maintaining the scapula against a surface is helpful to stabilize the shoulder.

DELTOID STRETCH *continued*

blade. As the last few degrees of movement are accomplished rotate the shoulder inward (*thumb pointing down*) for maximum stretch. Use the opposite hand to assist the stretch effort and maintain traction on the arm. Move the arm to a horizontal position after each stretch.

It is especially beneficial to stretch the supraspinatus and posterior deltoid muscles at the end of the movement by applying greater traction and lowering the arm beyond the navel until the arm is in a vertical position.

Repetitions: 8-10.



SHOULDER TRICEPS STRETCH

45° behind head



Muscles Stretched: Triceps brachii.

Muscles Contracted: Biceps brachii and anterior deltoid.

Method:

Part I: Begin with elbow flexed and positioned 90 degrees forward from a vertical position. Have the palm face toward the back of the shoulder. Exhale and extend the flexed arm upward as far as possible and assist the stretch gently using the opposite hand or rope. Be aware that arching your back is compensation. Use a rope is less stressful to the neck and assisting arm.

Part II: The elbow is flexed and positioned 90 degrees forward from the vertical position with the palm facing toward the back of the shoulder. Using a rope or free hand moving the arm obliquely upward behind the neck at a 45 degree angle to provide better stretch to the upper and outer triceps fibers. Return to the starting position after each repetition. The edge of the doorway is also used to rest the elbow against and walk into the doorway while reaching the arm upward.

Repetitions: 8-10 each part.

SHOULDER FORWARD ELEVATION

Muscles Stretched: Upper triceps, posterior deltoid, and serratus anterior for greater upward movement of the arm.

Muscles Contracted: Upper biceps brachii and anterior deltoid.

Introduction: Lack of full forward elevation contributes too many shoulder problems. The arm should be able to reach a complete vertical position without bending the elbow. Forward elevation is also helpful for frozen shoulder and limited joint capsule freedom. (*adhesive capsulitis*).

Method: From a sitting or standing position, reach one arm forward directly over top of shoulder as far as possible contracting the anterior shoulder muscles.

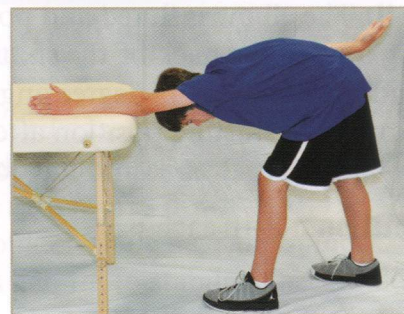
1. Keep the palms facing the body and the elbows extended throughout the movement. Counterbalance spinal extension (*low back*) compensation by contracting the abdominal muscles and reaching the opposite arm back as far as possible. You may alternate the left and right arms. It may be necessary to first perform the Triceps Stretch in order to achieve maximum forward elevation.



2. Lifting upward with the palm facing forward.

3. Internally rotate the humerus (*palm facing away from body.*) Perform the same basic forward elevation procedures during the advanced exercises.

Compensation Check: Complete the exercise without rotating the upper torso, arching the back or allowing the elbow to bend.



SHOULDER FORWARD ELEVATION *continued*

Notes: You may use the top or side of a doorway to assist the stretch. Reach the arm upward, step forward with one leg moving the body forward to assist the stretch. Be sure the exercising arm is kept close to the head. Perform in three positions. 1) palm-facing the body, 2) palm forward, and 3) palm facing away from the body. The exercise may also be assisted by bending the body forward and placing the extended arm on a counter, table or desk and bend further forward while attempting to lift the arm. Perform in all three hand positions.

Repetitions: 1-2 sets of 5-8 with each of the three movements.

SHOULDER SIDEWARD ELEVATION

Muscles Stretched: Teres major, subscapularis, latissimus dorsi, subclavius and sternal portion of the pectoralis major.

Muscles Contracted: Deltoids, upper trapezius, supraspinatus, infraspinatus and teres minor muscles.

Method 1: "Shoulder-Sideward Elevation"

The elbow is fully extended with the palm facing forward throughout the movement. Reach upward as far as possible by contracting the deltoid and rotator cuff muscles. Cross the arm in back of the head and reach across the midline. Assist by clasping the elbow with the opposite hand. Lower the arm to the side and repeat the movement. An additional 90 degrees (*palm outward*) internal rotation of the humerus results in greater stretch to numerous fibers not affected by the neutral position.

Repetitions: 1-2 sets 5-10.

Method 2: "Shoulder Impingement Exercise"

Exercise using the sideward elevation motion with the palm facing backward (*little finger leading*). The arm lifts upward very carefully. The opposite hand or careful use of a strap or rope is helpful in releasing the impingement tissue. Lower to the starting position and repeat. Exercise great care so that injury or soreness does not occur.

Repetitions: 1-2 sets 5-10.



1.



2.

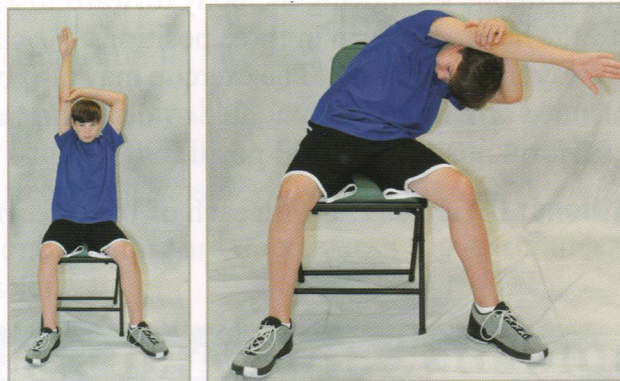
continued next page

SHOULDER SIDEWARD ELEVATION *continued*

Method 3: "Shoulder -Trunk Lateral Flexion"

Stretching: latissimus dorsi, quadratus lumborum and multifidus. Maintain a level pelvis with the arm directly overhead and the palm facing forward. Spread legs 12 inches wider than the shoulders for better balance. Lean the body lateral as far as possible. Return to the vertical position and repeat. Once the tissue is quite well stretched, repeat the same movement with the palm facing downward in a prone position.

Repetitions: 1-2 sets of 5-8.

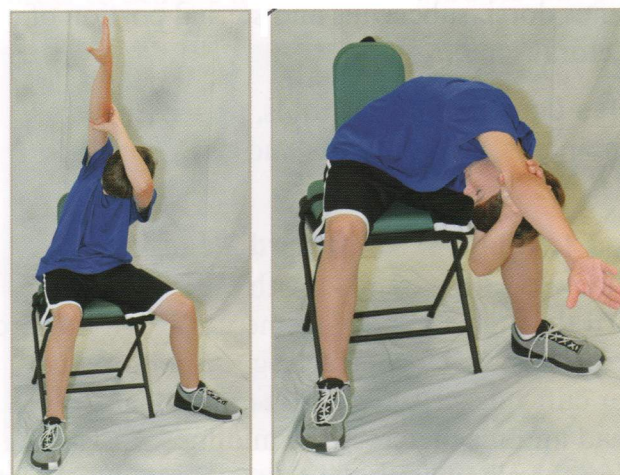


3.

Method 4: "Shoulder-Trunk Forward Oblique"

Maintain the pelvis in a level, neutral position. Rotate the upper body 45 degrees. Spread the legs 12 inches wider than the shoulders for better balance. The arm is positioned vertical near the head and clasped around the elbow by the front hand. Move the upper body forward at a 45 degree angle maintaining 45 degrees of upper body rotation throughout the movement. Excellent stretch of latissimus dorsi, trapezius, serratus posterior, quadratus lumborum, multifidus, and same side erector spinae all which will influence the shoulder complex.

Repetitions: 1-2 sets of 5-8.

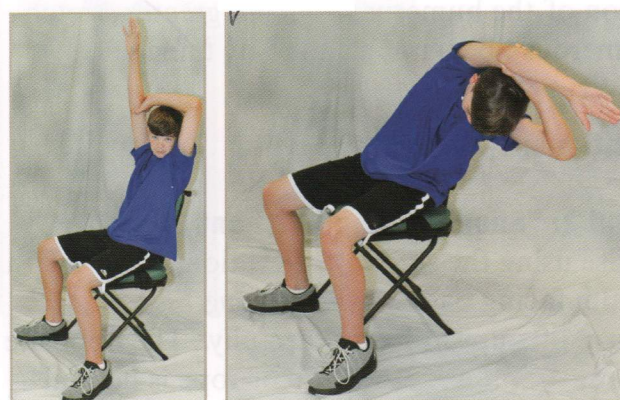


4.

Method 5: "Shoulder-Trunk Posterior Oblique"

The pelvic girdle is stabilized in a neutral position. The feet are spread 12 inches outside of the width of the shoulders for better balance. Rest the hips and buttocks on a chair or stool keeping the feet on the surface. Rotate the upper body 45 degrees. Contract the back and buttocks muscles positioning the trailing arm in a vertical position simultaneously clasping the upper arm with the free lower hand. This is an excellent stretch for the serratus anterior, intercostal muscles, pectoralis major, pectoralis minor, internal oblique and external oblique abdominal muscles.

Repetitions: 1-2 sets of 5-8 according to condition.



5.

POSTERIOR HAND CLASP (APLEY SCRATCH TEST)

Muscles Stretched Upper Arm: Triceps brachii, serratus anterior, and upper pectoral fibers.

Muscles Stretched Lower Arm: Long head of biceps brachii, deltoids, supraspinatus, and teres minor.

Method: Position the upper arm vertically against the neck with the palm facing the body. As the top arm reaches over (*abduction*) and downward (lateral rotation), the triceps, serratus anterior, and upper pectoral fibers are stretched. The opposite hand, is positioned with the palm facing away from the body and moves up the spine between the shoulder blades attempting to clasp the top hand. Join the hands or move gently toward joining hands. As the lower arm reaches under (*medial rotation*) and upward (*adduction*), the long head of the biceps brachii, deltoids, supraspinatus, infraspinatus, and teres minor are lengthened. The four knuckles of the lower hand are maintained against the back throughout the movement to prevent biceps or pectoral irritation. At the end of the movement, you may assist an active effort with your free hand, assisting the lower arm upward or top arm downward to increase both movements. **DO NOT** assist either movement unless active effort is sustained. Stretch gently to increase the range. Beware that arching the back is compensation and does not allow accurate assessment of true range of motion.

It is not unusual that a person can do this well on one side but not on the other. For gentle assistance, use a rope or towel to help gain range needed to clasp the hands. As one hand reaches toward the opposite hand using a rope to assist the stretch. Return to the starting position and repeat the movement. Work equally on the left and right side or you may experience greater risk of injuries when stressed in extended positions.

Repetitions: 1 -2 sets of 5-10 each shoulder.



ELBOW, RADIAL ULNAR, WRIST, FINGER, AND THUMB FLEXIBILITY: ACTIVE

Stretching may help reduce joint strain from weight bearing or repetitive job activities, sudden jolts, repeated stress from throwing, or torque, which may result in injuries such as Little League Elbow, Tennis Elbow, and wrist or forearm strain. The elbow, wrists, and fingers are often neglected in sports and work preparation. Repetitive stress causes breakdown to these areas. Stretching before and after is preventive. Fibromyalgia, stroke, carpal tunnel syndrome, multiple sclerosis, and Parkinson's disease are just a few of the problems that will receive positive benefits. The following stretches are beneficial for increasing circulation and helping reduce joint and muscle stress or pain in the elbows, radial-ulnar, wrists, and hands.

ELBOW FLEXOR STRETCH

Muscles Stretched: Elbow flexors (*biceps brachii*, *brachialis*, and *brachioradialis*).

Muscles Contracted: Triceps brachii, anconeus.

Introduction: Stretching the elbow flexors helps insure maximum joint range and tissue extensibility to assist in reducing elbow and radioulnar joint strain.

Method 1: Extend the elbow employing the triceps brachii and anconeus muscles to stretch the biceps brachii and brachialis muscles. With the palm facing the body mid line, ulnar flex the wrist (*little finger toward same side of wrist*) to stretch the brachioradialis muscle. Use the free hand to stabilize the elbow. Return to the starting position and repeat. **Repetitions:** 5-8.

Method 2: Hyperextend the shoulder having the palm facing forward (*prone*). Extend the elbow and move the arm backwards at a 45 degree angle obliquely away from the body. This will stretch the medial belly and distal attachment of the biceps. Repeat the same movement with the palm facing backwards (*supine*) to stretch the coracobrachialis. Shoulder level is the normal range. **Repetitions:** 1-2 sets of 5-8.





3.

Method 3: Hyperextend the shoulder backward with the palm facing anterior, (*palm forward*), elbow extended, moving at a 45-degree angle backward obliquely across the body midline to stretch the lateral belly and distal attachment of the biceps brachii. Repeat the same movement with the palm facing backwards to stretch the origin of the latissimus dorsi, teres major, biceps brachii and subscapularis. Shoulder high is the normal range.

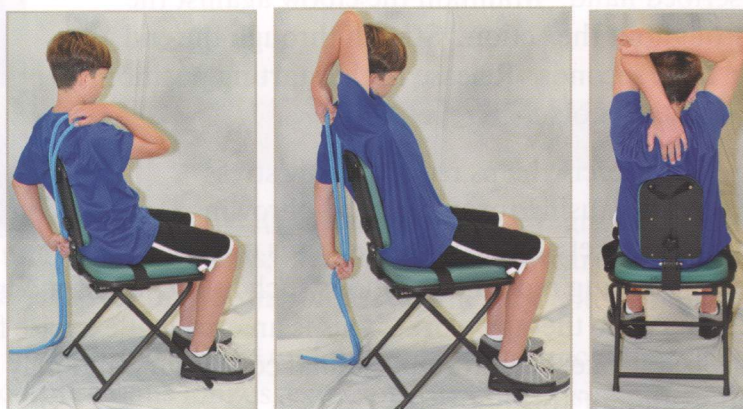
Repetitions: 1-2 sets of 5-10 depending on the individual's flexibility.

TRICEPS STRETCH

Muscles Stretched: Triceps brachii, a two-joint muscle of the posterior shoulder and elbow joints, and the anconeus muscle.

Muscles Contracted: Biceps brachii and anterior deltoid muscles.

Method Part I: Begin with the elbow positioned 90 degrees forward from the vertical position with the palm facing toward the back of the shoulder. Maintain a flexed elbow, exhale and extend the flexed arm upward as far as possible. Contract the abdominals to prevent compensatory arching of the back. Assist the stretch gently using the opposite hand on a rope or towel which is less stressful to the neck or assisting arm. Return to the starting position after each repetition. **Repetitions:** 1-2 sets of 5-8.



Part II: Initiate the exercise with the elbow flexed and positioned 90 degrees forward from a vertical position. The palm will point downward toward the back of the shoulder. Using a rope, towel or free hand, move the arm obliquely upward behind the neck at a 45 degree angle to provide better stretch to the upper and outer triceps fibers. Contract the abdominal muscles to prevent a compensatory arching of the back.

Repetitions: 1-2 sets of 5-8.

RADIAL-ULNAR PRONATION

Muscles Stretched: Supinator and biceps brachii.

Muscles Contracted: Pronator quadratus and pronator teres.

Method: Flex the elbow 90-degrees and adduct the shoulder and elbow against the side of the body throughout the movement. Begin in a neutral position. Rotate the forearm inward towards a palm downward position. Clasp just above the wrist with the free hand for a gentle active assisting stretch.

Alternate Method: Place your thumb around the base of the opposite thumb and radial side of the wrist to pull with. Position the ring finger and little finger surrounding the lateral (*ulnar*) side of the wrist to push with, and widely spread the index finger and middle finger on the palm of the hand to help rotate. Pronate the hand rotating the forearm inward to a palm downward position with the gentle assistance of the described hand. Maintain the elbow against the side throughout the action. Stretch through the end feel for 1½-2 seconds. Release to the starting position and repeat the effort 5-10 repetitions.

Notes: This exercise helps reduce elbow stress in movements causing torque, such as throwing, batting, and racket sports or in situations of job or hobby involving repetitive motions such as the use of a computer, assembly line repetition, and physical-massage therapy work. This is an excellent exercise for any neurological condition such as Parkinson's, stroke, head trauma, spinal cord injury and may require assistance. If so, please see the assisted section of this book.

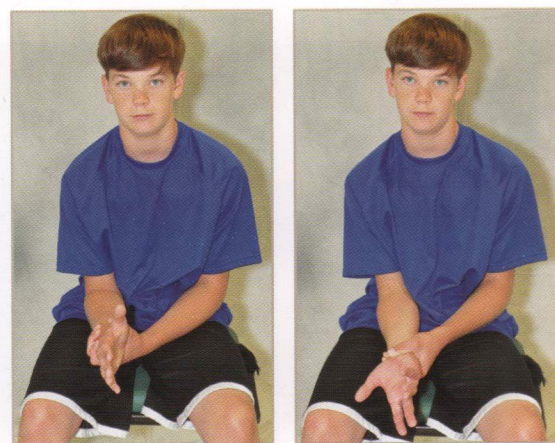


RADIAL-ULNAR SUPINATION

Muscle Stretched: Pronator quadratus and pronator teres.

Muscles Contracted: Supinator, biceps brachii and brachioradialis.

Method 1: Flex the elbow 90 degrees and adduct the shoulder, maintaining the elbow against the side of the trunk throughout the entire movement. From a thumb upward neutral position, rotate the forearm outward moving the palm upward, and pointing the thumb outward and downward while contracting the muscles that supinate (*palm face upward*) the radial-ulnar joint



RADIAL-ULNAR SUPINATION *continued*

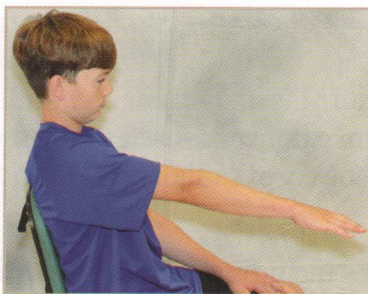
(forearm). Clasp just above the wrist to prevent straining the ulnar collateral wrist ligament. Use the free hand for gentle assisting stretch.

Method 2: Use the assisting hand to clasp the exercising hand with the middle finger, ring finger, and little finger placed side by side at the base of the thumb. Place the index finger around the web between the index finger and thumb. Place the thumb approximately 2 inches below the base of the little finger with the palm of the hand over the ulnar wrist joint to prevent ulnar collateral ligament strain. Clasp firmly and gently assist the rotational process. Release to the starting position and repeat the effort. Pull with the four fingers and simultaneously push with the base of the thumb (thenar eminence) to prevent strain of the ulnar (little finger) side of the wrist.

Notes: This stretch helps reduce elbow stress in throwing, batting, and racket sports or in situations involving job or hobby repetitive motions such as the use of computers, assembly line repetitions or physical therapy - massage therapy work. This is very useful for post strain or fracture, neurological problems or spinal cord injuries. Manual assistance may be necessary. If so, see the assisted section of this book. **Repetitions:** 6-8.



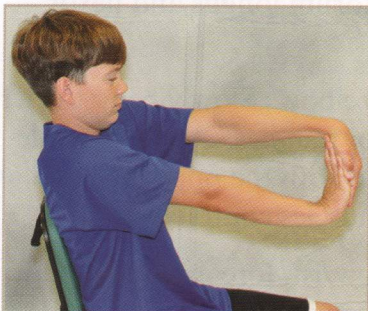
WRIST EXTENSION: PRONE



Muscles Stretched: Wrist and finger flexors with greater emphasis at the distal end attachments, including the flexor carpi radialis, flexor carpi ulnaris, flexor digitorum longus and flexor digitorum brevis.

Muscles Contracted: Wrist and finger extensors including the extensor carpi radialis longus, extensor carpi radialis brevis, and extensor carpi ulnaris.

Method: Exercise with a straight elbow and the palm facing downward (*Prone*). Exhale and extend the wrist and fingers backward as far as possible by contracting the wrist-finger extensor muscles. For a gentle assisting stretch contract the wrist and finger extensor muscles assisting with your free hand and finger muscles. Place the free hand over the entire palmar surface of the exercising hand and the entire length of the fingers. Make sure the distal ends of the fingers do not bend forward as the free hand assists. If the fingers bend forward toward the palm the effectiveness of the stretch will be minimal.



Notes: This exercise stretches the wrist and finger flexors and helps reduce hand, wrist, forearm, and elbow stress. The exercise is great for sports performance, arthritis, post injury, computer and repetitive use activities. This method is safer and more effective than pushing the hand against a hard surface and straining the wrist or fingers by holding the position for a period of time. **Repetitions:** 6-10.

WRIST EXTENSION: SUPINE



Muscles Stretched: Wrist flexors with greater emphasis at the proximal end attachments, including the flexor carpi radialis, flexor carpi ulnaris, flexor digitorum longus and flexor digitorum brevis.

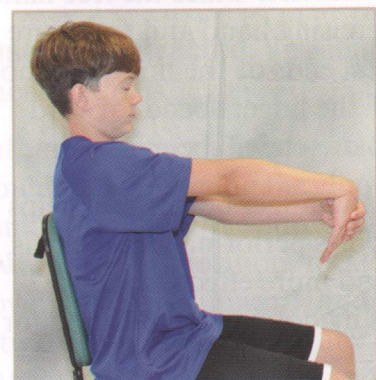
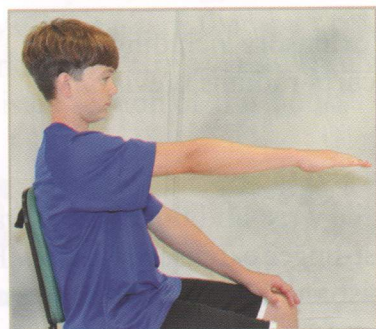
Muscles Contracted: Wrist-finger extensors including the extensor carpi radialis longus, extensor carpi radialis brevis, extensor carpi ulnaris, extensor digitorum longus, and extensor digitorum brevis.

Method: Exercise with a fully extended elbow and the palm facing upward (*supine*). Slowly exhale and extend the wrist and fingers backward through a full range by contracting the wrist and finger extensors. Assist at the end of an active movement with the free hand by placing it over the entire palmar surface of the exercising hand, covering the entire length of all the fingers. Make sure the fingers and the wrist muscles continue to extend as the free hand assists. Do not allow the fingers to bend forward toward the palm or the effectiveness of the stretch will be minimal.

Notes: This routine provides greater stretch of the wrist and finger flexors at the proximal attachments and helps reduce hand, wrist, and forearm stress from computers, repetitive carpentry, air hammers, brick or masonry work, sports activities or other specific repetitive movements. This is safer and more effective than pushing the hand and wrist against a hard surface and holding the position for a period of time.

Repetitions: 6-10.

WRIST FLEXION



Muscles Stretched: the wrist and forearm extensor muscles including the extensor carpi radialis longus, extensor carpi radialis brevis and extensor carpi ulnaris.

Muscles Contracted: Wrist flexor muscles including the flexor carpi radialis, flexor carpi ulnaris, flexor digitorum longus and flexor digitorum brevis.

Method: Exercise with a fully extended elbow. Slowly bend the wrist downward by contracting the wrist flexor muscles. Apply a gentle stretch across the posterior (*dorsal*) hand with the opposite hand and mild traction of the wrist as the flexor muscles contract.

Notes: Wrist flexion helps reduce hand, wrist, forearm and elbow stress. Very helpful for post injury, heavy work, fatigue, arthritis, repetitive activity for computer users, dentists and dental assistants, surgeons, construction workers and athletes.

Repetitions: 6-8.

WRIST-FINGER EXTENSOR STRETCH

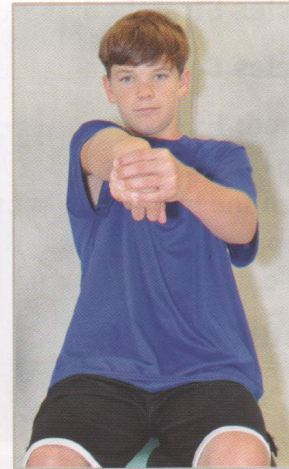
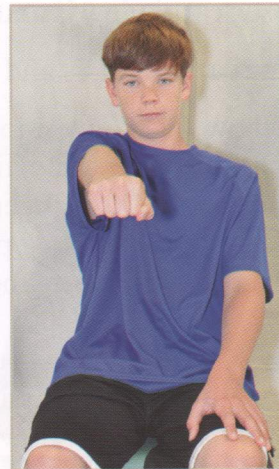
Muscles Stretched: The extensor carpi radialis longus, extensor carpi radialis brevis, extensor carpi ulnaris, extensor digitorum longus, extensor digitorum brevis, extensor indicis, and extensor digiti minimi.

Muscles Contracted: Flexor carpi radialis, flexor carpi ulnaris, flexor digitorum superficialis, flexor digitorum profundus and flexor digiti minimi brevis.

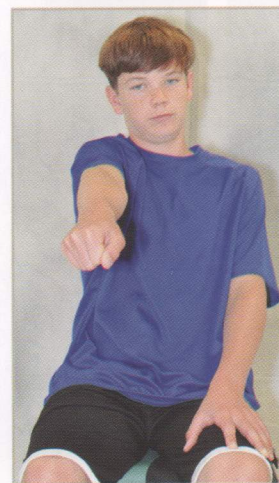
Method 1: From a standing or sitting posture, fully extend the elbow and make a firm fist. Exhale and bend the wrist downward by contracting the flexor muscles. Flex the wrist as far as possible and assist with the opposite hand. Mild supination (45-degree) while flexing wrist will provide greater stretch to the little finger and ring finger extensors.

Method 2: Maintaining a tight fist and position the wrist in full radial flexion (*toward thumb side*). Flex the wrist downward as the wrist is maintained in this extreme radial flexed position. Repeat 1-2 sets of 5.

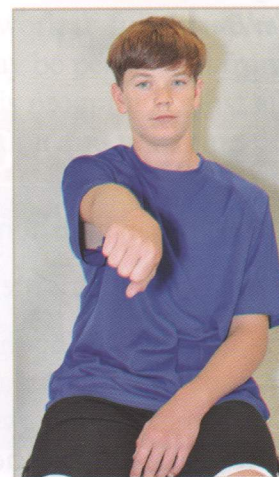
Method 3: Maintain a tight fist and position the wrist in full ulnar flexion (*toward little finger*). Bend the wrist downward as the wrist is maintained in this extreme ulnar flexed position. Repeat 1-2 sets of 5.



1.



2.



3.

WRIST RADIAL FLEXION (Abduction)

Muscles Stretched: Extensor carpi ulnaris and flexor carpi ulnaris.

Muscles Contracted: Flexor carpi radialis and extensor carpi radialis longus.

Method: Exercise with the elbow in full extension. The wrist may be exercised in a prone (*palm down*) or a palm upward (*supine*) position. Exhale, while contracting the radial wrist muscles (*thumb side*), to stretch the ulnar wrist muscles on the little finger side. Assist gently at the end of active movement with the opposite side hand. Release to the starting position of complete ulnar flexion and repeat. For a most complete stretch perform stretch flexing the wrist 20 degrees and extending the wrist 20 degrees.

Repetitions: 1-2 sets of 5-10.

Note: Excellent for sports, repetitive stress work, arthritis, drivers, construction and musicians.



Palm Down

Palm Upward

WRIST ULNAR FLEXION (Adduction)

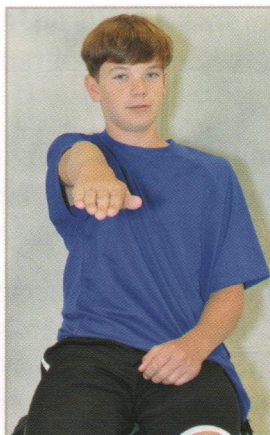
Muscles Stretched: Flexor carpi radialis, extensor carpi radialis longus.

Muscles Contracted: Extensor carpi ulnaris, flexor carpi ulnaris.

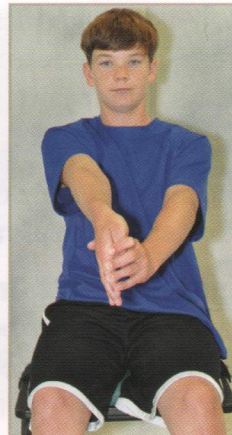
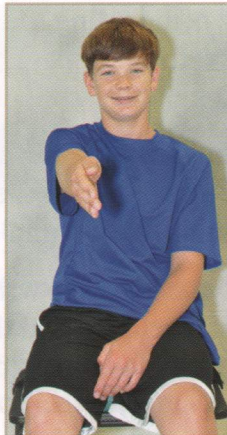
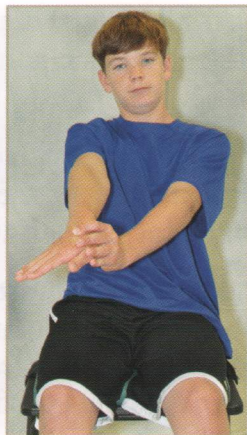
Method: Exercise with a straight elbow. The thumb is maintained against the index finger with the opposite hand. The wrist may be exercised in a prone (*palm down*) or a shake hand (*thumb up*) position. Exhale while contracting the ulnar wrist muscles on the little finger side and move the hand and wrist in that direction, assisting at the end of the movement with the opposite side hand. Stretch and release to the starting position, where the wrist is flexed toward the thumb side as far as possible before moving in the frontal plane toward the ulnar (*little finger*) side of the wrist. The base of the thumb is usually part of the problem if there is radial wrist inflammation or injury. For a most complete stretch, flex the wrist 20 degrees and complete the same movement, then extend the wrist 20 degrees and complete the same effort.

Repetitions: 1-2 sets of 5-10.

WRIST ULNAR FLEXION (ADDUCTION) *continued*



Palm Down



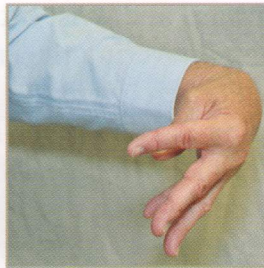
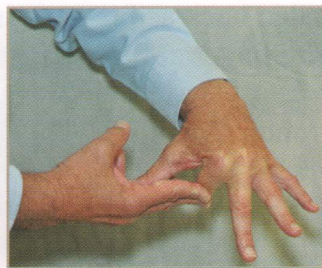
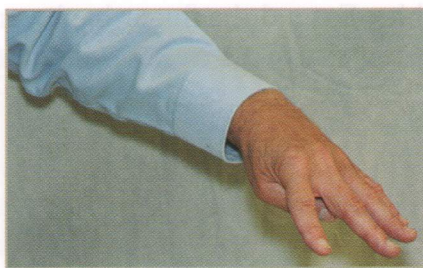
Handshake

FINGER EXTENSOR STRETCH

Muscles Stretched: The extensor digitorum longus, extensor digitorum brevis, extensor indicis, and extensor digiti minimi.

Muscles Contracted: Flexor digitorum superficialis, flexor digitorum profundus, and flexor digiti minimi brevis.

Method 1: For greater stretch of the finger extensors bent the wrist maximally. Flex the straight individual finger as far as possible and assist with the opposite side thumb or fingers. Also stretch each finger both medial and lateral directions away from the neutral position. Release to the starting position and repeat the effort. (*stretching finger adductors and abductors*). Begin with each finger fully extended and as more freedom is established gradually work to full (*complete*) flexion of the finger for greatest possible stretch. The straight finger exercise may be performed from a prone (*palm down*), side lying or supine (*palm up*) position of the hand. This program is most effective if performing one repetition, then moving to the next finger for one repetition and repeating this series a number of times.



1.

Method 2: For maximum finger extensor stretch, roll the finger into a ball (*firm finger flexion*) and maintain during complete wrist flexion. Repeat 1-3 series of 5.



2.

FINGER FLEXOR STRETCH

Muscles Stretched: Finger flexors including the lumbricales, flexor digitorum superficialis, flexor digitorum profundus, and flexor digiti minimi. The wrist flexors including the flexor carpi radialis and flexor carpi ulnaris also receive stretch.

Muscles Contracted: Working the extensor muscles of the fingers including the extensor digiti minimi, extensor digitorum, and extensor indicis. Also the wrist extensor muscles including extensor carpi radialis longus, extensor carpi radialis brevis, and extensor carpi ulnaris.

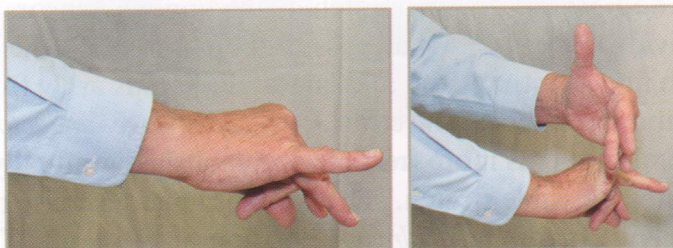
Method 1: (Four Fingers At Once) extend the wrist and fingers backward and assist with the opposite hand. Release and repeat. For best results, extend the elbow and wrist joints. Perform this exercise a number of repetitions from the prone (palm down) position and then exercise from a supine (*palm up*) position.



1.

Method 2: (Single Finger-Prone) the finest flexor stretch involves stretching one finger at a time, as each finger has a different level of tissue tension. For best results extend the wrist backward as far as possible, then, place the entire palm of the hand along the length of the finger rather than only on the end of the finger. Extend the finger as far as possible and assist with the opposite hand. Stretch each finger with the palm facing downward (*prone*). This exercise should also be accomplished moving the finger in both directions away from the natural neutral position (*abduct and adduct*) and also mild traction 2-3 times. This is a more thorough stretch of the finger muscles and fascia.

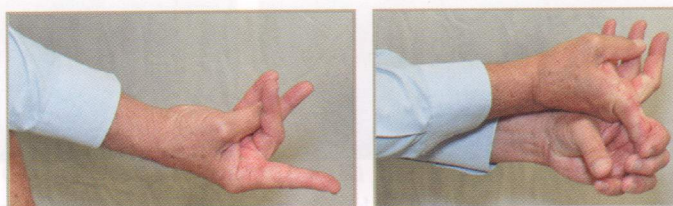
1-2 sets of 5.



2.

Method 3: (Single Finger-Supine) Exercise with the palm facing upward and wrist extended back as far as possible. Extend the finger backward with the palm of the hand covering the entire finger and assisting at the end of active movement. Release and repeat. This stretch releases tissue not achieved during Single Finger-Prone Stretch. This stretch should also be performed moving the finger in extremes away from the normal neutral position as far as possible and then extend backwards

(*abduct the finger and then extend the finger. Then adduct the finger and extend the finger*).



3.

Repetitions: 1-2 sets of 5-10.

FINGER FLEXOR-JOINT STRETCH

Muscles Stretched: Flexor digitorum superficialis, flexor digitorum profundus, flexor digiti minimi, lumbricales.

Muscles Contracted:

Extensor digiti minimi, extensor digitorum longus, extensor indicis (*index finger*).



The exercise is performed with complete wrist hyperextension. Flex a finger into a complete ball. Maintain this position with the opposite hand and assist the metacarpo-phalangeal joint and muscle tissue into hyperextension. This exercise should be performed with the flexed finger into abduction and adduction while extending the flexed finger. This is excellent for greater joint muscle freedom for all types of hand conditions and problems. Repeat 1-2 sets of 5.

FINGER-WRIST FLEXOR STRETCH

Muscles Stretched: Finger flexors including the flexor digitorum superficialis, flexor digitorum profundus and flexor digiti minimi. This stretch also involves the wrist flexor muscles including the flexor carpi radialis and flexor carpi ulnaris.



Muscles Contracted: Working the extensor muscles of the fingers including the extensor digiti minimi, extensor digitorum, and extensor indicis. Also the wrist extensor muscles including the extensor carpi radialis longus, extensor carpi radialis brevis, and extensor carpi ulnaris.

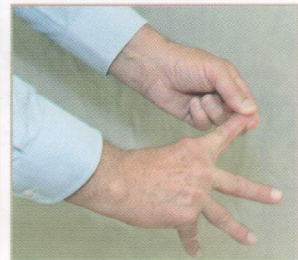
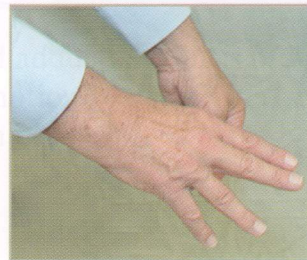
Method: From a standing or sitting position contract the working extensor muscles of the wrists, fingers, and elbows. Begin with the palms facing away from the body and flex the elbows 90 degrees. To stretch the finger-wrist flexors, hyperextend the wrist backwards and extend the fingers and elbows simultaneously. Release and repeat 1-2 sets of 5.

FINGER ADDUCTOR (WEB) STRETCH

Muscles Stretched: The webs between each finger and the interossei palmaris muscles located between each finger.

Muscles Contracted: Interossei dorsalis and abductor digiti minimi muscles.

Method 1: Contract the interossei and abductor muscles that move the finger away from its neutral position. Clasp the finger with the opposite side hand. Finally, move the clasped finger in the opposite direction from its neutral position as far as possible. This is a neat stretch for athletes, over worked hands, neurologically affected hands, carpal tunnel syndrome and arthritic hands. Repeat 1-2 sets of 5.

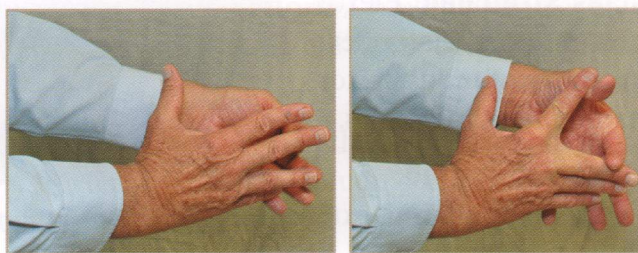


1.

continued next page

FINGER ADDUCTOR (WEB) STRETCH *continued*

Method 2: This exercise moves two fingers at a time. Abduct (*spread*) the fingers by contracting the interossei dorsalis and abductor digiti minimi muscles. To assist the stretch, use the thumb and an additional finger from the free hand at the end of active movement. Stretch, release, and repeat 1-2 sets of 5.



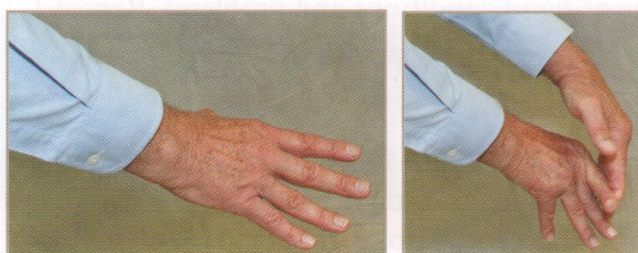
2.

FINGER ABDUCTOR STRETCH

Muscles Stretched: Dorsal interossei manus.

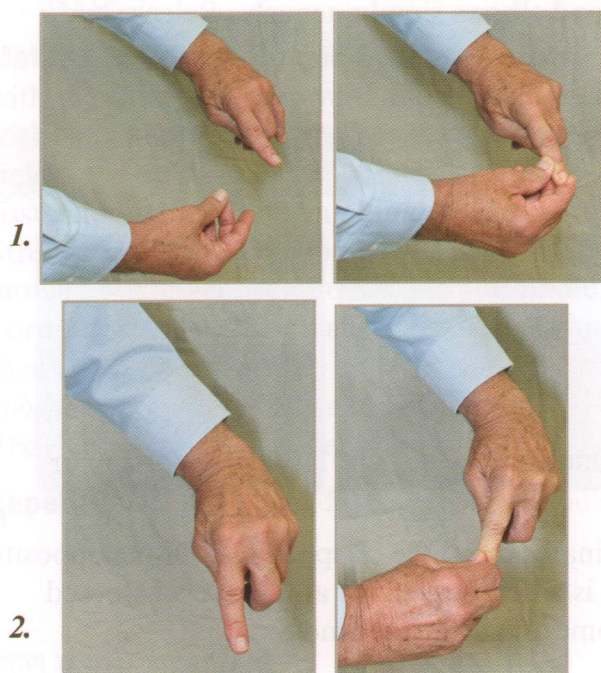
Muscles Contracted: Palmer interossei.

In order to stretch the finger abductors, move the fingers toward the midline and gently provide additional stretching with the free hand as far as possible. For the maximum ring finger and little finger, the wrist is also in full radial flexion. For the maximum index and middle fingers the wrist is also in full ulnar flexion. This is excellent for stiff hands, arthritis, scleroderma, etc. Repeat 1-2 sets of 5.



INTERPHALANGEAL JOINTS

Frequently the proximal, middle or distal interphalangeal joints are affected by fracture, dislocation, varied sprain and strain injuries, arthritis inflammatory, or various neurological considerations. These conditions may result in limited range, swelling, pain and possibly altered sensations (*neuropathy*).



Method 1: Lateral release Clasp the finger above the joint to be treated. Provide gentle lateral pressure on both sides of the joint. Alternate pressure on one side and then reverse to the opposite side. Gently repeat a number of repetitions and a number of sets as needed. This along with linear flexion and extension stretches will help relieve Heberden's nodes, Duputron's contractures, calcium buildup and crystallization buildup along the lateral joint and ligament attachments.

Method 2: Rotary traction This is a second action to assist in relieving inflammation, pain, swelling, joint buildup and finger dysfunction. Clasp the finger above the joint to be exercised. Apply gentle traction and gentle alternating medial-lateral joint rotation. Repeat a number of rotations and additional sets as required.

THUMB STRETCHING

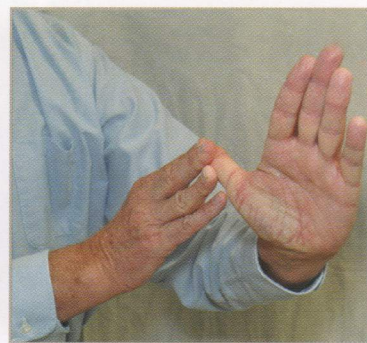
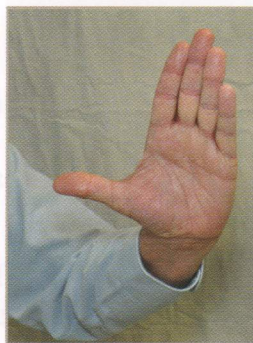
The thumb is a comprehensive, versatile digit that is used countless times per day often with considerable stress. The thenar muscles at the flexor base of the thumb are used in most grasping activities. Repetitive activities such as computer use or other overuse of the hand in work or play result in pain and inflammation. The specific stretches of the thumb for prevention, improvement of performance or rehabilitation range of motion are described below.

THUMB OPPOSITION STRETCH

Muscles Stretched: Muscles that are involved in opposition include the opponens pollicis, flexor pollicis brevis and adductor pollicis. This is an excellent stretch of the thenar eminence.

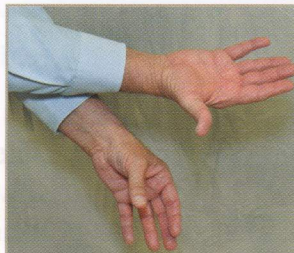
Muscles Contracted: Extensor pollicis longus, extensor pollicis brevis and abductor pollicis.

Method 1: Placing your hand with the palm facing away from the body and your thumb at a 90-degree angle to the index finger. Horizontally abduct the thumb away from the palm of the hand as far as possible using the abductor and extensor thumb muscles. Move the thumb back toward the body. Use your opposite hand to assist as if you are drawing back on a bowstring. Release and repeat 1-2 sets of 5.



1.

Method 2: Perform this exercise with the palm of the hand facing upward (*supine*). Extend the thumb downward toward the surface below and assist with the free hand. Gradually move the thumb additional degrees horizontally away from the index finger to stretch muscle and fascial tissue not lengthened thoroughly in method 1. This is a great exercise for lower thumb pain and an outstanding stretch of the thenar eminence. Repeat 1-2 sets of 5.



2.

THUMB ADDUCTOR (WEB) STRETCH

Muscles Stretched: The adductor pollicis longus and adductor pollicis brevis move the thumb inward toward the index finger forming an inward pinching motion. The web between the thumb and index finger is a strong supportive group of tissues but often becomes shortened because of the thumb's major actions.



1.

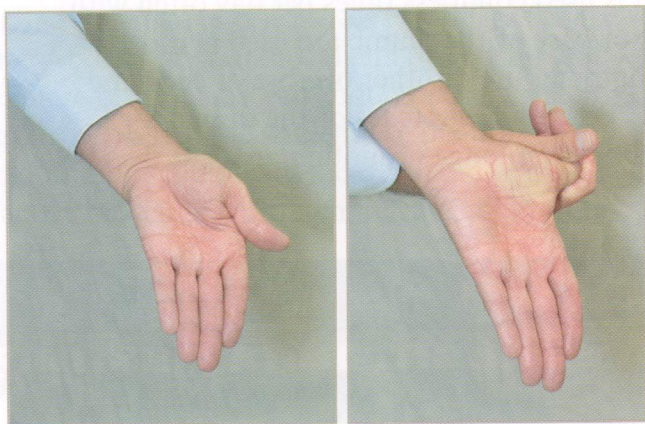
Muscles Contracted: Include the abductor pollicis longus, abductor pollicis brevis.

Method 1: Abduct the thumb horizontally moving the thumb laterally away from the index finger. Contracting the abductor muscles

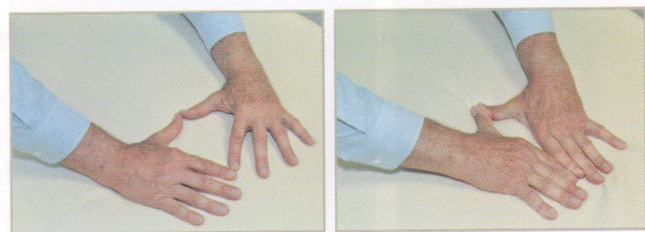
continued next page

THUMB ADDUCTOR (WEB) STRETCH *continued*

2.



3.



release the stretch. Repeat the same action a number of times with the hand and wrist flat against a surface. Repeat 1-2 sets of 5-8 repetitions.

stretch the web and thumb adductors using the opposite hand to assist. Release and repeat 1-2 sets of 5-8 repetitions.

Method 2: This exercise is also to be exercised from a palm-up (*supine*) position to stretch additional seldom lengthened muscle and fascial tissue. 1-2 sets of 5-8 repetitions.

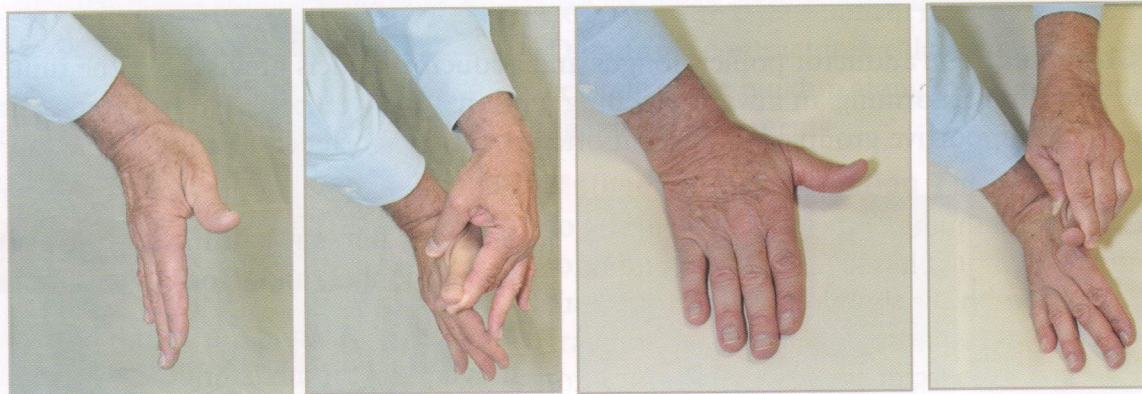
Method 3: This exercise will stretch thumb adductors, connective fascia and webs simultaneously. Place both hands flat in a palm down position on a supportive surface. The wrist is also to remain flat against the surface during the thumb adductor stretching. Placing both thumbs and both index fingers against each other spread the thumbs as far away from the index as possible and assist the stretch of both webs as each hand pushes toward the opposite hand. Stretch 1½-2 seconds and

THUMB ABDUCTOR STRETCH

Muscles Stretched: The thumb abductor muscles include the abductor pollicis longus, abductor pollicis brevis and the thenar eminence. The muscles that move the thumb away from the index finger (*abduction*) are seldom stretched and are involved when the radial side of the wrist is affected.

Muscles Contracted: Including the adductor pollicis longus and adductor pollicis brevis.

Method: Actively move the thumb over the top of the neighboring index finger in both the shake hand and the palm flat down on a surface (prone) position. Use the index finger, middle finger and ring finger of the opposite hand to assist the stretch. Release and repeat 5-8 repetitions in each position.



THUMB EXTENSOR STRETCH

Muscles Stretched: Muscles that extend the thumb include the extensor pollicis longus and extensor pollicis brevis. The abductor pollicis, especially the oblique fibers need to be well stretched.

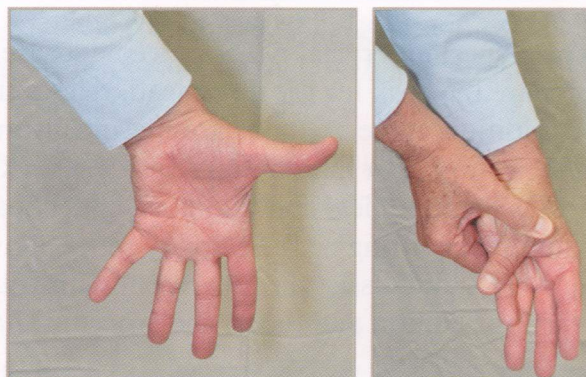
Muscles Contracted: Muscles that flex the thumb and provide opposition include the opponens pollicis, flexor pollicis brevis and adductor pollicis.

Method 1: Contracting the opponens pollicis brevis, and adductor pollicis, actively contract the muscles of opposition by moving the fully extended thumb towards the base of the little finger. Use the free (*opposite*) hand by placing the assisting thumb on the outer base of the thumb being stretched. Flex the thumb toward the bottom of the little finger. Release and repeat. 1-2 sets of 5.

Method 2: Place the thumb deep inside the palm of the hand and firmly flex the four fingers around the thumb. Maintain an extended elbow. Ulnar flex the wrist moving the hand toward the ulna (*little finger side*) of the wrist. This is probably the finest stretching of the thumb extensors. Make sure that the entire thumb is flexed as far as possible before beginning the stretch. Release and repeat 1-2 sets of 5 repetitions.

Method 3: Place the thumb deep inside the palm of the hand and firmly hold the four fingers around the thumb throughout the stretch. Maintain an extended elbow. Begin with the thumb and radius bone in a neutral, upward position. Bend the wrist inward 45 degrees and move the wrist downward and inward at a 45 degree angle. As capable flex the wrist as much as 90 degrees and repeat the same movement making sure the radius remains in a vertical position throughout the effort. Assist at the end of the movement. This is an outstanding stretch for the lateral oblique thumb, index, and middle finger extensor muscles. Repeat 1-2 sets of 5.

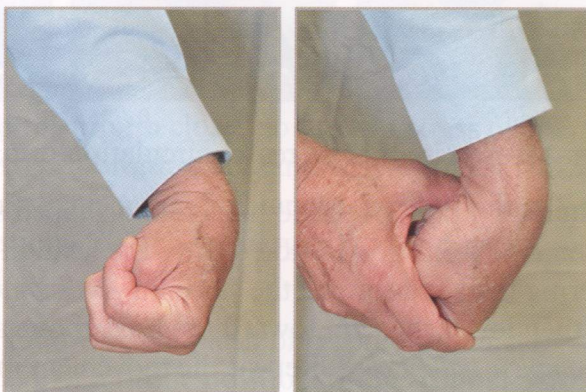
Method 4: Place the thumb deep inside the palm of the hand and firmly hold the four fingers around the thumb. Begin with the thumb and radius bone positioned vertically. Extend the wrist as far as capable and flex the wrist down and away at a 45 degree angle. Excellent for stretching the lateral oblique thumb extensor muscle and fascia and the medical oblique wrist radial flexors. Repeat 1-2 sets of 5.



1.



2.



3.



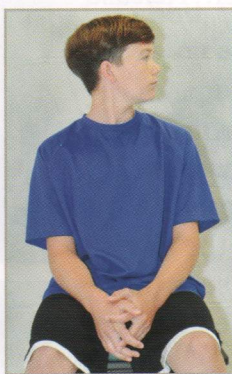
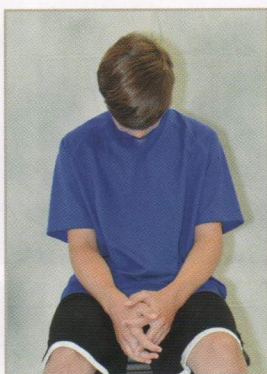
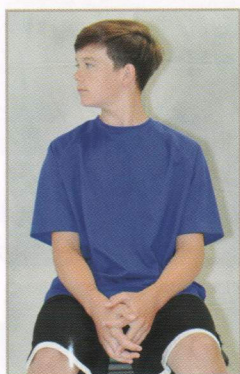
4.

NECK FLEXIBILITY: ACTIVE STANDING OR SITTING POSITION

These specific cervical A.I.S. movements are designed to insure maximum range of motion and prepare the neck for the day ahead, relieve stiffness, stress, and for injury prevention in sports. In addition, these exercises are specifically intended to help improve range of motion for post injury, surgery or inactive muscles. These exercises provide relief of previous neck trauma, T.M.J., neurological conditions, poor cervical range of motion or cervical muscle tension. The standing or sitting neck flexibility series allows you to move your head in a given direction actively and to assist the movement with your hands. Stretch 1½-2 seconds, release to the starting position and repeat the procedure. (See Neck Protocol listed in Appendix)

ANTERIOR SEMI-CIRCLES

Half Moon



Introduction:

Complete circumduction (360 degrees) places unwarranted stress on tendons and ligaments and is contraindicated for those suffering from whiplash, surgery, post fracture, or disc problems.

Complete circumduction may also endanger the vertebral artery. Semi-circumduction, however, is a gentle

warm-up exercise that increases circulation prior to the specific fundamental movements of the neck.

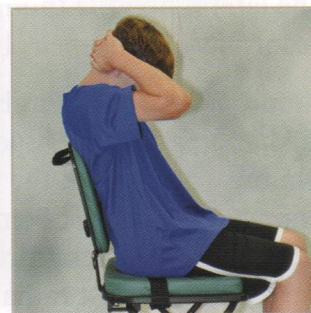
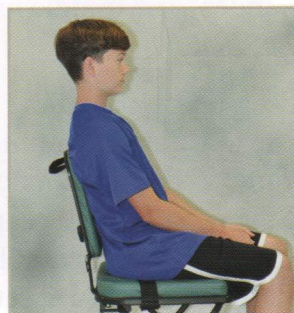
Method: Employ a relaxed half-moon shaped semi-circular motion, moving the head in pendular movements from side to side. Move the head in slow, gentle half circles. Begin the movement by lowering the head toward the sternum (*breastbone*). Move the chin toward the top of one shoulder, and then lower the chin toward the breastbone and move toward the opposite shoulder. (A complete half circle). Repeat the movement in the opposite direction.

Repetitions: 8-10.

CERVICAL FLEXION

Muscles Stretched: Cervical extensor muscles including the multifidus, semispinalis, oblique capitis, and erector spinae.

Muscles Contracted: Anterior cervical flexor muscles, including the rectus capitis anterior, rectus capitis lateralis, sternocleidomastoid, longus colli, longus capitis, and anterior scalene muscles.



CERVICAL FLEXION *continued*

Method: Tuck the chin as close to the neck as possible. Flex the head forward by contracting the anterior cervical muscles. Assist the terminal (*end*) movement, placing the hands on the upper posterior region of the head. Release and return to the neutral position.

Compensation Check: *DO NOT* allow the spinal areas below the neck to bend downward as the head moves forward. Tightening the abdominal muscles and moving the shoulder blades (*scapulae*) back towards the spine helps to prevent compensation.

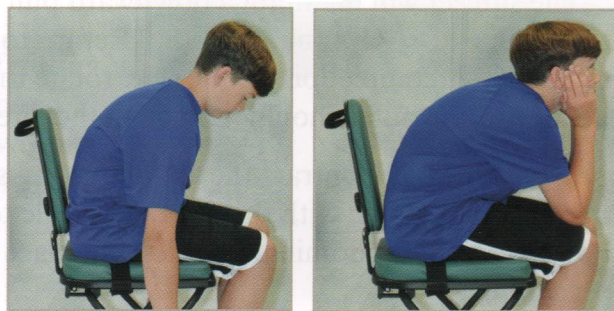
Repetitions: 5-10.

CERVICAL HYPEREXTENSION

Muscles Stretched: Cervical flexors, including the longus colli, longus capitis, rectus capitis anterior, rectus capitis lateralis, and anterior scalene muscles.

Muscles Contracted: Extensor muscles including the multifidus, semispinalis, oblique capitus, and erector spinae.

Method: Flex the trunk 45-60 degrees forward to prevent the anterior muscles from contracting eccentrically. Extend the head backward by contracting the cervical extensor muscles. Assist at the end of the movement with the hands around the outer borders of the jaw. Upward mild traction under the mandible with the jaw closed, while assisting the head backward, will allow for greater safety and a more successful stretching movement. Keep the mouth closed to prevent stress of the temporomandibular joint, especially those suffering from temporomandibular jaw syndrome (T.M.J.). *Do Not* allow extension movement of the spinal areas below the neck. Tightening the abdominal muscles will help prevent thoracic and lumbar compensation. Stretch the cervical flexor muscles. Release to the neutral starting position and repeat the movement.



Notes: For those with disc involvement, post-surgery, or following whiplash or severe trauma, hyperextension may be carefully exercised from this posture or a prone position. **Repetitions:** 8-10.

CERVICAL OBLIQUE HYPEREXTENSION

Muscles Stretched: Anterior Scalenus, sternocleidomastoid, longus colli cervices, longus capitus, and rectus capitus muscles.

Muscles Contracted: Antagonist extensor muscles from the side head is moving towards including the multifidus, semi spinalis, oblique capitus, and erector spinae.

Method: Bend the trunk forward 45-60 degrees to prevent the anterior neck muscles from contracting eccentrically. To lengthen these muscles, rotate the head 45 degrees, nose centered over the middle of the breast: then extend the neck backwards at a 45 degree angle, moving the head (*ear*) towards the outer border of the scapula in the direction the head is rotated. Assist the head movement gently.

continued next page

CERVICAL OBLIQUE HYPEREXTENSION *continued*



The same side hand will provide the assistance with gentle push on the upper-lateral portion of the head. The subject will maintain a downward pull of the shoulder girdle and abdominal muscles to prevent trunk extension compensation. Return to the starting neutral position after completing each repetition. After completion of one side, rotate the head 45 degrees in the opposite direction and move the ear toward the outer shoulder blade in the direction the face is pointing. **Repetitions:** 5-8.

Compensation Check: Contract the abdominal muscles to help prevent the trunk from flexing laterally. Contract and pull down with the shoulder girdle to prevent shoulder shrugging. If sitting on a chair or stool, tighten the abdominal muscles and place the free hand under the seat to prevent trunk compensation.

Notes: For those with disc involvement post-surgery, or following whiplash or severe trauma, this exercise may be more appropriately performed in a stable prone position. (*See Neck Flexibility: Active Gravity*)

CERVICAL LATERAL FLEXION: Right



Muscles Stretched: Left lateral muscles, including the scalene muscles, sternocleidomastoid, sacrospinous, and splenius capitis muscles.

Muscles Contracted: Right cervical lateral flexors, scalene muscles, sternocleidomastoid, sacrospinous, and splenius capitis muscles.

Method: To best stretch the lateral muscles on the left side of the neck contract the same cervical lateral flexors on the right side of the neck. Move the head downward toward the right anterior shoulder. Exhale at the end of active movement and

assist with the right hand placed on the left side of the head. Focus on an object directly in front of the eyes to prevent movement out of the correct frontal plane. Stretch and return to the starting neutral position.

Compensation Check: *DO NOT* shrug the left shoulder or allow the mid (*thoracic*) spine or (*lumbar*) spine to bend laterally. If sitting, tighten the abdominal muscles and place the left hand under the chair or stool and pull the left shoulder downward to prevent right lateral trunk movement or a left shoulder shrug.

Repetitions: 1-2 sets of 5-10.

CERVICAL LATERAL FLEXION: Forward Oblique Right

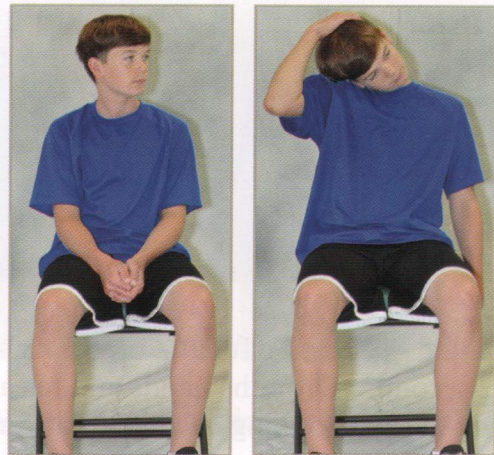
Muscles Stretched: Upper trapezius, levator scapula, semispinalis capitis, longissimus capitis, erect spinae, and middle and posterior scalene.

Muscles Contracted: Right side sternocleidomastoid, anterior scalene and pre-vertebral muscles.

Method: Rotate the head 45 degrees to the left pointing the right ear toward the center of the right breast. Exhale when moving the head at a 45-degree angle towards the center of the right breast by contracting the right side sternocleidomastoid and prevertebral muscles. Assist the movement with the right hand. Return to the starting vertical position and repeat the effort.

Compensation Check: **DO NOT** allow elevation of the left shoulder or lateral flexion of the trunk to the right. If sitting, tighten the abdominal muscles and place the free left hand under the chair or stool and pull the left shoulder downward to prevent lateral trunk compensation or shoulder shrugging.

Repetitions: 1-2 sets of 5-10.



CERVICAL FLEXION FORWARD OBLIQUE: Right

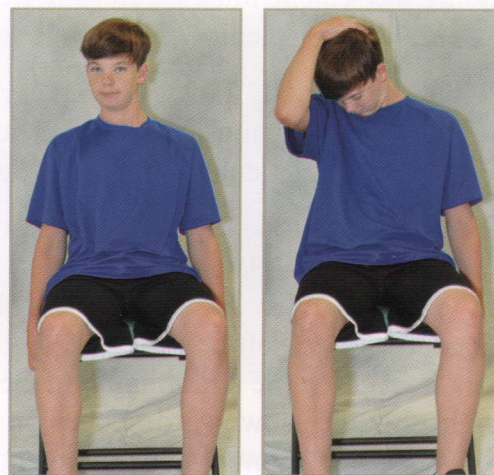
Muscles Stretched: The left side of the upper trapezius, levator scapula, semispinalis capitis, longissimus capitis, middle and posterior scalene muscles and erector spinae.

Muscles Contracted: The right side sternocleidomastoid, anterior scalene and entire pre-vertebral muscle group.

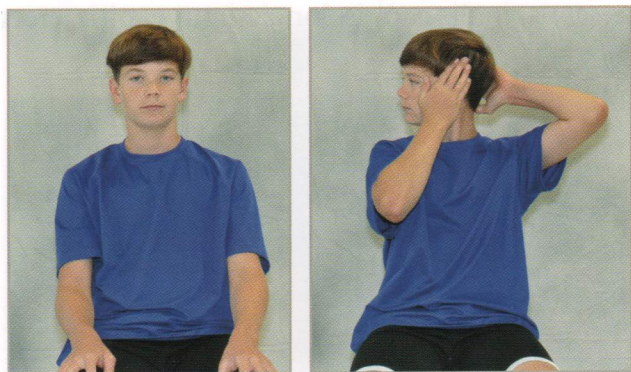
Method: Rotate the head 45 degrees to the right, pointing the nose and chin toward the center of the right breast. Exhale while moving the nose towards the center of the right side breast, contracting the anterior neck (*cervical*) muscles. Assist the gentle movement with the right hand. This posterior cervical stretch will further isolate the tension filled levator scapula and additional upper trapezius muscle and fascia fiber.

DO NOT allow the left shoulder to shrug or the trunk to bend forward during the stretch. Return to the starting vertical position and repeat the movement. If sitting, place the uninvolved left hand under the back of the chair or stool to help prevent shoulder shrugging or trunk compensation.

Repetitions: 1-2 sets of 5-10.



CERVICAL ROTATION: Right



Muscles Stretched: The left cervical rotators including the multifidus, rotatores, semispinalis, and sternocleidomastoid muscles.

Muscles Contracted: Right cervical rotators including the multifidus, rotatores, semispinalis, and sternocleidomastoid muscles.

Method: Rotate the head to the right by contracting the same right side cervical rotators. Assist at the end of movement by placing the right hand along the entire left side of the

mandible (*jaw*) and left hand on the right side of the head toward the back end. Exhale and stretch for 1½-2 seconds. Drop the hands and release to the starting neutral position and repeat the effort. Turn having the eyes looking backwards as far as possible during the effort to help achieve greater range.

Compensation Check: **DO NOT** allow compensation by shrugging the shoulders or rotating the upper trunk and shoulder girdle. Forcefully pull the left shoulder girdle backward while rotating the head to the right. To prevent compensation you may place the shoulder blades against a wall. Do not allow the left shoulder blade (*scapula*) to leave the surface during the stretch to the right.

Repetitions: 1-2 sets of 5-10.

CERVICAL LATERAL FLEXION: LEFT

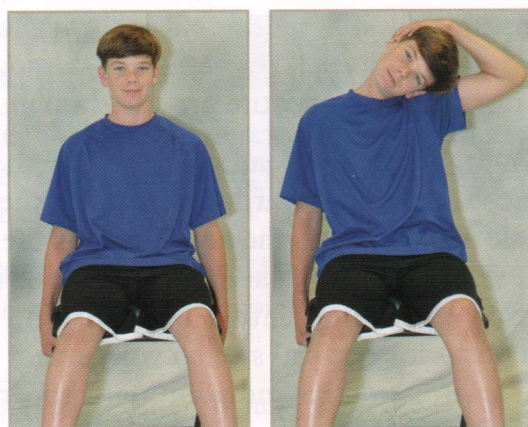
Muscles Stretched: Right lateral muscles of the neck including the scalene muscles, sternocleidomastoid, sacrospinous, and splenius capitis muscles.

Muscles Contracted: Left cervical lateral flexors including the scalene muscles, sternocleidomastoid, sacrospinous, and splenius capitis muscles.

Method: Contract the left lateral neck muscles and move the head to the left (*ear downward*) toward the left anterior shoulder. Exhale; assist at the end of the movement with the left hand placed on the right side of the head. Tighten the abdominal muscles while pulling the right shoulder downward. Focus on an object directly in front of your eyes to prevent movement out of the correct frontal plane. Stretch, then inhale while returning to the starting neutral position.

Compensation Check: **DO NOT** shrug the right shoulder, bend the mid spine (*thoracic*) or lower the lumbar spine. If seated place the right hand under a stool or chair seat to prevent shoulder shrugging and tighten the abdominal muscles to help eliminate lateral trunk compensation.

Repetitions: 1-2 sets of 5-10.



CERVICAL LATERAL FLEXION: Forward Oblique: Left

Muscles Stretched: Upper trapezius, levator scapula, semispinalis capitis, longissimus capitis, erector spinae, and middle and posterior scalene muscles.

Muscles Contracted: Left side sternocleidomastoid, anterior scalenes and prevertebral muscles.

Method: The subject will rotate the head 45 degrees to the right. The left ear is pointed toward the center of the left breast and the nose toward the center of the right breast. Move the head at a 45-degree angle towards the center of the left breast. Purposefully pull the right shoulder girdle downward to prevent shrugging compensation and provide optimal stretch. Assist the movement with the left hand and exhale when stretching. Return to the vertical neutral starting position and repeat the effort.

Compensation Check: DO NOT shrug the right shoulder or allow the (*thoracic*) or lower (*lumbar*) spine to bend. If sitting, place the right hand under the chair or stool. Pull the right shoulder girdle downward to prevent shrugging and tighten the abdominals to prevent lateral trunk movement.

Repetitions: 1-2 sets of 5-10.



CERVICAL FLEXION FORWARD OBLIQUE: LEFT

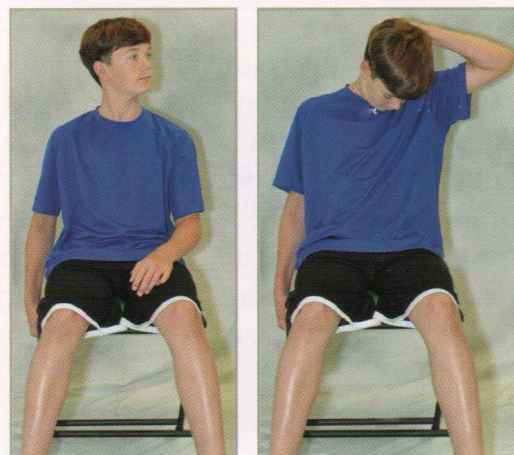
Muscles Stretched: The left side of the upper trapezius, levator scapula, semispinalis capitis, longissimus capitis, middle and posterior scalene muscles and the erector spinae.

Muscles Contracted: The right side sternocleidomastoid, anterior scalene and entire prevertebral muscle group.

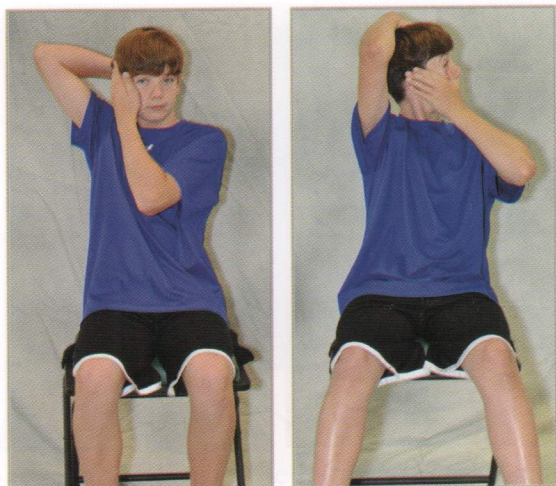
Method: Rotate the head 45 degrees to the left pointing the nose and chin towards the center of the left breast. Exhale while moving the nose toward the center of the left side breast, contracting the anterior cervical (*neck*) muscles. Assist the gentle movement with the left hand. This posterior cervical stretch will further isolate the levator scapula and additional upper trapezius muscle and fascia fibers.

DO NOT allow the right shoulder to shrug or the trunk to bend forward during the stretch. Return to the starting position and repeat the movement. If sitting, place the uninvolved right hand under the back of the chair or stool to help prevent trunk compensation.

Repetitions: 1-2 sets of 5-10.



CERVICAL ROTATION: LEFT



Muscles Stretched: Right side cervical (*neck*) rotators, including the multifidus, rotatores, semispinalis, and sternocleidomastoid muscles.

Muscles Contracted: Left side cervical (*neck*) rotators including the multifidus, rotatores, semispinalis and sternocleidomastoid muscles.

Method: Rotate the head to the left by contracting the opposite side (*left*) cervical rotators. Assist at the end of movement by placing the left hand along the entire right side of the mandible (*jaw*). Place the right hand on the left side of the head towards the back end. Exhale when stretching, inhale during the return to the starting position. Drop the hands following

each repetition. Having the eyes look backward as far as possible will help achieve greater range.

Compensation Check: **DO NOT** allow shoulder shrugging or rotation of the upper trunk by fixating the right shoulder down and backwards. Stretch the neck and release to the starting neutral position. To prevent compensation you may place the shoulder blades (*scapulae*) against the wall as you turn the head. **DO NOT** allow the right shoulder blade to leave the surface as the head rotates to the left.

Repetitions: 1-2 sets of 5-10.

NECK FLEXIBILITY: ACTIVE GRAVITY

Proper preparation of the neck muscles and connective tissue while maintaining normal joint range of motion may help reduce muscle strain and the possibility of severe injury such as nerve damage, fracture, or paralysis. This range of movement is especially important in maintaining good posture, for sports activities, following post fracture, surgery, repetitive stress situations, or an accident. The following localized movements of the cervical spine help improve flexibility, strength, and localized endurance of the cervical musculature, and provide a specific rehabilitation program for post-surgery, post trauma, temporomandibular jaw dysfunction (T.M.J.), neurological conditions, or poor cervical range of motion. The subject may initially require cervical assistance. (*See Neck Flexibility Assisted Gravity*)

CERVICAL ANTERIOR SEMI-CIRCLES

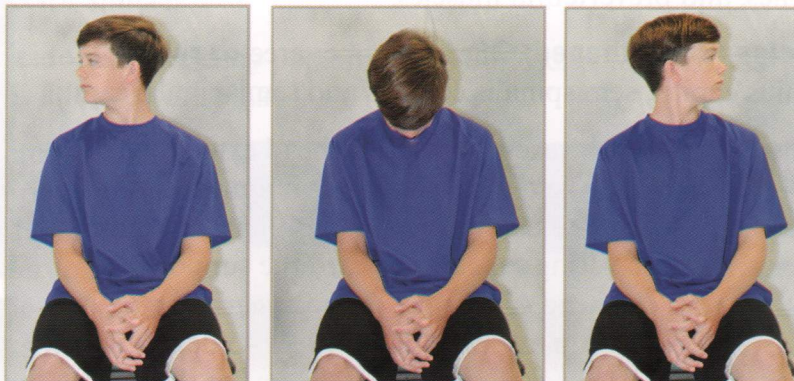
Introduction: Full circumduction (*360 degrees*) places unwarranted stress on cervical tendons and ligaments and is contraindicated in those with post trauma, disc problems, or post-operative status. Complete circumduction may also endanger the vertebral artery. Anterior semi-circles are a general warming exercise initiated from a standing, sitting, or leaning position.

A relaxed semi-circle motion is employed moving the head in pendular movements from side to side.

CERVICAL ANTERIOR SEMI-CIRCLES *continued*

Method: Move the head in half circles. Initiate the movement by lowering the head toward the chest (*sternum*). Move the chin towards the top of one shoulder, and then bring the head back to the sternum (*breastbone*) and move it to the opposite shoulder. Repeat this sequence in the opposite direction.

Repetitions: 8-10.



CERVICAL HYPEREXTENSION

Muscles Stretched: Sternocleidomastoid, anterior scalenes, and prevertebral muscles.

Muscles Strengthened: Upper erector spinae, splenius cervicis, splenius capitis, semispinalis cervicis and semispinalis capitis.

Method: This exercise may be performed in a four-point position on the hands and knees or in a prone position with the head extending beyond the edge of a table or bed. Inhale and initiate the exercise by lowering the head full range toward the supportive surface and then exhale as you extend the head upward as far as possible without allowing a compensatory movement of the middle (*thoracic*) or lower (*lumbar*) spine. If on a table, reach the arms down as far as possible and hold on gently to help prevent mid and lower spine movement.

Notes: Exercise should be performed slowly, with gentle stretch at the end of each movement. You may need assistance if weak or lacking range of motion. (*See Neck Flexibility Assisted Gravity*)

Repetitions: 5-10 progressing to 15. More than one set may be beneficial.

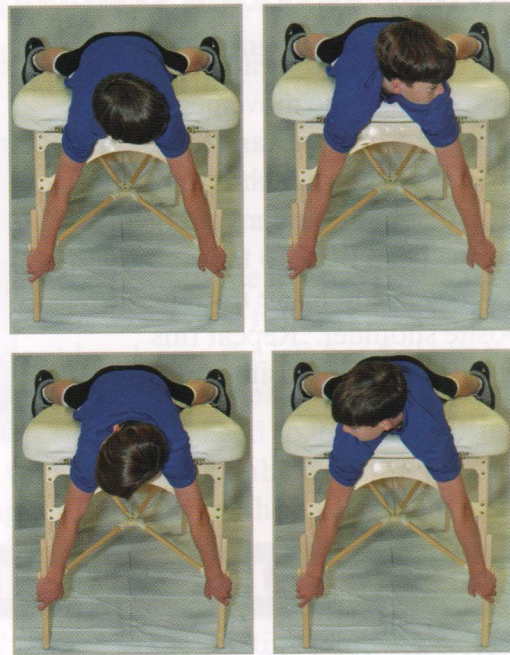


CERVICAL HYPEREXTENSION: OBLIQUE

Muscles Stretched: One side sternocleidomastoid, anterior scalenes, and prevertebral muscles.

Muscles Strengthened: One side upper erector spinae, splenius capitis, semispinalis cervicis and semispinalis capitis.

Method: Perform the exercise with the head extending beyond the edge of the table or bed or in a four-point position resting on the hands and knees. Inhale and initiate the exercise by lowering the head toward the supportive surface, rotate the head 45 degrees (*nose centered over the breast*). Exhale as you extend obliquely at a 45 degree angle over the same side outer shoulder blade, moving the head as far as possible without allowing thoracic movement. Exercise and repeat the oblique movement. Complete the same series to the opposite side. If exercising on a table, reach the arms down as far as possible to prevent middle and lower spinal compensation.



Note: This exercise may be initially contraindicated for bulging or herniated disc conditions until sufficiently healed. The exercise is performed slowly with gentle stretch at the end of each movement. You may need assistance if weak, lacking range of motion, or following an accident, surgery, cervical fusion or other serious conditions. (*Neck Flexibility: Assisted Gravity*)

Repetitions: 1-2 sets of 5-10, progressing to 15.

CERVICAL LATERAL FLEXION: RIGHT

Muscles Stretched: The three left side scalenes, sternocleidomastoid, erector spinae and prevertebral muscles.

Muscles Strengthened: The three right side scalenes, sternocleidomastoid, erector spinae and prevertebral muscles.

Method: Assume a left side-lying position. Inhale and move the head downward through a full range toward the lower shoulder. Exhale and lift the head upward toward the upper right shoulder, giving a gentle stretch to the muscles and fascia at that point.



Compensation Check: To help prevent lateral trunk flexion, hold onto the table leg with a full arm extension. Prevent levator scapula substitution (*shrug*) by placing the top arm along the thigh and purposefully pulling the right shoulder girdle downward to help prevent shrugging of the top shoulder. You can help prevent cervical rotation by looking at an object that is eye level. If uncomfortable, or fearful, this exercise may be performed without having the arm beyond the end of the table.

Note: DO NOT rotate the head or extend the head backward during the exercise.

Repetitions: Begin with 1-2 sets of 5-10 repetitions or a lesser number according to one's ability or previous history. Progress to 15 repetitions per series.

CERVICAL ROTATION: RIGHT

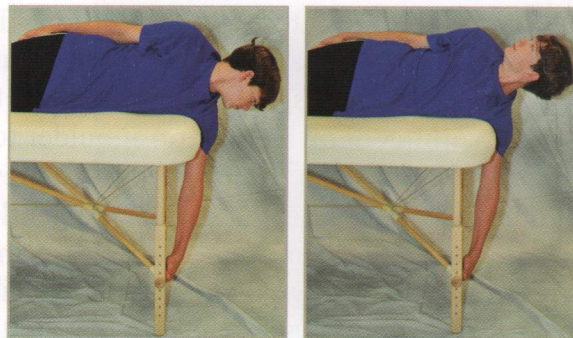
Muscles Stretched: Left sternocleidomastoid, deep posterior spinal muscles, longissimus cervicis, splenius capitis, splenius cervicis, and erector spinae.

Muscles Strengthened: Right sternocleidomastoid, deep posterior spinal muscles, longissimus cervicis, splenius capitis, splenius cervicis, and erector spinae.

Method: In a side-lying position, this exercise is performed from a downward left rotated position, exhale and slowly rotate the head upward and to the right without allowing the top shoulder to move backward. Stretch gently at the top of the end motion. Release and inhale while returning to the starting position. Perform with the eyes looking backward as far as possible to help achieve greater range.

Compensation Check: **DO NOT** allow the top shoulder to shrug or rotate backward, which is compensation for limited cervical rotation. (Maintain the top shoulder, preventing backward and forward motion). This exercise may also be performed without having the lower arm beyond the end of the table.

Repetitions: 1-2 sets of 5-10 if capable or a lesser number according to one's ability or previous cervical history. Progress to 15 repetitions per series.



CERVICAL LATERAL FLEXION: LEFT



Muscles Stretched: The three right side scalenes, sternocleidomastoid, erector spinae and prevertebral muscles.

Muscles Strengthened: The three left side scalenes, sternocleidomastoid, erector spinae and prevertebral muscles.

Method: Assume a side-lying position. Inhale as you move the head downward toward the lower right shoulder. Exhale, while moving the head upward toward the front of the left shoulder, giving a gentle stretch to the right side

muscles at that point. Lower the head and repeat the movement.

Compensation Check: To help prevent lateral trunk flexion, depress the right shoulder downward and hold onto the table leg with a full arm extension. Prevent left shoulder shrugging by placing the top arm along the thigh and forcefully holding the left shoulder down. You can help prevent cervical (neck) rotation by looking at an object that is approximately eye level.

Note: **DO NOT** rotate or extend the head backward during the exercise. If uncomfortable or afraid, this exercise may be performed without having the arm beyond the end of the table.

Repetitions: 1-2 sets of 5-10 repetitions or a lesser number according to one's ability or previous history. Progress to 15 repetitions per series.

CERVICAL ROTATION: LEFT

Muscles Stretched: Right side of the neck, including the sternocleidomastoid, deep posterior spinal muscles, longissimus cervicis, splenius capitis, splenius cervicis, and erector spinae.

Muscles Strengthened: Left sternocleidomastoid, deep posterior spinal muscles, longissimus cervicis, splenius capitis, splenius cervicis, and erector spinae.

Method: Assume a right side lying position. This exercise is initiated with a right downward rotated movement. Exhale and slowly rotate the head upward to the left, without allowing the top shoulder to move backward. Hold the top shoulder down to prevent left shoulder girdle shrugging. Perform a gentle stretch at the top of the movement. Release, inhale and return to the starting position. This exercise may be performed without having the arm beyond the end of the table. Have the eyes look backward as far as possible to help achieve greater range.



Compensation Check: **DO NOT** allow the top shoulder to move backward in compensation because that jeopardizes the cervical rotation improvement potential.

Repetitions: 1-2 sets of 10 if capable or a lesser number according to your ability or previous history. Progress to 15 repetitions per series. More than one set may be desirable.

CERVICAL FLEXION



Muscles Stretched: Cervical erector spinae, splenius cervicis, splenius capitis, semispinalis cervicis, and semispinalis capitis muscles.

Muscles Strengthened: Sternocleidomastoid and prevertebral muscles. Excellent for muscles used to swallow.

Method: This exercise is performed in a supine position. Contract the abdominal muscles to help prevent the thoracic or lumbar muscles from flexing forward. Retain the shoulders on the table throughout the exercise. Tuck the chin as close as possible to the neck, exhale and lift the head in a

close tuck. You may provide aid at any point throughout the range or at the end of the movement with a gentle assistance of your hand(s). Inhale; maintain the chin in a close tuck, while returning to the starting position and repeat. The mouth must be closed throughout the exercise to prevent compensation and achieve a maximum result.

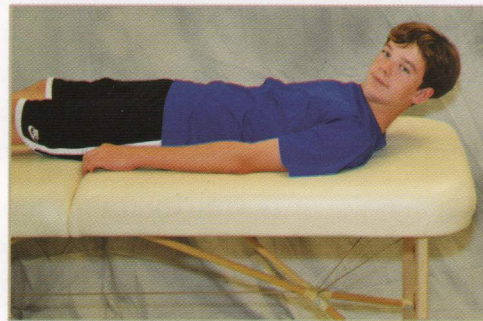
Repetitions: 1-2 sets of 5-10 repetitions if capable or a lesser number according to your ability or previous history. Progress to 15 repetitions with each series.

CERVICAL FLEXION: OBLIQUE

Muscles Stretched: One side upper erector spinae, splenius cervicis, splenius capitis, semi spinalis cervicis, and semispinalis capitis.

Muscles Contracted: One-side sternocleidomastoid, anterior scalenes and prevertebral muscles.

Method: The subject will assume a supine position on a surface. The subject will rotate the head 45 degrees (*nose centered over breast*) and maintain the shoulders on the table throughout the movement. The subject will move the front ear at an oblique angle toward the same side breast. (*Example: right ear movement toward center of right breast, left ear movement toward left breast*). The subject will not tuck the chin while moving the ear toward the breast. Have the subject inhale while lowering the head and exhale as the head lifts off the table. The subject will tighten the abdominals and hold the shoulders down to help prevent thoracic compensation. Complete one side, and then repeat the series in the opposite direction. Maintain a closed mouth for maximum anterior strengthening and posterior stretching results.



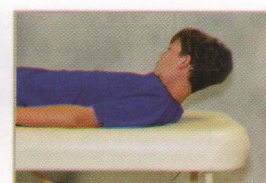
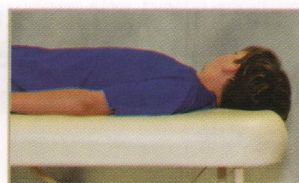
Repetitions: Begin with 1-2 sets of 5 to 8 repetitions, gradually increasing to 10. 2 or 3 sets may be indicated.

CERVICAL FLEXION: FORWARD OBLIQUE

Muscles Stretched: Especially good levator scapula stretch, upper trapezius, erector spinae, splenius cervicis, splenius capitis, semi spinalis cervicis and semi spinalis capitis.

Muscles Strengthened: One side sternocleidomastoid, one side anterior scalene, pre-vertebral and muscles of swallowing.

Method: Have the subject assume a supine position. Maintain the shoulders on the table throughout the entire exercise. Rotate the head 45 degrees, pointing the nose towards the breast. The subject will tuck the chin as close as possible, exhale and move the head at a 45 degree angle through full range. Assist the motion at the end of the movement with a gentle stretch. Maintain the chin in a fully tucked position and inhale while slowly lowering the head downward to the surface and complete the capable number of repetitions. Now rotate the head 90 degrees and move the tucked chin toward the opposite side breast. Slowly return in a tucked chin position towards the surface and complete the series.



Repetitions: 1-3 sets of 5. Gradually increase to 10 or greater as required.

HIP – BACK PROTOCOL: ACTIVE

The spine allows movement in all planes. Although the potential is there most of us do not utilize our maximum strength and range of motion in this area. To help prevent injury and develop maximum power and quickness in a variety of sports and physical activities, this potential should be explored and maximized. Limited flexion, extension, lateral flexion and rotation of the thoracic-lumbar (*low back*) spinal tissues may lead to problems such as muscle strains or various middle and lower back injuries. When muscles of the trunk and hip are properly stretched, free pelvic movement is possible. This section contains specific exercises that address these issues. Note that restoration of trunk flexibility following an injury or surgery should be followed carefully. In the initial stages of post-injury or post-surgery the Assisted Back-Trunk Flexibility Program may be necessary before the Active Back-Trunk Flexibility Program is initiated. These exercises are part of a sound preventive or rehabilitation program consideration. *See Hip-Back Stretching Protocol listed in Appendix*

The muscles of the hip joint are among the most frequently injured. Many of the muscles that flex and extend the hip are also part of the low back and knee. Inflexibility of these joint muscles can limit hip, pelvic girdle, and low back movements. Hip inflexibility also limits walking, running stride, gait, lateral movements, and quickness. The hip and pelvic girdle region when limited, may lead to hip and spinal changes or deterioration and present increased tension throughout the body. Posture and movement is immediately improved with increased hip range. Pain patterns throughout the body are decreased or eliminated when pelvic neutrality is restored. (*See Hip/Back Stretching Protocol listed in the Appendix, See Knee Protocol listed in Appendix*)

PSOAS-ILIACUS STRETCH: PRONE

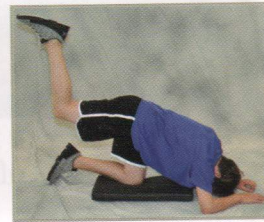
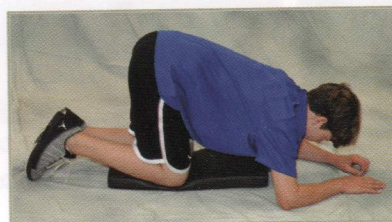
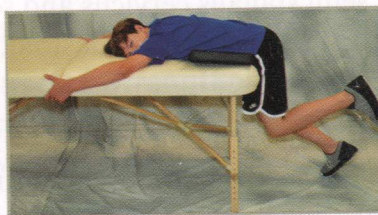
Muscles Stretched: Psoas major, iliacus, and sartorius.

Muscles Contracted: Hip extensors including the gluteus maximus and proximal hamstrings including the semitendinosus, semimembranosus and biceps femoris.

Method: Rest the pelvis and upper body on a table with very little weight on the contralateral (*non-active*) leg which is positioned against the table. The exercising leg is maintained at a 95-100 degree angle at the knee so that the proximal end of the rectus femoris will not interfere with stretching the hip flexors. In stretching the psoas major the exercising leg extends straight back with greater effort at the end of the active movement. The iliacus muscle is isolated by adducting the exercising thigh 10 degrees across the body midline and fully extending the hip. In order to stretch the sartorius muscle the thigh will be adducted 20 degrees across the body midline and controllably exercised into hyperextension as far as possible.

Note: The same exercise may be accomplished on the floor in a three-point position.

Repetitions: 1-2 sets of 5.

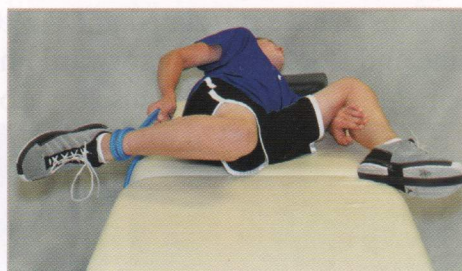


PSOAS-ILIACUS STRETCH: SIDE LYING

Muscles Stretched: Psoas major, iliacus and sartorius.

Muscles Contracted: Gluteus maximus (*buttock*), the hamstrings including the semitendinosus, semimembranosus and biceps femoris.

Method: Exercising from a side-lying position, move the lower, uninvolved leg close to the chest and secure stability holding under the thigh or under the foot with the lower arm. Maintaining the leg near the chest and contracting the abdominal muscles will prevent arching (*hyperextension*) of the back. The top hip always remains in a vertical position for each of the three stretches. A rope or strap is wrapped around the top ankle. Maintain the top knee at a 95-100 degree angle to prevent the proximal rectus femoris contraction which would limit the opportunity to stretch the hip flexors. In order to stretch the psoas major, contract the buttock and upper hamstrings and reach back as far as possible, using the rope for a 1½ second stretch. Repeat this movement until successfully lengthened. The iliacus muscle is stretched by moving the thigh an additional 10 degrees across the body midline toward the surface and extending the thigh backwards, assisting gently for 1½ seconds with the rope or strap. The sartorius is lengthened by moving the exercising leg 20 degrees across the body midline and hyperextended backward with the assisting strap or rope.



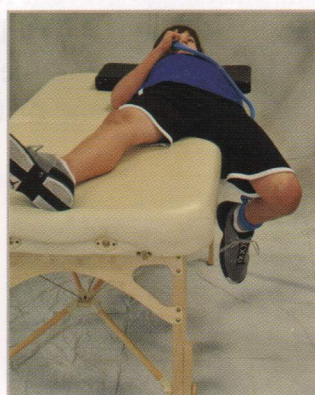
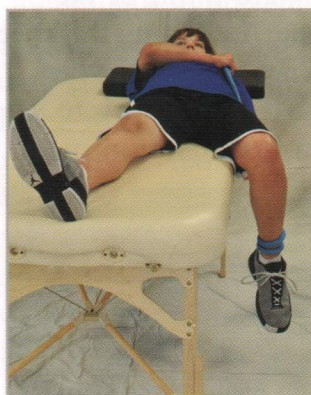
Repetitions: 1-2 sets of 5-8 for each of the three affected muscles.

PSOAS-ILIACUS STRETCH: SUPINE

Muscles Stretched: Psoas major, and iliacus.

Muscles Contracted: Gluteus maximus (*buttock*), the hamstrings including the proximal semimembranosus, semitendinosus and rectus femoris.

Method: Exercise while lying on your back (*supine*) and position the non-active leg near the chest to prevent compensation by allowing the lower back to hyperextend. Place a rope or strap around the ankle of the exercising leg. Maintain the exercising knee angle at 95-100 degrees. Extend the exercising hip backwards for 1½ seconds, assisting with the rope or strap. Isolating the iliacus muscle, move the exercising leg 10 to 15 degrees across the body midline and extend the thigh downward for 1½ seconds and release.



Repetitions: 1-2 sets of 5-8.

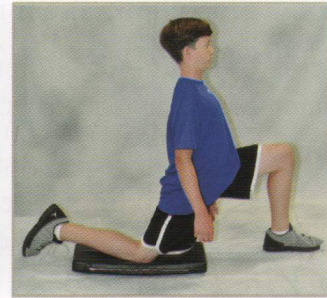
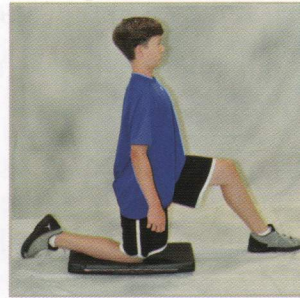
PSOAS-ILIACUS-SARTORIUS: KNEELING

Muscles Stretched: Psoas major, iliacus, and sartorius.

Muscles Contracted: Upper hamstrings and gluteus maximus.

Method: Position the body in a vertical, kneeling position throughout the effort. Begin with the body weight centered over the kneeling knee. The front leg (*foot*) is stationed 12 inches beyond the lead leg. At the end of each stretch movement the front knee should finish over the weight receiving front foot. When moving forward contract the lower abdominals and keep the pelvis tilted backward. During the forward movement maintain a parallel pelvis preventing the same side of the pelvis from moving forward. When initiating the forward movement, contract the abdominals, gluteus maximus and upper hamstring muscles. At the end of active movement maintain a stretch for 1½ seconds. The Iliacus muscle is isolated and stretched by moving the kneeling knee 10 degrees across the center midline and slowly lunging forward onto the front leg for 1½ seconds at the end of the end range of movement. The sartorius muscle is isolated by moving the kneeling knee at least 20 degrees across the body midline and slowly lunging the vertically positioned body, finishing the front knee over the resting foot-ankle. Stretch at the very end for 1½ seconds and release to the starting position and repeat the movement.

Repetitions: 1-2 sets of 5-8 in each of the three stretch positions.

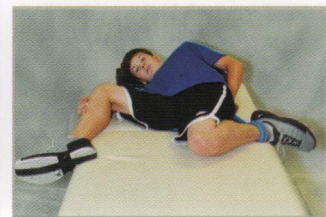
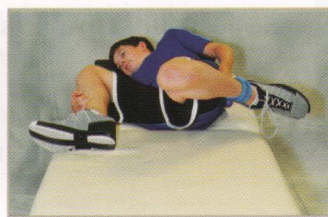


QUADRICEPS STRETCH: SIDE LYING

Muscles Stretched: Rectus femoris and vastus lateralis.

Muscles Contracted: Gluteus maximus and hamstrings including the semitendinosus, semimembranosus and biceps femoris.

Method Part 1: (Knee Flexion) In order to stretch the distal rectus femoris, lay on one side with the lower hip flexed and the thigh pulled close to the chest. This position and abdominal contraction prevents the lower back from compensating (*hyperextension*). The lower arm helps to maintain the lower leg posture by clasping underneath the foot or under the bottom thigh if unable to clasp the foot. The top hip is always positioned vertically and the lower thigh is stationed in a straight line directly below the upper body. Contract the abdominal muscles to prevent forward tilting of the pelvis. Maintain the upper leg in an adducted position toward the body midline, preventing the knee from pointing upward. Fasten the rope or strap around the ankle. Bend the knee moving the heel toward the buttock. This is an excellent exercise to stretch the distal end of the rectus femoris to help correct osgood-schlatters, chondromalacia and high patella syndromes. The vastus lateralis distal



QUADRICEPS STRETCH: SIDE LYING *continued*

attachment is accomplished from the same posture moving the thigh down against the surface with the leg in a straight line with the upper body. Bend the top exercising leg moving the heel towards the center of the exercising thigh to prevent knee ligament irritation. Hold the stretch for 1½ seconds at the end of movement and repeat.

Repetitions: 1-2 sets of 5-10.

Method Part 2: (Bent Knee hip Extension) In order to stretch the top (*proximal*) end of the quadriceps, contract the abdominals and position the lower leg near the chest. Maintain a vertically positioned top hip. Bend the top leg and clasp the ankle. If unable to grab the ankle use a strap or rope around the ankle taking a short hold and reaching the thigh backwards while in a midline adducted position. Stretch at the end of movement for 1½ seconds and repeat the effort. This is especially good for the proximal rectus femoris muscle.

The proximal vastus lateralis is stretched in the same manner, excepting the exercising knee is positioned against the surface, as the bent thigh extends backwards.

Repetitions: 1-2 sets of 5-10 in both positions



QUADRICEPS STRETCH: STANDING OR SITTING

Introduction: Having stretched the quadriceps in the side lying position and needing additional quadriceps stretching during and following activity or because of quadriceps cramping or fatigue the standing or sitting quadriceps stretch is acceptable.

In the standing or sitting position, bend the knee and extend the hip to stretch the distal rectus femoris. Following the distal rectus femoris, adduct the thigh 15 degrees across the midline while bending the heel toward the center thigh to prevent knee pain. This will stretch the distal vastus lateralis. Either sitting or standing, tighten the abdominals to prevent back arching as the hand or strap clasped thigh is extended to stretch the proximal rectus femoris. Moving an additional 15 degrees across the midline while maintaining the flexed knee, will isolate the proximal vastus lateralis.



Standing

Sitting

HIP ADDUCTOR STRETCH (GROIN): SUPINE

Muscles Stretched: Hip adductors, including the gracilis, pectinius, adductor magnus, adductor longus, and adductor brevis.

Muscles Contracted: The hip abductor muscles including the gluteus medius, gluteus minimus, sartorius, rectus femoris, tensor fascia latae, psoas and iliacus.

Phase 1 Horizontal: This is a primary stretch for the middle and distal adductor muscle fibers. The subject assumes a supine position and will abduct and external rotate the non-exercising leg as far as possible. Internally rotate the fully extended exercising leg. Using a rope or strap, place the band under the middle of the foot and around the inside of the lower leg to help prevent external rotation of the hip. (see photograph). Perform the exercise with the foot pointed inward as far as possible. Contract

the anterior thigh (*quadriceps*) to help prevent the knee from bending. Actively move the exercising leg away from the midline as far as possible from the starting position and repeating the movement. Move the same side hand down the rope as far as possible to help assist the stretch. The opposite side hand holds the top of the rope for control.

1.



exercise is performed by rotating the entire leg outward at a 45 degree angle in order to better isolate the adductor magnus and gracilis muscles. The adductor magnus, sometimes called the fourth hamstring is a contributing factor in hamstring injuries. The gracilis is a major factor in groin injuries and along

with the sartorius and semitendinosus make up the pes anserinus and help resist valgus (*knock knee*) stress. Working from the edge of an elevated surface with the leg turned outward 45 degree, reach downward at a 45 degree angle and assist with a rope or strap and the same side hand at the end of active movement for 1½ seconds. Release and repeat the movement.

2.



Phase 3 Vertical: In order to facilitate optimum stretch of the proximal end (*origin*) of the hip adductors (*groin*) a special exercise is necessary. The muscle tissues attached to the symphysis pubis are frequently the most irritated and resistant to releasing tension and tightness. Spread the non-exercising leg and rotate the leg outward. Fully extend the exercising leg and turn to an inward extreme. Place the rope or strap around the inward lower leg, placing the rope in the outside hand. Lift the maximally inward rotated leg vertical by reaching with the hip flexors and hip abductors toward a point 12-15 inches outside the same side shoulder. Clasp the thigh with the same side hand to assist the moving leg

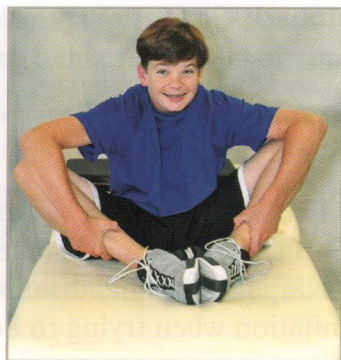
at the end of movement for 1½ seconds. Return to the starting position and repeat the movement.

3.



Repetitions: 1-2 sets of 5-10 for all three movements.

HIP ADDUCTOR STRETCH (GROIN): SEATED



Muscles Stretched: Hip adductors including the gracilis, pectiniis, adductor magnus, adductor longus, and adductor brevis.

Muscles Contracted: Hip abductors including the gluteus medius, gluteus minimus, tensor fascia latae, sartorius and hip external rotators.

Method: The subject assumes a seated position and places the soles of the feet together. Contract the muscles on the outside of the hips and spread the legs gently as far as possible using the hands

or forearms to assist the active stretch for 1 ½ seconds and return to the starting position. This is often used as a rewarming exercise during the course of an athletic contest as a more thorough adductor stretch was accomplished before an event.

Notes: This technique is less exacting because of the natural backward tilt of the pelvis and the external rotation of both femurs. From this position the adductors are required to stabilize the pelvis and femur which cause the adductors to contract eccentrically in order to achieve stabilization.

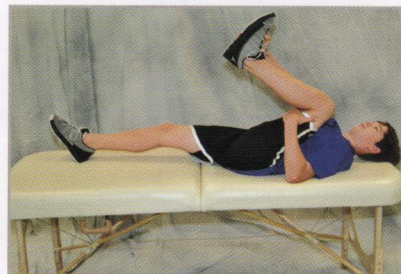
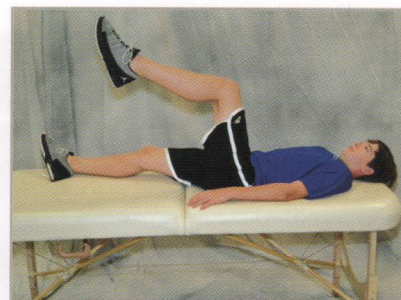
SINGLE LEG PELVIC TILT

Muscles Stretched: This Williams Back Exercise helps attain maximum sacrospinalis (*low back*) and gluteus maximus flexibility. The adductor (*groin*) muscles also receive stretch.

Muscles Contracted: Hip flexors including the psoas, iliacus, and rectus femoris. The anterior and oblique abdominal muscles.

Caution: If the condition is postoperative, disc involvement is present, or there is severe pain, flex the non-exercising knee 25 or more degrees. Otherwise, the non-exercising knee may remain straight and in contact with the surface.

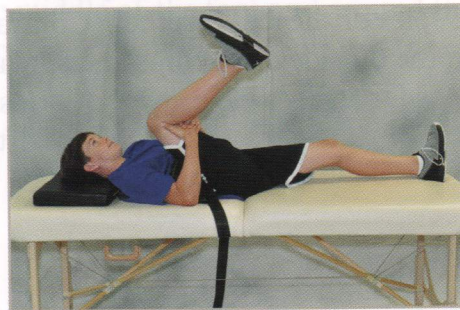
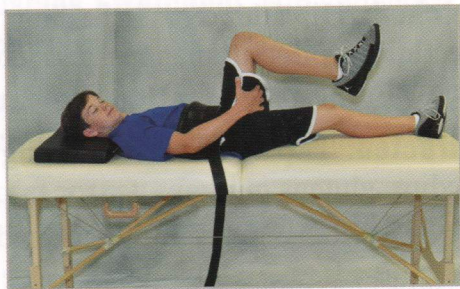
Method: Assume a supine position, flexing the exercising hip and knee, moving it outside the rib cage toward the axilla (*arm pit*) by contraction of the hip flexor and abdominal muscles. Place the hands behind the thigh to prevent pressure on the knee and provide slight assistance at the end of free movement. Return the thigh to a vertical position and repeat the exercise. The more flexible or athletic individual may place the opposite side hand under the foot to provide assistance, while maintaining the free leg against the surface.



Notes: 1) If there is no major back condition, this exercise may also be performed from a standing or sitting position. 2) From any position moving the knee toward the chest rather than the armpit (*axilla*) will structurally limit the movement as the hip range and position of the stomach limit potential at that angle.

Repetitions: 1-2 sets of 5-10.

HIP FLEXION



Muscles Stretched: Gluteus maximus (*buttock*), proximal end of the hamstrings, and proximal end of hip adductors.

Muscles Contracted: Psoas, iliacus, proximal rectus femoris and abdominal muscles.

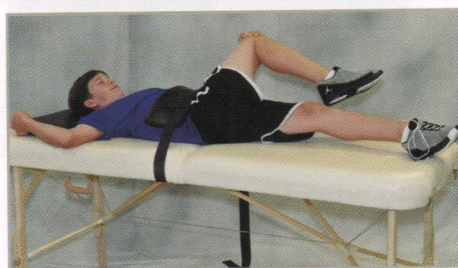
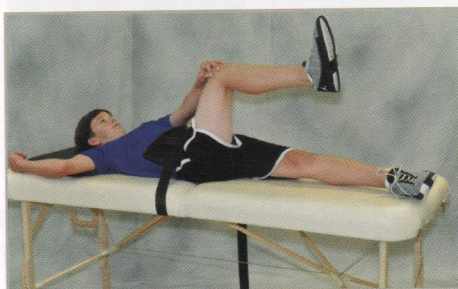
Introduction: This exercise improves the ability of the hip to bend forward. It is the beginning stage of stretching the lower back. A large abdominal distension (*belly*) will also be a severe limitation when trying to flex the knee towards the chest.

Method: Exercising in a supine position, bend the knee 90 degrees and move in the direction of the same side axilla (*armpit*). The inactive leg may be straight or slightly bent if the back is irritable. Use your hands behind the thigh to prevent pressure on the knee and provide assistance at the end of active movement. As more flexible, and if possible,

the opposite side hand may be placed under the opposite side foot to assist and stretch. A rope or strap under the foot and both hands on a rope or strap may also be employed. Hip flexion may also be employed in a standing position.

Repetitions: 1-2 sets of 5-10.

LATERAL GLUTEUS MAXIMUS STRETCH



Muscles Stretched: Lateral fibers of the gluteus maximus, gluteus medius, gluteus minimus and tensor fascia latae.

Muscles Contracted: Adductor magnus, adductor longus, adductor brevis, pectiniis and gracilis.

Method: The subject will exercise in a supine position and help stabilize the pelvis by moving the non-exercising leg across the midline and rotate the non-exercising leg to an inward extreme. Bend the exercising leg 90 degrees. Contract the inward thigh (*adductor*) muscles and move the leg towards the center of the opposite side hip. Use one or both hands on the outside of the lateral thigh to assist at the end of active movement. Return to the starting vertical position and repeat the effort.

Repetitions: 1-2 sets of 5-10 repetitions.

OBLIQUE GLUTEUS MAXIMUS STRETCH

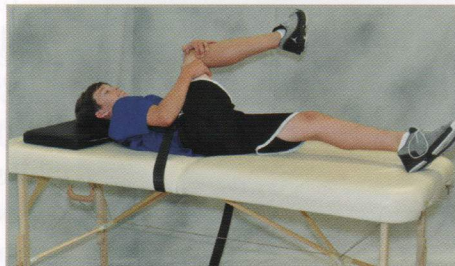
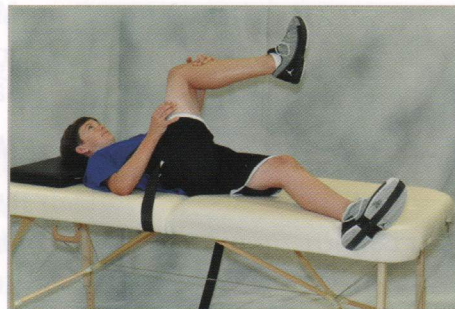
Muscles Stretched: Rotary gluteus maximus fibers, gluteus medius, gluteus minimus, tensor fascia latae, quadratus lumborum and multifidus.

Muscles Contracted: Abdominals, psoas, iliacus, adductor magnus, adductor longus, adductor brevis, pectinius, gracilis and medial hip rotators.

Introduction: This gentle stretch is ideal for the lower back region.

Method: Exercising in a supine position, stabilize your pelvis by moving the non-exercising leg across the midline. The exercising leg is vertical, externally rotated 45 degrees, and bent at a 90 degree angle. Contract the medial side muscles including the abdominals, hip flexors and hip adductor muscles and move the thigh towards the opposite side breast. Assist the stretch using both hands on the outside of the knee and thigh for 1½-2 seconds. Release to the starting vertical position and repeat. If groin impingement is felt during this stretch, externally circumduct the exercising hip and move the flexed knee slowly towards the bottom of the opposite side breast.

Repetitions: 1-2 sets of 5-10.



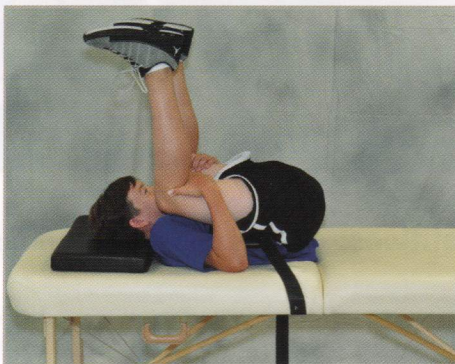
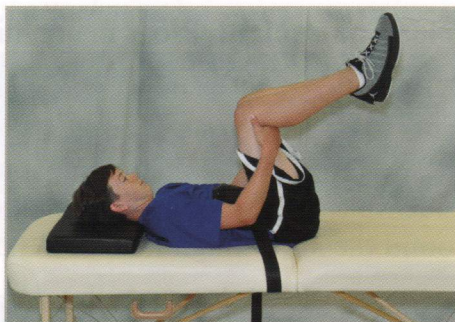
DOUBLE LEG PELVIC TILT

Muscles Stretched: Gluteus maximus, sacrospinalis (low back) muscles, and sacral-coccyx tissues.

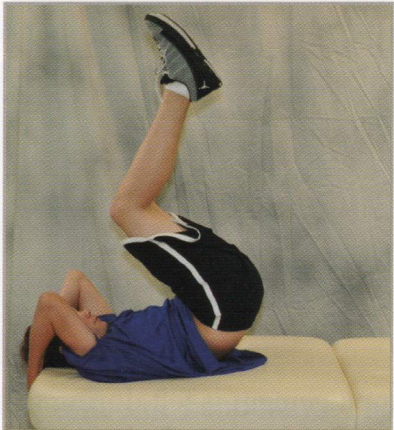
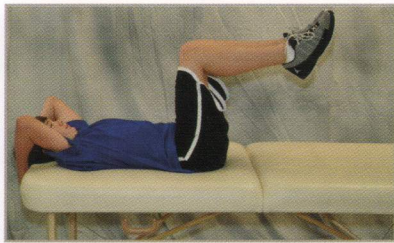
Muscles Contracted: Hip flexors including the psoas major, iliacus, and rectus femoris. The rectus abdominus, internal obliques and external obliques.

Method: Begin with the knees and hips flexed at a 90 degree angle and the thighs pointed vertical. Exhale and contract the hip flexor and abdominal muscles, pulling the thighs outside the ribs toward the axilla (*arm pits*). Place the hands under the thighs or under the hips and assist the contracting muscles in the stretching movement. Return to the starting position (*thighs vertical*) and attempt to move the thighs closer to the axilla (*armpit*) with each repetition.

Repetitions: 1-2 sets of 5-10.



REVERSE CURL



Muscles Stretched: Thoracic-lumbar extensors muscles including erector spinae, multifidus, quadratus lumborum, sacrospinalis and lumbar extensor muscles.

Muscles Contracted: Lower abdominal and hip flexor muscles.

Method: This stretch is accomplished by flexing the knees 90 degrees and lifting the pelvis. Contract the lower abdominal and hip flexor muscles and lift the trunk upward until the shoulder blades touch the surface. Then immediately, lower the body slowly and return the bottom of the trunk and legs until the lower back touches the surface again.

Contraindications: Extension of the legs over the head until the toes are touching the floor in back of the head is contraindicated because the back muscles are placed in a state of contraction (*lengthening*) while the stretch is attempted. This position also puts undue pressure on the neck.

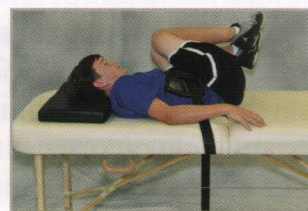
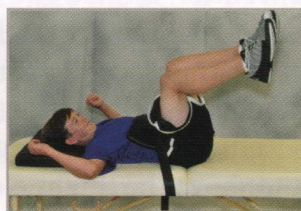
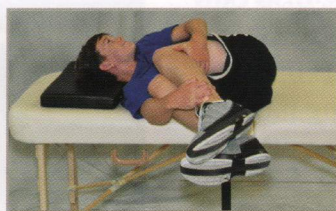
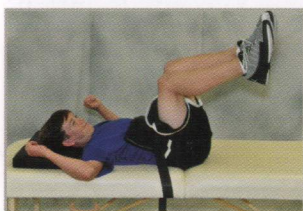
Repetitions: 8-10.

OBLIQUE DOUBLE LEG PELVIC TILT

Muscles Stretched: Multifidus, quadratus lumborum, rotatores, transversospinalis, iliocostalis, longissimus, and serratus posterior muscles.

Muscles Contracted: Psoas major, iliacus, rectus abdominus, external obliques, and internal obliques muscles.

Method: The subject is exercised in a supine position. The purpose of the double oblique pelvic tilt is to stretch the rotary and oblique muscles of the lower back. Rotate the pelvis as close as possible to one side rib cage. Contracting the anterior trunk muscles, move both legs toward the arm pit (*axilla*). Surround the lower thigh with both hands to guide and gently assist the movement.



Repetitions: 1-2 sets of 5-8 repetitions in both directions.

PIRIFORMIS FEMORAL ATTACHMENT

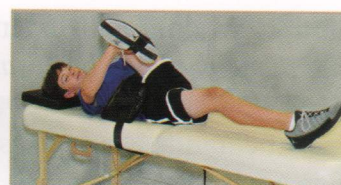
Muscles Stretched: Femoral attachment of the piriformis (*external hip rotator*) and gluteus maximus.

Muscles Contracted: Hip adductors including the adductor magnus, adductor longus, adductor brevis, pectiniis, gracilis and hip external rotators.

Introduction: The piriformis serves as a protective housing for the sciatic plexus upon entering the hip joint. In order to stretch the piriformis femoral attachment the lateral and oblique gluteus maximus must be flexible. The opposite leg must also be hyperadducted and internally rotated in order to thoroughly stretch the piriformis insertion. Note that for many people, this is a very sensitive, inflexible attachment.

Method: After stretching the lateral and oblique gluteus maximus fibers rotate the uninvolved leg inward and hyperadduct across the midline to help stabilize the pelvis and isolate the piriformis fibers to be stretched. Because of where the proximal piriformis fibers are positioned it is necessary to hyperadduct the exercising leg as close to the opposite side shoulder as possible. This position is maintained by using the same side hand. The exercising knee is a 90 degree angle. Clasp the ankle with the far side hand and rotate the hip by moving the lower leg downward toward the surface. Release to the starting position and gently repeat the movement.

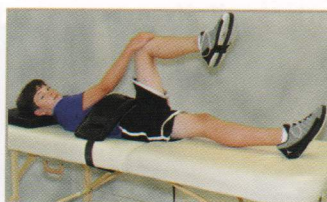
Repetitions: 1-2 sets of 5-10.



PIRIFORMIS: SACRAL

Muscles Stretched: Low back rotators, external hip rotators, and gluteus maximus.
(*This is a good stretch for the piriformis muscle, especially the sacral attachment*).

Method: Exercising from a supine position, rotate the non-exercising leg inward and move it across the midline (*hyperadduct*) as far as possible to help stabilize the pelvis and isolate the muscles to be stretched. Stretch the opposite side muscles by bending the knee 90 degrees. Lift the leg upward to as near vertical as possible. Contract the lower abdominals, internal hip rotators, and hip adductor muscles and reach across the body towards the last rib on the opposite side (*15 degrees above horizontal*) with the scapulae (*shoulder blades*) and pelvic girdle remaining in contact with the surface. A pad and seatbelt may be placed across the pelvis for greater stabilization. Assist the stretch movement with the opposite side hand or by using the opposite side hand and a rope that has been looped just above the knee. Return to the starting vertical position and gently repeat the movement.



Repetitions: 1 or 2 sets of 5-10.

Notes: A 90 degree angle flexed exercising side knee will help prevent biceps femoris (*hamstring*) and tensor fascia latae interference. This is an important stretch for those who wish to improve quickness and lateral movement or help relieve sciatic nerve radiation. See *Assisted Hip: Piriformis Sacral* for proper technique to assist those with back histories, pelvic distortions, piriformis syndrome, or sciatic nerve involvement.

GASTROCNEMIUS (CALF) STRETCH

Muscles Stretched: Gastrocnemius, plantaris, and achilles tendon.

Muscles Contracted: Quadriceps to fully extend the knee joint. Anterior tibialis, extensor digitorum, extensor hallucis longus and extensor hallucis brevis to lift the ankle and foot muscles.

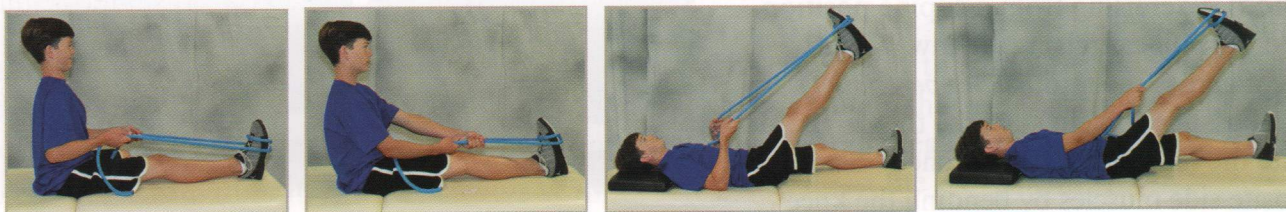
Introduction: This heel cord stretch lengthens the two-joint gastrocnemius muscle, reducing the risk of calf injuries, shin splints, achilles tendon problems, hammer toes, metatarsalgia, and foot-ankle injuries.

Method 1: The subject will lay down supine which will isolate the distal end of the gastrocnemius. Turning the subtalar joint inward 20 degrees and dorsal flexing the ankle with assistance of the rope will isolate the distal (*lower*) outer belly of the biceps, turning the subtalar joint outward 20 degrees and dorsal flexing the ankle with assistance of the rope will isolate the medial belly of the lower gastrocnemius.



Method 2: Maintain an extended knee by contracting the quadriceps muscles. (*Bending the knee or leaning the upper body backwards will decrease the effectiveness of this upper proximal gastrocnemius stretch.*) Lift the foot backwards with the anterior foot-ankle muscles. Assist the effort with a strap, rope, or the hands. Do not assist the movement unless the anterior muscles are contracting. To provide greater stretch, gradually lean the trunk forward in 10-degree increments. When the muscle is free at that angle, lean forward an additional 10-degrees, etc. Maintain that body angle when performing the stretch. Perform the stretch from a supine position if there is a neurological problem or if having a problem performing from a sitting posture. Turning the foot inward 20 degrees will isolate the proximal outer gastrocnemius fibers. Turning the foot outward 20 degrees will best isolate the upper inward fibers.

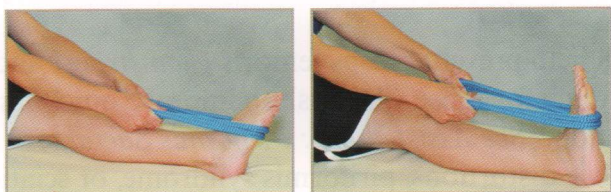
Repetitions: 10 if for warm-ups, 2-3 sets of 5-10 alternately for tight calves.



OUTER GASTROCNEMIUS STRETCH

Muscles Stretched: Gastrocnemius, especially the outer (*lateral*) belly and the plantaris.

Muscles Contracted: Quadriceps, (*to fully extend the knee*), anterior tibialis, extensor digitorum, extensor hallucis longus, and extensor hallucis brevis to extend the toes.



Method: In order to isolate the upper outer part of the gastrocnemius muscle, and the one joint plantaris muscle, maintain an extended knee, turn the foot inward 20-25 degrees and lift the foot and ankle backwards towards the body for 1½-2

OUTER GASTROCNEMIUS STRETCH *continued*

seconds. Use a rope or strap to assist at the end of each movement. Gradually lean the upper body forward in 10 degree increments for increased stretching.

Repetitions: 1-2 sets of 5-10.

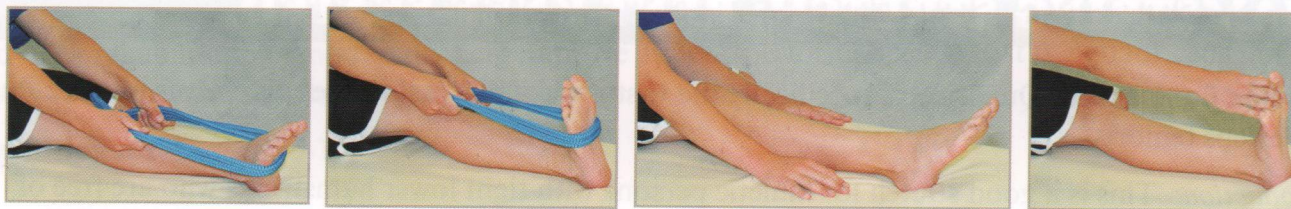
INNER GASTROCNEMIUS STRETCH

Muscles Stretched: Gastrocnemius, especially the (*medial*) inner belly.

Muscles Contracted: Quadriceps, (*to lock knee*) anterior tibialis, extensor digitorum, extensor hallucis longus and extensor hallucis brevis.

Method: In order to stretch the upper inner (*medial*) belly of the gastrocnemius muscle, maintain an extended knee. Turn the foot outwards 20-25 degrees and lift the ankle and foot backwards. Use a rope or strap to assist at the end of movement for 1½-2 seconds. Gradually lean the upper body forward in 10 degree increments for greater stretch.

Repetitions: 1 or 2 sets of 5-10.



BENT KNEE HAMSTRING STRETCH

Muscles Contracted: Quadriceps, specifically the vastus medialis, vastus lateralis, vastus intermedius and rectus femoris.

Muscles Stretched: Especially good stretch for the distal lower hamstrings (*area above distal insertion*). These muscles include the semitendinosus, semimembranosus, and biceps femoris.

Method: In order to achieve optimal hamstring flexibility always stretch the distal hamstrings before the proximal end and belly of the hamstrings. Exercising from a supine position, place one hand in front of the active knee to help maintain a flexed hip. You may bend the uninvolved leg especially if hamstring flexibility is severely limited or the back is stiff or painful. Contract the quadriceps and extend the exercising knee slowly to full extension. Do not flex the hip any closer to the chest unless your knee can extend completely. You will be able to move the leg 2-3 degrees closer to the chest as lower hamstring flexibility improves. It is not unusual to improve flexibility 30-40 degrees in a single



continued next page

BENT KNEE HAMSTRING STRETCH *continued*



session. At the end of knee movement continue to contract the quadriceps muscles and assist with a rope, strap or your hand. The lower leg should finish over the upper leg without the upper leg moving forward away from the chest. In order to assure maximum stretch, a proper angle must be maintained between the thigh and chest and full extension of the knee is attained each repetition. Release to the starting position of complete knee flexion and gently repeat the exercise moving the leg slightly closer to the chest. This is an excellent stretch to help improve lower leg circulation. For post hamstring injury or because of back pain, the hamstrings may be exercised in an agravity, side-lying position using a rope for assistance.

Repetitions: 2 sets of 5-10, alternating legs after each set.

HAMSTRING STRETCH: BENT KNEE SEATED

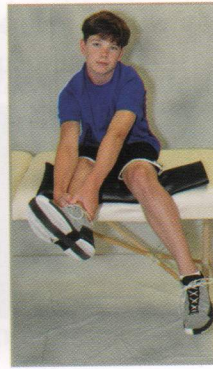
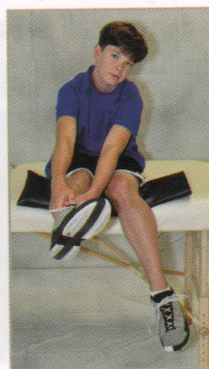
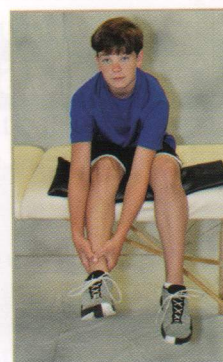
Muscles Contracted: Quadriceps, specifically the vastus medialis, vastus lateralis, vastus intermedius and biceps femoris.

Introduction: This is a good stretch for athletic persons with tight lower hamstrings who are free of lower back problems.

Method: From a seated position, lean the body forward, contract the abdominal muscles and completely extend the knee contracting the quadriceps. Use the hands to provide gentle assistance at the end of movement, lasting no longer than 1½ seconds. Release to the starting position and repeat the movement. Lean the trunk farther forward as the flexibility increases.

Notes: Eventually the athlete should be able to touch the chest on the knees and lock the knee in extension.

Advanced Positions: Rotate the lower part of the leg inward to isolate the insertion end of the biceps femoris (lateral hamstrings). Rotate the lower part of the leg outward to isolate the insertion ends of the semitendinosus and semimembranosus muscles (*medial hamstrings*).

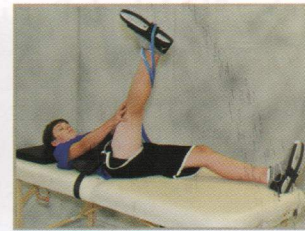
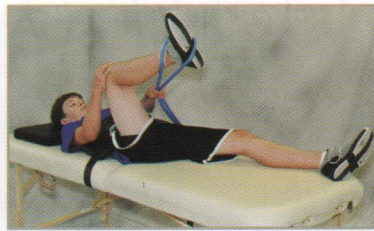


Repetitions: 2-3 sets of 5-10 reps for each of the three exercises.

BENT KNEE "INNER HAMSTRING STRETCH"

Muscles Contracted: Quadriceps, specifically the vastus medialis, vastus lateralis, vastus intermedius and rectus femoris.

Muscles Stretched: Provides greater isolation of the distal medial (*insertion*) aspect of the semitendinosus and semimembranosus muscles.



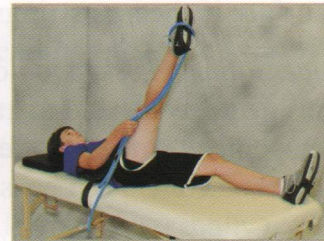
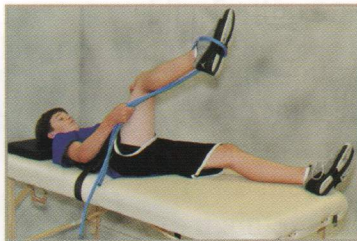
Method: This is an excellent exercise to improve performance and help prevent injury to the distal end of the hamstrings. Rotate the lower leg (*tibia*) outward and perform a full knee extension. Place the free hand in front of the knee to help maintain the proper femur angle. The lower leg finishes above the upper leg to full extension, without allowing the upper leg to compensate by moving downward. Place the rope or strap under the foot and wrap the assistive device around the outside of the lower leg to help maintain outward rotation of the tibia. Do not allow the upper leg (*femur*) to rotate outward during the exercise. Extend the knee and move the lower leg upwards towards the same side shoulder. Move the knee 2-3 degrees closer to the chest as the current range is achieved. It is not unusual to achieve 30-40 degrees of improvement in a single session. The inner hamstring stretch is an excellent adjunct to help correct leg-foot medial (inward) rotation, improve the range of motion during knee, hip and back rehabilitation, and rapidly help improve athletic performance. Assist the quadriceps muscles gently for 1½ seconds at the point of stretch.

Repetitions: 1-2 sets of 5-10.

BENT KNEE "OUTER HAMSTRING STRETCH"

Muscles Contracted: The quadriceps, specifically the vastus medialis, vastus lateralis, vastus intermedius and the rectus femoris.

Muscles Stretched: This exercise provides greater isolation of the distal biceps femoris insertions.



Method: This is an outstanding exercise to help improve athletic performance, assist with knee, hip and back rehabilitation and help correct outward leg rotation (*duck foot*). Place the free hand in front of the knee to maintain a proper femoral angle during full knee extension and prevent downward movement of the femur during extension. Rotate the lower leg (*tibia*) inward while extending the leg. Do not allow the upper leg to turn inward during the exercise movement. Extend the knee completely moving the lower inward rotated leg upward toward the same side shoulder. Keep moving the knee closer to the chest 2-3 degrees, providing the knee is fully straightened. Assist with a rope, strap or hand for 1½ seconds at the end. It is not unusual to improve many degrees in a single session. The biceps femoris is a frequently injured muscle having two insertion heads, one below the knee and may burn during athletic performance and possibly during the stretching process. Remember, tight adductor muscles may be a contributing factor to a hamstring problem or injury.

Repetitions: 1-2 sets of 5-10.

STRAIGHT LEG HAMSTRING STRETCH: NEUTRAL

Muscles Stretched: Proximal end (*ischial tuberosity*) and belly (*center*) of hamstring muscles, especially the semitendinosus.

Muscles Contracted: The quadriceps muscles including the vastus medialis, vastus lateralis, vastus intermedius and rectus femoris. The bent knee hamstring stretches (*insertion end*) should always be stretched before the straight leg hamstring stretches. Hamstring flexibility is necessary for injury prevention, back rehabilitation, maximum human performance, and knee and hip rehabilitation.

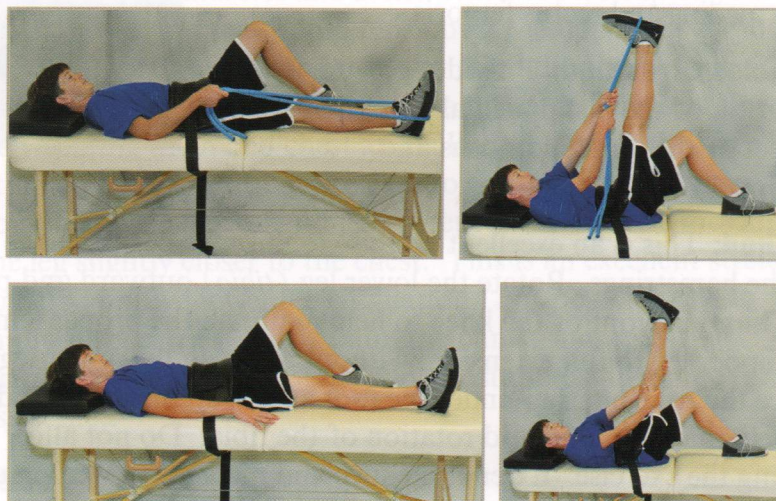
Method: Exercising in a supine position, lock the knee and slowly lift one leg using the quadriceps muscles.

Give gentle assistance with a rope or the hands at the end of the movement as the quadriceps muscles continue to move the leg. If using a rope or strap, walk the hands up the rope employing hand over hand as you lift the leg upward. Do not use assistance unless the quadriceps are doing the main work. Stretch for 1½ seconds at the end of regular movement (*end feel*). Release to the starting position and repeat the effort. Because of a hamstring injury or lower back pain the straight leg hamstring stretch may be accomplished in an agravity, side lying position using a rope for assistance.

Notes: You may bend the non-exercising leg 25 to 50 degrees especially if there is a back problem or until attaining 90-100 degrees of vertical hamstring flexibility. The non-exercising leg may remain on the surface if the hamstrings are quite flexible.

Compensation Check: Do not allow the exercising knee to bend at any point in the movement or the muscles and fascia to be stretched will not be isolated.

Repetitions: 2-3 sets of 5-10, alternating legs after each set.



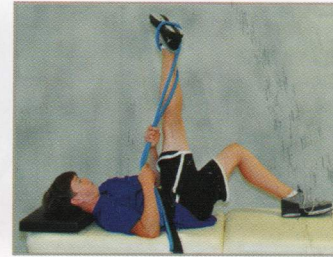
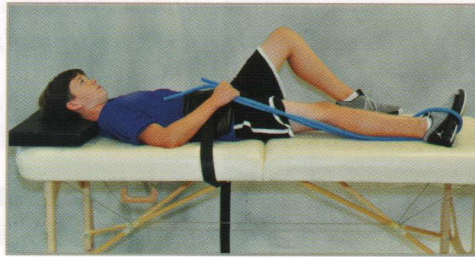
STRAIGHT LEG "INNER HAMSTRING STRETCH"

Muscles Stretched: Medial hamstring muscles-proximal end and belly of the semitendinosus and semimembranosus. Following the straight leg hamstring stretch the medial hamstring muscles may require greater isolated stretching. This is a more specific stretch of the medial oblique semitendinosus and semimembranosus muscles and fascial fibers.

Method: From the same position as the Straight Leg Hamstring Stretch, isolate the proximal medial hamstrings by rotating the entire leg (*femur*) inward. Lift the leg towards the sternum (*breastbone*).

STRAIGHT LEG "INNER HAMSTRING STRETCH" *continued*

Place the rope or strap under the foot with the band around the inside of the lower part of the leg to help maintain the leg in an internal rotated position. Lock the knee by contracting the front leg (*quadriceps*) muscles and lift with the hip abductors (*outer thigh*) and quadriceps. Walk the hands up the band and assist at the end-feel for 1½ seconds. Release to the starting position and repeat 1-2 sets of 5-10 repetitions.

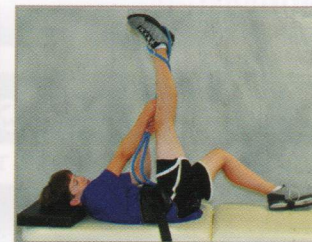
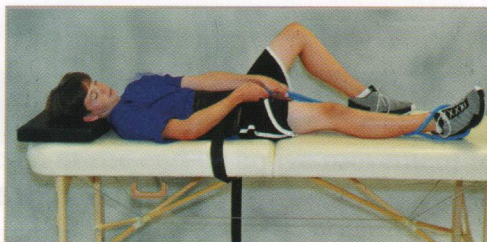


Note: A tight adductor magnus muscle (groin) may be a strong contributing factor to a medial hamstring soreness or injury involving the semitendinosus or semimembranosus muscles.

See the Hip Adductor Stretch – Phase 2. Greater stretch is accomplished if the straight leg "inner" hamstring stretch is performed before the straight leg "outer" stretch.

STRAIGHT LEG "OUTER HAMSTRING STRETCH"

Muscles Stretched: Outer hamstring (*biceps femoris*), especially proximal end and belly of the muscle. This is one of the best methods to stretch lateral-oblique biceps femoris muscle fibers and heavy fascia.



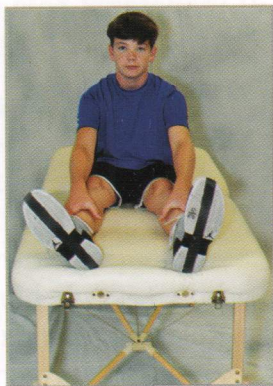
Muscles Contracted: Hip adductors to move the leg and the quadriceps to stabilize the knee and prevent knee bending.

Method: From the same position as the Straight Leg Hamstring Stretch, keep the knee extended (*quadriceps contracted*) and rotate the entire leg outward 45 degrees. Move the leg towards the opposite side shoulder by contracting the hip adductors (*inner thigh*). Place the rope or strap under the foot, then loop the band around the outside of the lower leg to help maintain the leg in an externally rotated position. The non-exercising leg is internally rotated and adducted well beyond the midline of the opposite side exercising leg to prevent pelvic rotation. For extreme tightness or those having back pain the free leg may be flexed. For best results, place the rope in the opposite side hand or use both hands to walk up the rope as the leg reaches toward the opposite side shoulder. Do not allow the knee to bend.

Notes: The biceps femoris is a frequently pulled muscle having two insertion heads, one inserting below the knee. The oblique fibers including the hamstrings and fascia are seldom stretched. These are primary considerations for prevention and rehabilitation. The tensor fascia latae, gluteus maximus, piriformis and other lateral thigh muscles may need to be stretched to assure maximal stretch with least compensation and interference. (*See the following exercises for stretching these muscles: Hip External Rotator, Hip Internal Rotator, Hip Abductor, Hip Flexion, lateral Gluteus Maximus, and Piriformis*) Tightness of the above mentioned muscle groups is a major cause for walking and running with legs turned outward (*duck foot*).

Repetitions: 2 sets of 10, alternating legs after each set.

HAMSTRING STRETCH: STRAIGHT LEGS, SEATED



Muscles Stretched: Hamstrings, lower back (*sacrospinalis*) and erector spinae (*long back*) muscles.

Muscles Contracted: Quadriceps, abdominals.

Introduction: This is an advanced exercise for those who are very flexible or for those athletes, such as gymnasts or swimmers, who require extreme flexibility in their sport.

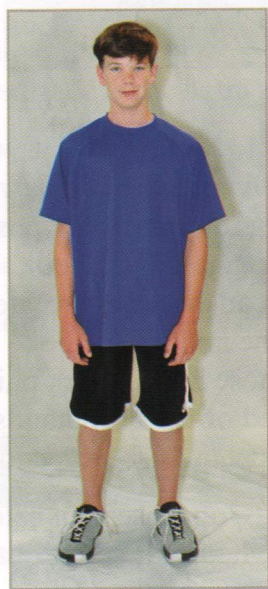
Method: Starting from a seated position with the legs out straight, tuck the chin, exhale, firmly

tighten the abdominal muscles and lean forward no longer than 2 seconds. Contract the quadriceps to keep the knees from bending. Do the exercise slowly without bouncing. Use the hands for light assisted stretch at the end of the movement. Resume the sitting position and repeat the effort.

Notes: It is safest to do this after performing the bent knee and straight leg hamstring stretching seen previously in this section and the long back muscles with the Bent Knee Trunk Flexion Exercise in the Back-Trunk Flexibility Section. Do not do this if you have pain or disc involvement of the back.

Repetitions: 10

HAMSTRING STRETCH: STANDING



Muscles Stretched: Hamstrings, lower back, and erector spinae muscles.

Muscles Contracted: Quadriceps and abdominals.

Method: Exercising from a standing position, contract the abdominal muscles, so that the back muscles may be stretched passively with less tension, and contract the quadriceps muscles (*front thigh*). Lean forward as far as possible to stretch the hamstrings and lower back. Release tension on the back by slowly returning to the starting stance. Do movement slowly without bouncing. Use hands for gentle assisted stretch. Proximal and lower ends of hamstring and lower back should be stretched prior to this exercise.

Notes: This stretch is best used after the body is well warmed and between competitive movements when you feel tightness in the hamstrings and back. The Bent Knee and Straight Leg Hamstring stretches and Bent Knee Trunk Flexion, Advanced Trunk Rotation and Thoracic Lumbar Rotation should be part of the warm-up before using the Standing Hamstring Stretch to help maintain flexibility and re-warm the tissue.

Repetitions: 3-5.

HIP ABDUCTOR STRETCH

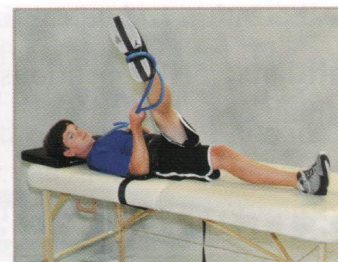
Muscles Stretched: Gluteus medius, gluteus minimus, tensor fascia latae, vastus lateralis, ilio-tibial band and deep fascial tissue.

Muscles Contracted: Anterior thigh muscles (*quadriceps*) lock the knee joint. The pectiniis, gracilis, adductor magnus, adductor longus and adductor brevis move the thigh medially across the midline.

Method: Exercising from a supine position move the non- exercising leg into hyperadduction well beyond the midline and rotate maximally inward. This combination of hyperadduction, inward (*medial*) rotation, pressing the exercising side buttock against the surface and contracting the abdominals will help to keep the pelvis from rotating off the surface. Place the rope or strap under the bottom of the foot and around the outside of the ankle. Hold the top of the rope in the exercising side hand. The opposite side hand will clasp the rope half way down the strands to properly help move the limb. The exercising leg is kept straight and rotated outward 20 degrees.

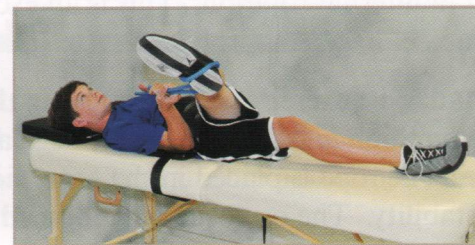
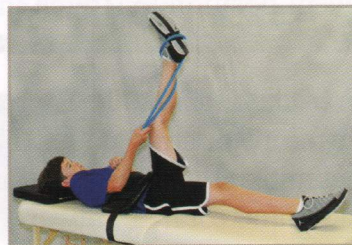
Phase 1 Horizontal: This exercise will lengthen the vastus lateralis and mid and lower tensor fascia latae through the iliotibial band connective tissue. Maintain an extended knee and outward rotated hip throughout the exercise. Wrap a rope or strap around the outside of the lower leg and clasp with

the same side hand. The free hand will clasp the rope half way down the strands and reach across the opposite leg as far as possible. Stretch at the end of active movement for 1½ seconds, release and repeat the effort. For male subjects the leg must pass above the scrotum to prevent discomfort.



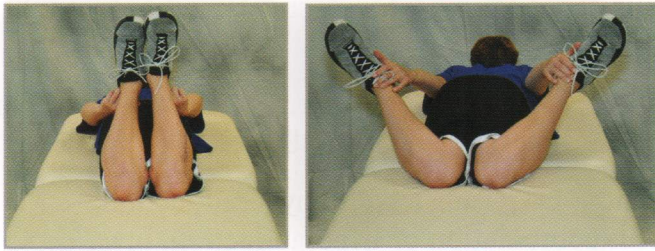
Phase 2 Vertical: Stretching the outer gluteus maximus, gluteus medius, gluteus minimus and majority of the upper tensor fascia latae. Maintain an extended knee and externally rotated hip. Wrap the rope or strap around the outside of the lower leg (*ankle*).

Lift the leg to a vertical position, keeping the opposite leg across the midline and rotated inward. From the vertical position reach the leg across the center of the opposite hip. Stretch for 1½ seconds at the end of movement. Return to the resting leg position once the tissue is quite well stretched, and perform the same exercise approximately 10-15 degrees above the opposite side hip. This will stretch the heavy fascia helping relieve hip, back and pelvic problems.



Repetitions: 1-2 sets of 10 repetitions for Phase 1 and Phase 2.

EXTERNAL HIP ROTATOR STRETCH: PRONE



Muscle Stretched: The six deep external hip rotators including the quadratus femoris, gemellus superior, gemellus inferior, obturator internus, obturator externus, piriformis, and also the outer gluteus maximus.

Muscles Contracted: The hip internal rotators including the gluteus medius, gluteus

minimus, tensor fascia latae and the hip adductors which also medially rotate the thigh.

Method: The subject is positioned in a face down (*prone*) posture. Begin with both knees together and spread the legs 10 additional degrees for each additional muscle to be stretched, a total of five- 10 degree movements. Rotate the hips inward by moving the lower legs away from the midline. Stretch by having the hands assist the movement from the end position for 1½ seconds. Release to the heels in a vertical position and repeat the effort. Maintain the anterior hips flat on the surface.

Repetitions: 5-10 repetitions each 10 degrees of lateral movement depending on the degree of inflexibility.

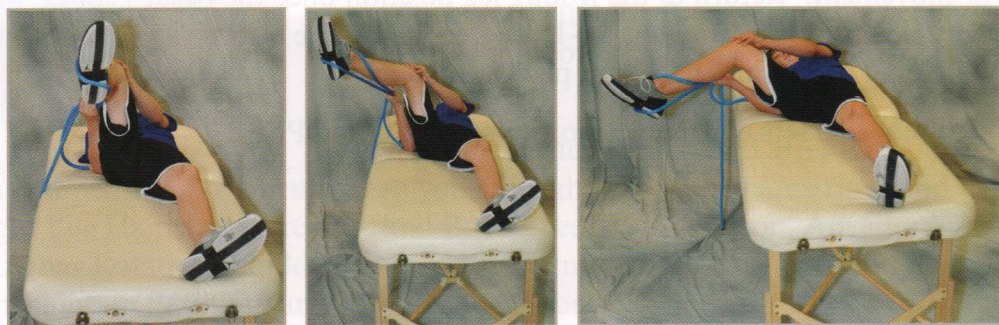
EXTERNAL HIP ROTATOR STRETCH: SUPINE

Muscles Stretched: The six deep external rotators including the quadratus femoris, obturator externus, gemellus inferior, obturator internus, superior gemellus, piriformis, and also the outer gluteus maximus.

Muscles Contracted: Gluteus medius, gluteus minimus, tensor fascia latae. The hip adductors also assist in internal rotation. This is an excellent position to stretch the external rotators for sports or if the subject has back problems.

Method: The exercise is performed on the back (*supine*). The exercising knee is at a 90 degree angle with the thigh in a vertical position. Place a rope or strap under the foot and around the inside of the ankle. The rope is placed in the same side hand and the free hand is in front of the thigh for balance and stability. The opposite leg is spread wide and rotated outward. Contract the hip muscles moving the lower leg outward, away from the body. The assistance of the rope is used for 1½ seconds at the end of active movement. When able to move 55 to 60 degrees, move the thigh 10 degrees farther away and repeat the same process. The thigh is moved five-10 degree increments and then repeated on the opposite side.

Repetitions: 5-8 reps for each 10-degree angle of movement.



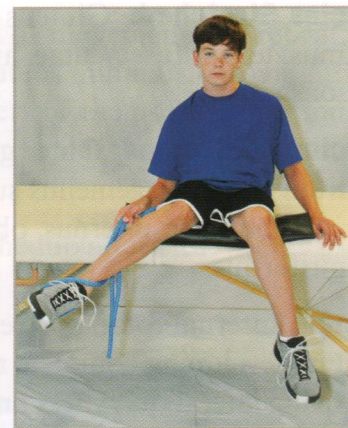
EXTERNAL HIP ROTATOR STRETCH: SEATED

Muscles Stretched: The six deep external rotators including the quadratus femoris, obturator externus, gemellus inferior, obturator internus, gemellus superior, piriformis and the outer gluteus maximus.

Muscles Contracted: Gluteus medius, gluteus minimus, tensor fascia latae and adductors which assist in internal hip rotation.

Introduction: Hip rotation is important in sports activity and the hip rotators help us change direction and also stabilize the hip during walking and running. The external rotators are deep tissues located in a difficult to reach structure and are frequently very tight muscles affecting the hip and back regions. Exercise is performed in a seated position moving the femur inward by moving the lower leg outward away from the midline. The subject must keep the pelvis level by maintaining the same side buttock on the surface. Fasten the rope or strap under the foot and around the inside of the ankle and place the rope in the same side hand. The opposite hand can help stabilize the thigh. Instead of the rope, the same side hand may be used to assist the movement. Assist at the end of active movement for 1½ seconds and repeat the movement. The hip moves laterally (*abduction*) 10 degrees after freeing the stretched muscle. A total of 5 movements from the original position are required to isolate each of the six deep external rotators, one muscle at a time. If you have back problems perform external rotation in a supine position.

Repetitions: 5-8 reps. for each 10 degree angle of movement.



INTERNAL HIP ROTATOR STRETCH: PRONE



Muscles Stretched: Internal hip rotators including the gluteus medius, gluteus minimus, tensor fascial latae, and the hip adductors which also rotate the femur.

Muscles Contracted: Quadratus femoris, gemellus inferior, gemellus superior, obturator externus, obturator internus, piriformis and also the outer gluteus maximus fibers.

Method: Exercise in a face down (*prone*)

position. The non-exercising femur turns outward and is positioned close to the exercising leg. The hips remain flat on the surface. Externally rotate the active leg (*femur*) across the midline as far as possible by contracting the lateral hip rotators. Clasp the ankle with the opposite side hand and assist the movement at the end of active movement for 1½ seconds. Move the non-exercising leg away from the midline and the exercising leg 10 degrees across the midline for each additional internal hip rotator. During the last phase the exercising leg is resting on top of the non-exercising leg.

Repetitions: 3-5 each 10 degree position of change.

INTERNAL HIP ROTATOR: STRETCH WITH ROPE- SEATED

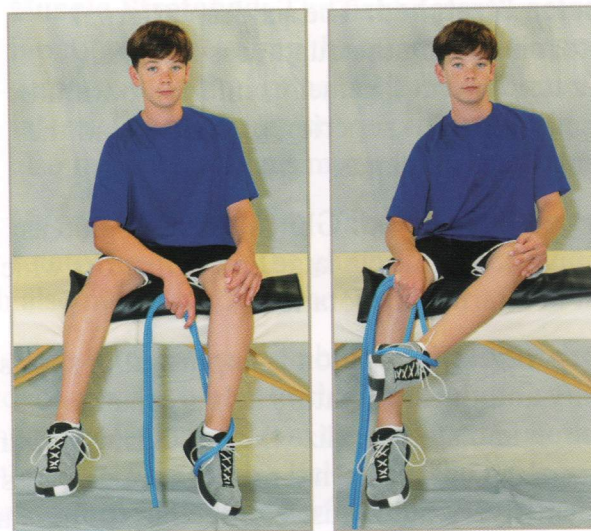
Muscles Stretched: Gluteus medius, gluteus minimus, tensor fascia latae, and rotational position of psoas major.

Muscles Contracted: Outer gluteus maximus, quadratus femoris, gemellus superior, gemellus inferior, obturator internus, obturator externus, and piriformis.

Method: Internal rotation stretching helps to assist in developing complete range of motion and improving lateral quickness and balance. Place a rolled pad or towel under the knees and assume a seated position. The opposite side buttock should remain on the surface throughout the exercise. (*pelvis level*). Drop the leg over the side of the table for greater pelvis stability. Place a rope or strap under the foot and around the outside of the ankle. Stabilize the thigh using the same side hand. Clasp the band with the opposite hand. Positioning the knee directly in front of the hip, actively move the lower leg across the midline to help stretch the tensor fascia latae and gluteus medius muscles, providing 1½ seconds of stretch beyond the end of active movement. Move (*adduct*) the exercising leg 10 degrees across the midline to help stretch the gluteus medius muscle. Adduct an additional 10 degrees (*20 degrees total*) across the midline to help stretch the rotational portion of the psoas major muscle.

Note: This series of movements will also help stretch the rotary function of the hip adductor (*groin*) muscles.

Repetitions: 5-10 repetitions for each angle of stretch.



INTERNAL HIP ROTATOR: STRETCH WITH HAND- SEATED

Muscles Stretched: Gluteus medius, gluteus minimus, tensor fascia latae, and rotational portion of psoas major.

Muscles Contracted: Outer gluteus maximus, quadratus femoris, gemellus superior, gemellus inferior, obturator internus, obturator externus and piriformis.

Method: The exercise will help improve external hip rotation, lateral quickness and balance. Place a rolled pad or towel under the knees and assume a seated position. The pelvis should remain level and the opposite side buttock flat on the surface throughout the exercise. Contract the abdominals and drop the leg over the side of the table for greater pelvic stability. Position the knee in front of the hip and stabilize the upper thigh using the same side hand. Clasp the ankle-foot with the opposite side hand. This position is primary in stretching the



INTERNAL HIP ROTATOR: STRETCH WITH HAND- SEATED *continued*

gluteus medius and tensor fascia latae. Stretch for 1½ seconds at the end of movement and repeat. Moving the thigh across the midline 10 degrees will greater isolate the gluteus minimus. Moving the active leg 20 degrees across the midline will better isolate the rotatory fibers of the psoas major muscle. This exercise may be performed on a floor or playing field in the sitting or supine position.

See Medial Hip-Thigh Stretch

Note: This series of movements will help stretch the rotary function of the hip adductor (groin) muscles.

Repetitions: 5-10 repetitions for each angle of stretch.

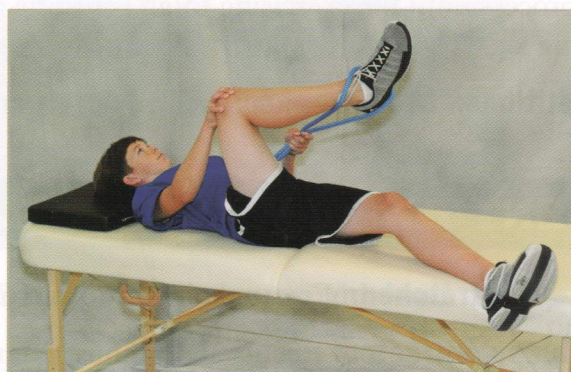
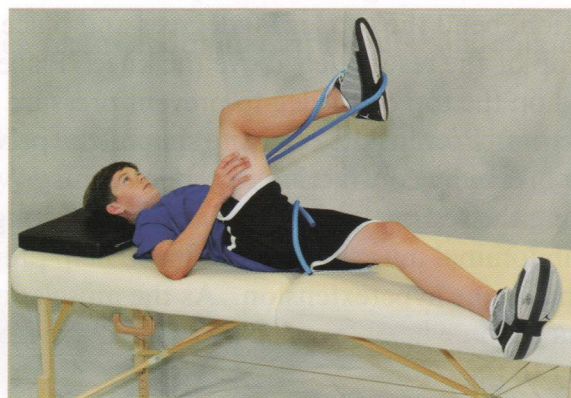
INTERNAL HIP ROTATOR STRETCH: SUPINE

Muscles Stretched: Gluteus medius, gluteus minimus, tensor fascia latae and rotational portion of the psoas major.

Muscles Contracted: The outer gluteus maximus, obturator externus, obturator internus, gemellus inferior, gemellus superior and quadratus femoris.

Method: Performing this exercise on the back (*supine*), tighten the abdominals and adduct the opposite thigh across the midline. Internally rotating the femur will help prevent pelvis distortion. Place a rope or strap around the external ankle and clasp with the opposite side hand. The free hand may be used instead of the rope or strap. Use the free hand near the knee to help stabilize the femur. Position the femur vertically in front of the hip to help isolate the tensor fascia latae and gluteus medius. Stretch for 1½ seconds at the end of active movement, return to the starting position and repeat. Next, move the vertical thigh 10 additional degrees across the midline to better isolate the gluteus medius, following by an additional 10 degrees (20-25) to better isolate the rotary fibers of the psoas major. Finally move the exercising leg across the midline as far as possible and maintain the pelvis on the surface. This is an excellent method to stretch the muscles of the sacrum.

Repetitions: 5-10 repetitions at each exercising angle.



MEDIAL HIP-THIGH MUSCLES STRETCH

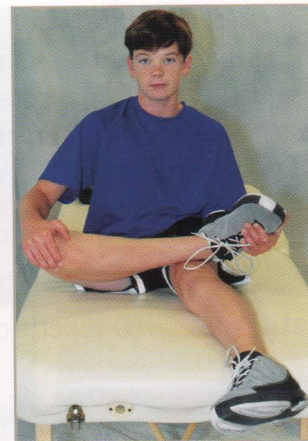
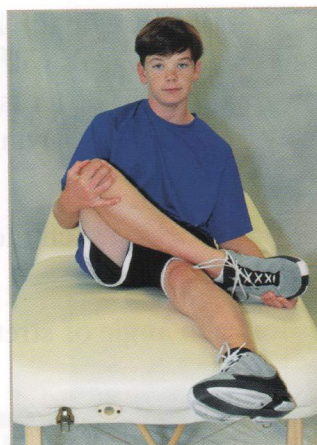
Muscles Stretched: Gluteus minimus, gluteus medius, tensor fascia latae, pectinius, psoas major, iliacus, gracilis, adductor magnus, adductor longus and adductor brevis.

Muscles Contracted: Outer gluteus maximus, gemellus inferior, gemellus superior, obturator internus, obturator externus, piriformis, and quadratus femoris.

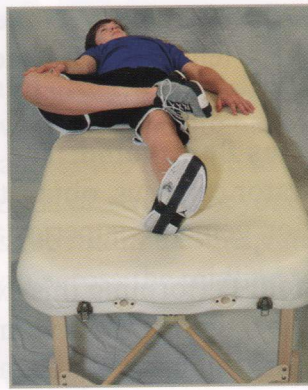
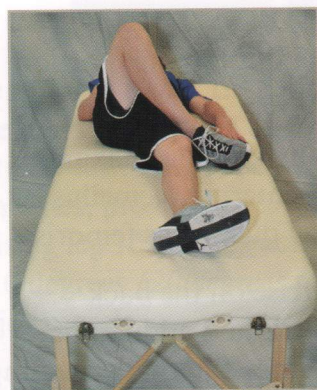
Introduction: This stretch is important in the evaluation of people with lower back involvement and is very beneficial in releasing pressure on the hips, sacrum and lumbar spine.

Method: Exercising from the supine or seated position, bend the top leg 90 degrees and place on the top of the resting leg above the knee. Place a pad on the top of the leg to prevent pressure irritation. Prevent the opposite side of the pelvis from hiking by contracting the abdominals, turning the resting leg outward and contracting the abdominal muscles. This will also help prevent lumbar spine hyperextension. As the muscles and fascia become flexible, move the thigh 10 degrees closer to the midline. As tissues release, move an additional 10 degrees and continue to repeat the process until the exercising thigh is resting against the side-top of the resting leg. This stretching series isolate each adductor and medial hip rotator.

Repetitions: 5-10 repetitions each 10 degree angle.



Seated



Supine

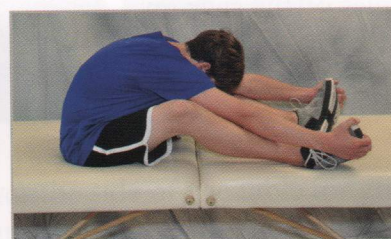
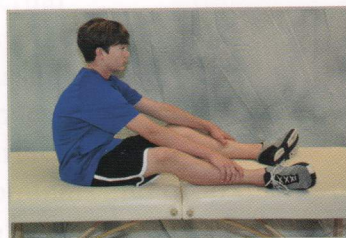
BENT KNEE TRUNK FLEXION

Muscles Stretched: Erector spinae and sacrospinalis muscles.

Muscles Contracted: Rectus abdominus, external obliques, internal obliques and psoas major.

Caution: Use care if your back has been injured, surgically repaired or if you are inflexible.

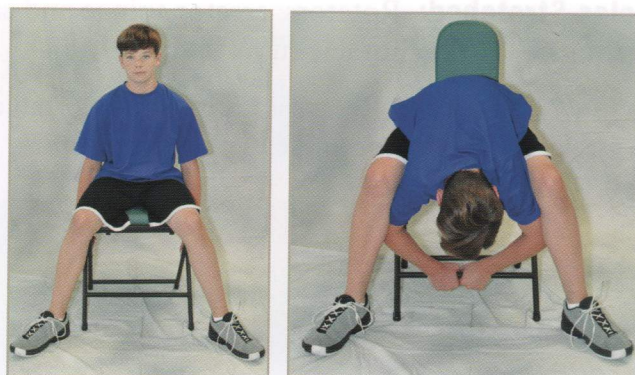
Method: Begin from an upright sitting position. Flex the knees 12-18 inches, tuck the chin, exhale and firmly contract the abdominals as you curl your body forward. Do not bounce or make rapid movements at the end of the active movement. At that point, use your hands to assist the stretch as you



BENT KNEE TRUNK FLEXION *continued*

continue to contract the stomach muscles. Move back to the starting position and repeat. This exercise may also be done sitting halfway forward on a chair, which helps prevent the hip muscles from being as involved in stabilizing the pelvis. Flex the trunk forward, exhale and contract the abdominal muscles. Assist the stretch with the hands clasping the lower legs or the chair.

Repetitions: 1 or 2 sets of 5-10.

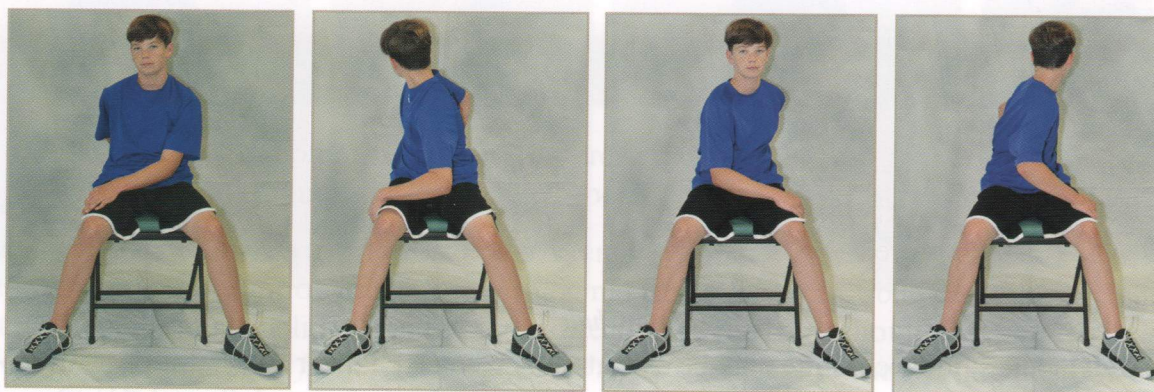


SEATED TRUNK ROTATION

Muscles Stretched: Thoracic and lumbar rotator muscles.

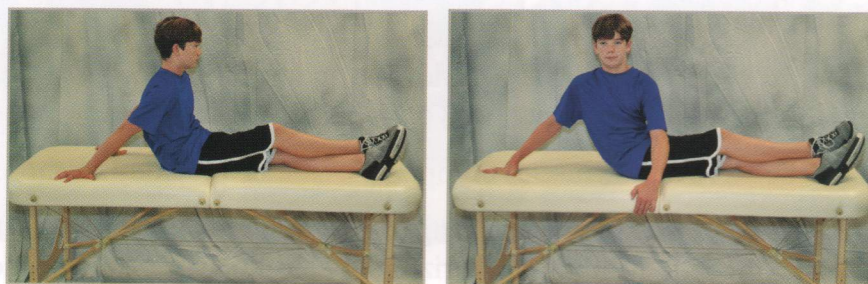
Muscles Contracted: Internal obliques, external obliques, rectus abdominus, transverse abdominus, serratus anterior, internal and external intercostals.

Method: Working from a chair or stool is an outstanding technique to stretch the spinal rotators. From a seated position, position the trunk (*pelvis*) firmly against the back of the chair with the legs spread wide. Place one hand around the far side leg and the same side hand around the back of the chair and stretch. Return to the starting position and repeat 1-2 sets of 5.



Method: Working on a table or seated on the floor. Sitting with one leg straight, bend the opposite knee 90 degrees. Cross the foot over the straight leg and rest the calf on the far side of the knee. Place the opposite side elbow or hand on the outside of the flexed knee. Rest the opposite side hand behind the back. Turn the head and trunk as far away as possible away from the midline contracting the opposite side cervical thoracic and lumbar rotators and assist with elbow pressure against the knee. Release, face forward, and repeat the movement. Perform the same exercise on the opposite side.

Repetitions: 1-2 sets of 5.



THORACIC-LUMBAR ROTATION: SEATED

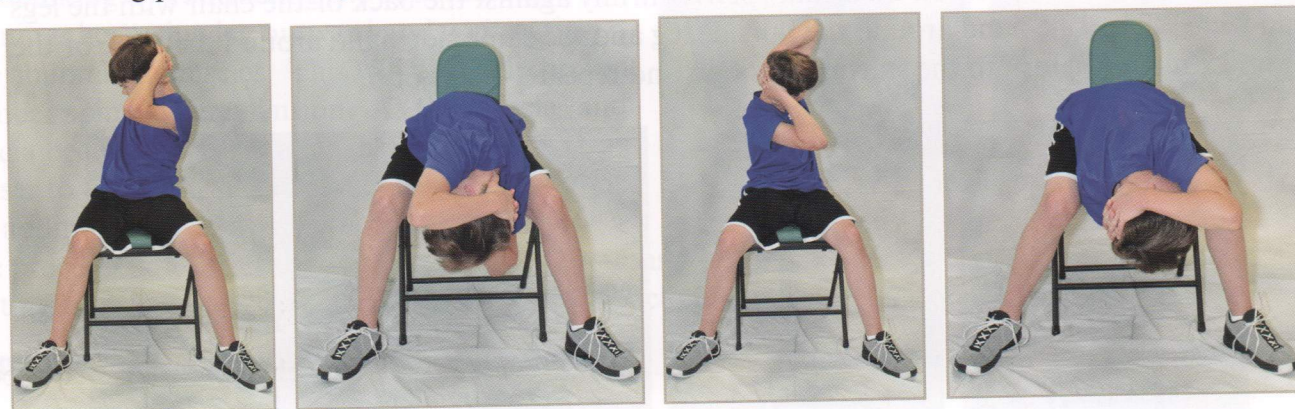
Muscles Stretched: Rotators, erector spinae and sacrospinalis-muscles and connective tissue that may limit rotation of the thoracic-lumbar spine.

Muscles Contracted: Rectus abdominus, external obliques, internal obliques, transverse abdominus, anterior serratus, interior and exterior intercostals.



Table

Method: (table) Exercise from a seated position with your feet spread wide. Clasp your hands behind your head, flex the knees 12-18 inches, tuck the chin, and rotate the trunk as far as possible in one direction. Move the lower (*lead*) elbow around towards the opposite side of the trunk. Exhale and flex the trunk forward, bringing the lead shoulder down between the knees toward the surface. Return to the starting position, complete the repetitions and then change sides.



Chair

Method: (chair) The same technique may be executed by using a chair or stool. Sit part way forward on the chair. Begin with full trunk rotation and flex the trunk slowly forward. Stretch 1½ -2 seconds and return to the starting position and repeat the complete movement.

Repetitions: 1-2 sets of 5 each side.

LATERAL TRUNK FLEXION (SEATED OR STANDING)

Muscles Stretched: Lateral spine flexors, quadratus lumborum (*lateral*), internal obliques, external obliques, transverse abdominus, and erector spinae muscles.

Muscles Contracted: Muscles on opposite side of the body of those named to be stretched.

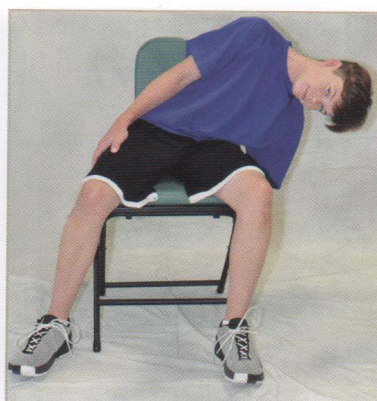
Method Stage 1: Begin in a standing or seated position with the feet a shoulder width apart and the knees extended. Maintain a horizontally level pelvis. Slowly bend laterally (*sideways*), directly

LATERAL TRUNK FLEXION (SEATED OR STANDING) *continued*

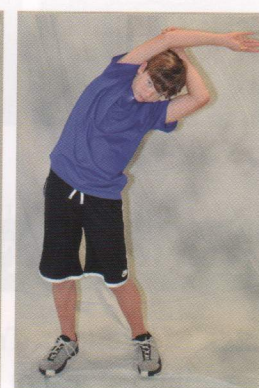
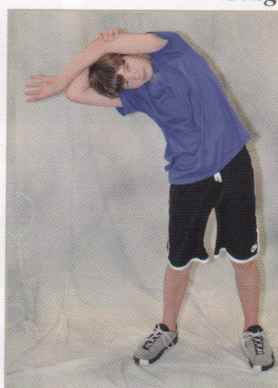
over the pelvis as far as possible. Return to the starting position and repeat on the same side.

Method Stage 2: Place the same side arm in a sideward-elevated position (*vertical*) and lean the trunk laterally as far as possible. The serratus posterior, latissimus dorsi, and oblique muscles receive greater stretch in Stage 2. Stage 2 may also be accomplished in a seated position.

Repetitions: 1-2 sets of 5 repetitions for each side.



Stage 1



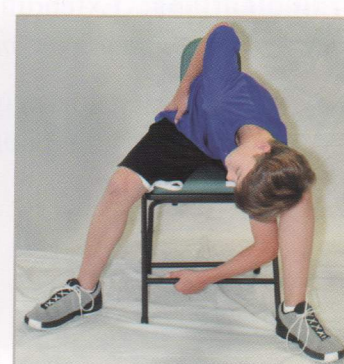
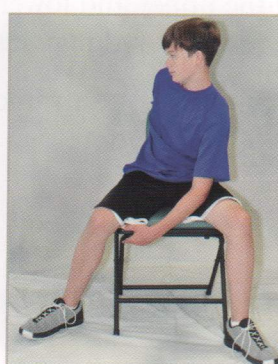
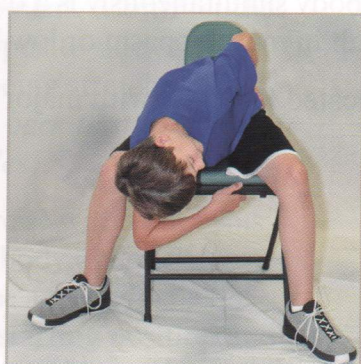
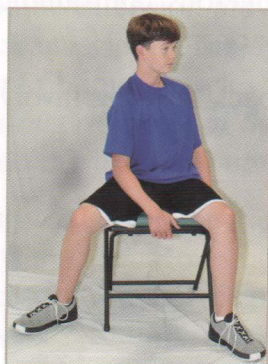
Stage 2

LATERAL TRUNK FLEXION – FORWARD OBLIQUE

Introduction: In this variation of the previous exercise, you can achieve greater stretching isolation of the quadratus lumborum, spinal rotators, serratus posterior and latissimus dorsi.

Method Stage 1: Rotate the trunk 45-degrees anterior without allowing the pelvis to turn. Contract the abdominals and anterior oblique muscles diagonal to the posterior obliques being stretched. Bend at a 45-degree angle obliquely in the same direction as the front shoulder is pointed (*turn trunk 45-degrees and move the body forward at a 45-degree angle*). Release to the starting position and repeat. Following this effort repeat the same movement on the opposite side.

Repetitions: 1-2 sets of 5-10.



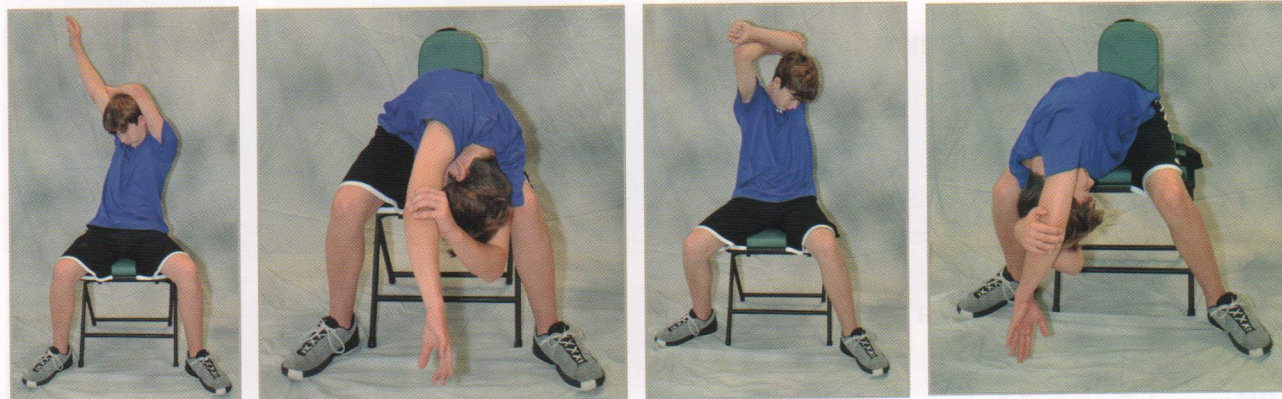
Stage 1

continued next page

LATERAL TRUNK FLEXION - FORWARD OBLIQUE *continued*

Method Stage 2: Stage 1 techniques are repeated with the arm overhead. This is an advanced stretch of the latissimus dorsi, posterior serratus, multifidus, and quadratus lumborum.

Repetitions: 1-2 sets of 5-10.



Stage 2

TRUNK EXTENSION

Muscles Stretched: Trunk extension increases lumbar spine extension and flexibility of the abdominal muscles. These include the rectus abdominus, external obliques, internal obliques, serratus anterior, interior and exterior intercostals.

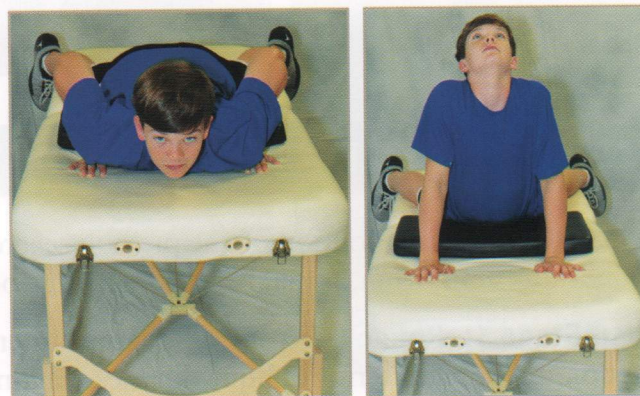
Muscles Contracted: Erector spinae, sacrospinalis, gluteus maximus and cervical extensors.

Method: Positioned in a prone position stabilize the lower body. Contract the erector spinae muscles (*entire long back muscles*) and lift the head and shoulders while the lower body remains on the surface. Use the hands to assist the extensor muscles at the end of the range. Lower the body immediately after reaching full extension.

Contraindications: Extending the upper and lower body simultaneously is a dangerous, contraindicated exercise (*called the rocker or banana*) and may result in muscle spasm or low back injury.

Caution: Trunk extension may initially be contraindicated for those with major back histories involving pinched nerves, disc bulging or disc herniation.

Repetitions: 5-10.



UPPER TRUNK EXTENSION

Muscles Stretched:

Rectus abdominus (*front stomach*), external obliques (*sides of stomach*), the pectoralis major (*chest*), and the serratus anterior (*rib cage*).

Muscles Contracted:

Erector spinae, sacrospinalis, gluteus maximus, and serratus anterior (*rib cage*).



Method: From a seated or standing position, bend the body forward and contract the back extensor (*erector spinae*) muscles. Slowly and carefully, extend the trunk backward to a point of maximum stretch for 1½-2 seconds. Release and repeat the exercise.

Contraindications: Subjects who have bulging disc(s), herniated disc(s), recent back fusion, post-operative conditions or intense back pain, should not be performing this exercise.

Repetitions: 5-8.

TRUNK EXTENSION: POSTERIOR OBLIQUE

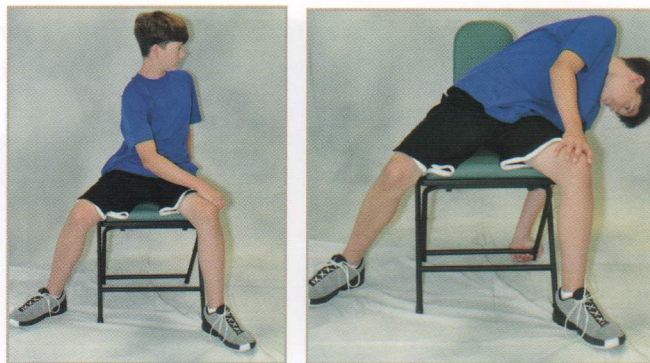
Introduction: The purpose of oblique trunk extension is specific isolation of each side of the trunk flexors.

Muscles Stretched: Rectus abdominus, internal obliques, external obliques, intercostals, and anterior serratus.

Muscles Contracted: Erector spinae, rotatores thoracic.

Method: Stabilize the body on a chair, table, or desk. The subject will rotate the upper body (*trunk*) without allowing the pelvis to rotate. Rotate the trunk 45-degrees and follow the lead shoulder at a 45-degree angle of posterior oblique extension movement. Contract the back muscles on the opposite side of the front oblique muscles being stretched (*i.e.: contract right side of the back to stretch the left side anterior trunk muscles*).

Stage 1: Begin the exercise with your arms by your side. Move the body obliquely backwards at a 45-degree angle as far as possible. Return to the starting position and repeat the exercise.



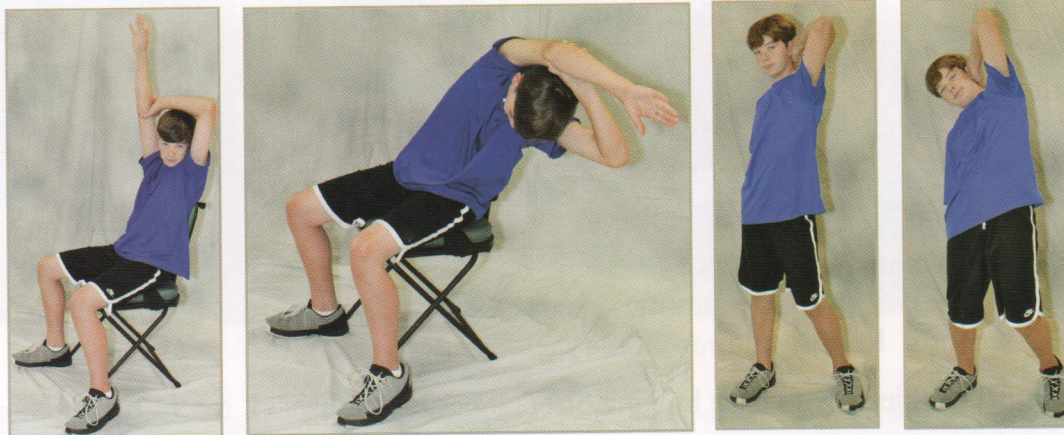
Stage 1

continued next page

TRUNK EXTENSION - POSTERIOR OBLIQUE *continued*

Stage 2: Place the same exercising side arm overhead and hold that arm with the opposite side hand. The same side obliques, serratus anterior and intercostals will be stretched maximally with the arm overhead. Reach at a 45-degree angle backwards or as far as possible. Return to the starting position and repeat the effort. The overhead exercises may also be done while seated.

Repetitions: 1 or 2 sets of 5-10 each side.



Stage 2

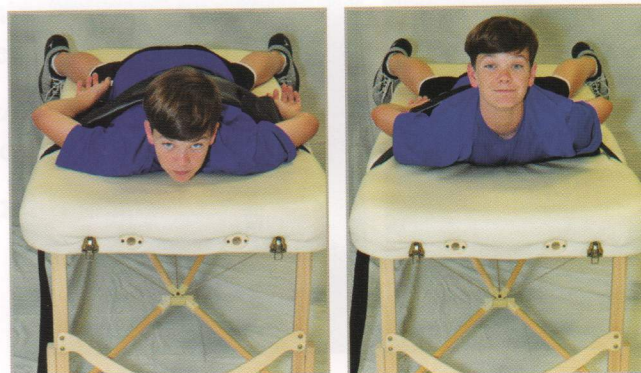
THORACIC EXTENSION

Introduction: This stretch is especially helpful for the dorsal (*anterior*) thoracic spine and for those suffering from thoracic kyphosis (*forward mid-spine curvature*).

Muscles Contracted: Erector spinae, sacrospinalis, and gluteus maximus.

Muscles Stretched: Rectus abdominus, external obliques, internal obliques, internal and external intercostals.

Method: From a prone position, stabilize the lower region of the thoracic spine (*T8-T9*) by placing a pad and strap across that area or by asking someone to apply firm pressure to that area in a forward and downward direction (*45 degree angle*). (*For a better understanding of assisting with this exercise see Thoracic Extension: Assisted.*) Once comfortably stabilized, extend the upper back and neck.



Advanced Positions: Once you master this exercise, you may wish to add sandbag resistance to increase thoracic strength.

Repetitions: 1-2 sets of 5-10 or, for more serious problems two or three series of 5-10 repetitions.

ANKLE-FOOT FLEXIBILITY: ACTIVE

Stretching helps establish full range of motion of the ankle joint, the subtalar joint, a joint between the ankle bone and the heel (talus, navicular, cuboid) and metatarsal-phalangeal joints (the joints from the heel to the toes). It also assists in helping prevent problems such as calf injuries, shin splints, Achilles tendon injuries, foot stress, hammer toes and ankle-foot sprains or strains. The following flexibility exercises can increase the performance potential for sports. Lower leg circulation may be improved through some of these stretching exercises. These exercises are important in restoring foot posture and rehabilitating all types of foot and ankle injuries. (See *Ankle-Foot Protocol* listed in Appendix)

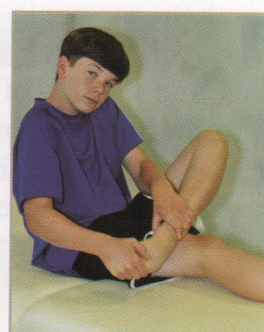
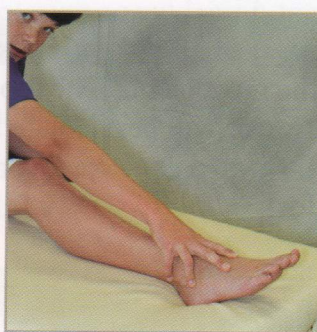
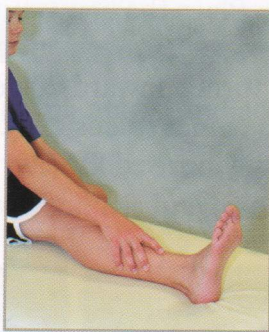
DORSAL ANKLE STRETCH

Muscles Stretched: Tibialis anterior, extensor digitorum longus, extensor digitorum brevis, extensor hallucis longus, and extensor hallucis brevis.

Muscles Contracted: Plantaris, soleus, gastrocnemius, flexor hallucis longus, flexor hallucis brevis, flexor digitorum longus, and flexor digitorum brevis.

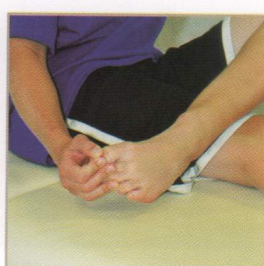
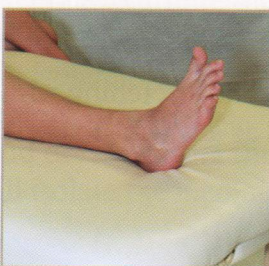
Introduction: Ankle plantar flexion (*pointing the foot downward away from the body*) may be limited because of injury, conditions causing weakness of the plantar flexors, or general lack of flexibility due to heredity, inactivity, or soreness. Stressing these muscles may result in shin splints or tendonitis. Limited plantar flexion may be the result of a shortened tibialis anterior, toe extensors, or tight fascia. Regular stretching of these muscles will increase plantar flexion and assist in the development of greater power and speed in sports.

Method: Part 1: Plantar flex the ankle foot straight downward (*toes pointing toward the surface*) by contracting the muscles on the bottom of the foot and back of the lower leg. You may bend the knee and assist the stretch with the hands. Release to the starting position and repeat the movement.



1.

Part 2: Additional stretch of the anterior tibialis will be accomplished by supinating (*turning inward and downward*) the subtalar joint-foot at the end of ankle plantar flexion. You may bend the knee and assist the stretch with the hands. Release to the starting position and repeat the effort.



2.

Part 3: Greater stretch of the medial dorsal ankle muscles, especially the ankle region down and outward including the big

continued next page

DORSAL ANKLE STRETCH *continued*

toe. This is accomplished by turning the subtalar joint-foot outward and plantar flexing the subtalar joint-foot downward. You may bend the knee and assist the stretch with the hands. Release to the starting position and repeat the movement.

Repetitions: 1-2 sets of 5



3.

SOLEUS STRETCH

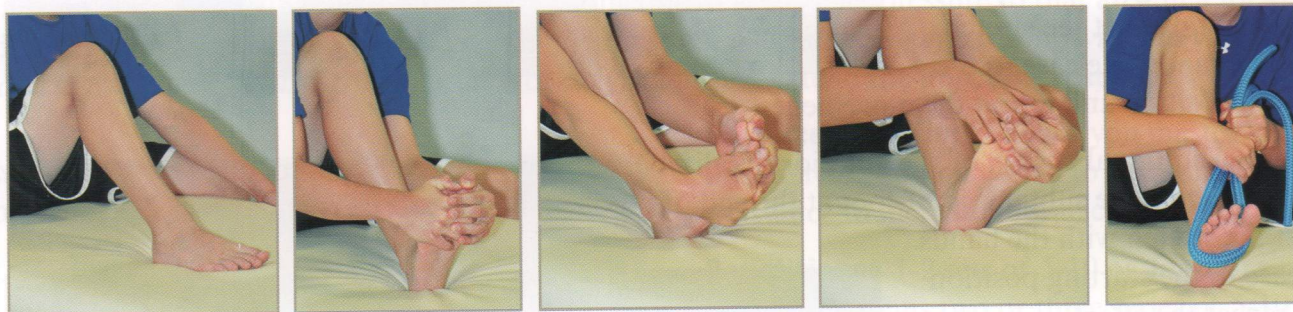
Muscles Stretched: Soleus and plantaris.

Muscles Contracted: Ankle-foot dorsal flexor muscles. Tibialis anterior, extensor digitorum longus, extensor digitorum brevis, extensor hallucis longus, and extensor hallucis brevis.

Introduction: Although a shortened soleus muscle, plantaris muscle, or Achilles tendon is an infrequent problem, it sometimes occurs following injury or problems such as fracture, sprain, casting, nerve damage, following stroke, head trauma, spinal cord injuries, parkinsonism, multiple sclerosis, Lou Gehrig's disease or fibromyalgia. These conditions may require assistance.

See Soleus Stretch Assisted in Assistive Section.

Method: In order to stretch the soleus, flex the knee to a 90-degree angle or slightly greater and lift the foot with the top ankle-foot dorsal flexor muscles. Place the hands under the ball of the foot. Provide gentle assisting stretch with the hands for 1½-2 seconds. Brace your chest on the knee for greater leverage and stability of the movement. The foot turned inward 20 degrees will isolate the outer soleus belly, turning the foot outwards will best isolate the inner soleus belly. For those who cannot place the hands under the ball of the foot, a rope or strap may be used for easy assistance. Release and repeat the effort.



Note: Flexing the knee at 90-degrees or more enables stretching without an interference of the two joint gastrocnemius muscle. This exercise is ideal as a warm-up exercise before activity, competition, or to assist in lymphatic drainage and circulation.

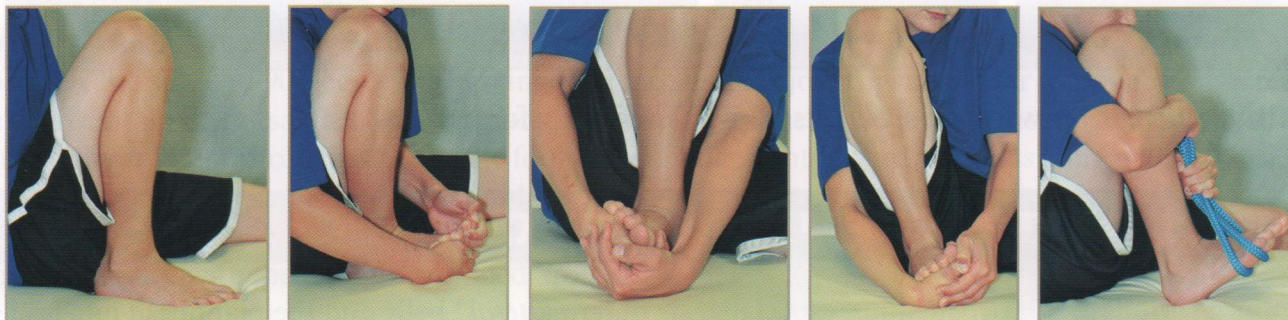
ACHILLES TENDON STRETCH

Muscle (Tissues) Stretched: Achilles tendon

Muscles Contracted: Anterior tibialis, extensor digitorum longus, extensor digitorum brevis, extensor hallucis longus, and extensor hallucis brevis.

Method: For greater isolation of the Achilles tendon, move the foot as close to the buttocks as possible. From this position the ankle plantar flexors are maximally immobilized. Dorsi flex the ankle/foot and move the toes/foot toward the shin by contracting the anterior lower leg muscles. Brace the chest or shoulder on the knee for greater leverage. Place the hands under the ball of the foot and assist at the end of the active movement. Turning the foot inward 20 degrees will help isolate the lateral achilles tendon. Turning the foot outward 20 degrees will help isolate the inner achilles tendon fibers. For those who cannot reach the ball of the foot, a rope or strap may be used to assist the stretch for 1½-2 seconds. Release to the starting position and repeat the effort.

Repetitions: 1-2 sets of 5-10.



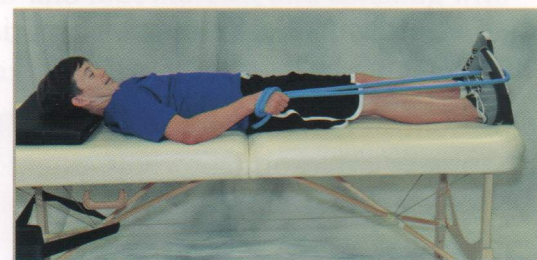
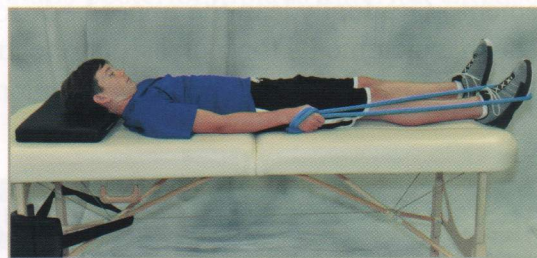
GASTROCNEMIUS (CALF) STRETCH

Muscles Stretched: Gastrocnemius, plantaris, and achilles tendon.

Muscles Contracted: Quadriceps to fully extend the knee joint. Anterior tibialis, extensor digitorum, extensor hallucis longus and extensor hallucis brevis to lift the ankle and foot muscles.

Introduction: This heel cord stretch lengthens the two-joint gastrocnemius muscle, reducing the risk of calf injuries, shin splints, achilles tendon problems, hammer toes, metatarsalgia, and foot-ankle injuries.

Method 1: The subject will lay down supine which will isolate the distal end of the gastrocnemius. Turning the subtalar joint inward 20 degrees and dorsal flexing the ankle with assistance of the rope will isolate the distal (*lower*) outer belly of the gastrocnemius, turning the subtalar joint outward 20 degrees and dorsal flexing the ankle with assistance of the rope will isolate the medial belly of the lower gastrocnemius.

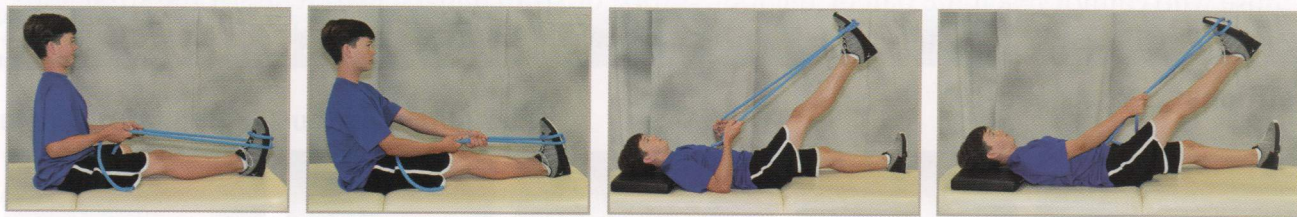


1.

continued next page

GASTROCNEMIUS (CALF) STRETCH *continued*

Method 2: Maintain an extended knee by contracting the quadriceps muscles. Bending the knee or leaning the upper body backwards will decrease the effectiveness of this upper (*proximal*) gastrocnemius stretch. Lift the foot backwards with the anterior foot-ankle muscles. Assist the effort with a strap, rope, or the hands. Do not assist the movement unless the anterior muscles are contracting. To provide greater stretch, gradually lean the trunk forward in 10-degree increments. When the muscle is free at that angle, lean forward an additional 10-degrees, etc. Maintain that body angle when performing the stretch. Perform the stretch from a supine position if there is a neurological problem or if having a problem performing from a sitting posture. Turning the foot inward 20 degrees will isolate the proximal outer gastrocnemius fibers. Turning the foot outward 20 degrees will best isolate the upper inward fibers.



Repetitions: 10 if for warm-ups, 2-3 sets of 5-10 alternately for tight calves.

OUTER GASTROCNEMIUS STRETCH

Muscles Stretched: Gastrocnemius, especially the outer (*lateral*) belly and the plantaris.

Muscles Contracted: Quadriceps, (*to fully extend the knee*), anterior tibialis, extensor digitorum, extensor hallucis longus, and extensor hallucis brevis to extend the toes.

Method: In order to isolate the upper outer part of the gastrocnemius muscle, and the one joint plantaris muscle, maintain an extended knee, turn the foot inward 20-25 degrees and lift the foot and ankle backwards towards the body for 1½-2 seconds. Use a rope or strap to assist at the end of each movement. Gradually lean the upper body forward in 10 degree increments for increased stretching.

Repetitions: 1-2 sets of 5-10.

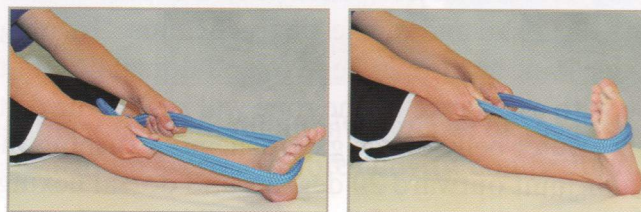


INNER GASTROCNEMIUS STRETCH

Muscles Stretched: Gastrocnemius, especially the (*medial*) inner belly.

Muscles Contracted: Quadriceps, (*to lock knee*) anterior tibialis, extensor digitorum, extensor hallucis longus and extensor hallucis brevis.

Method: In order to stretch the upper inner (*medial*) belly of the gastrocnemius muscle, maintain an extended knee. Turn the foot outwards 20-25 degrees and lift the ankle and foot



INNER GASTROCNEMIUS STRETCH *continued*

backwards. Use a rope or strap to assist at the end of movement for 1½-2 seconds. Gradually lean the upper body forward in 10 degree increments for greater stretch.

Repetitions: 1 or 2 sets of 5-10.



EVERTOR STRETCH

Muscles Stretched: The lateral tissue of the subtalar and foot regions including the peroneus longus, peroneus brevis, peroneus tertius, and extensor digitorum longus.

Muscles Contracted: Subtalar and foot invertor (*medial*) muscles, including the tibialis posterior, tibialis anterior, flexor digitorum, flexor hallucis longus and flexor hallucis brevis.

Method: Exercise in a seated or supine position with the rope wrapped once around the ball of the foot. Dorsi flex the ankle to 90-degrees or less and turn the subtalar joint inward as far as possible. Decrease the degree of ankle dorsal flexion, and gradually plantar flex the ankle joint to insure greater stretching of the outer forefoot pronators. Turn the foot and subtalar joint inward while assisting with the inside positioned strand of the rope. Release and repeat the effort. An alternate technique is to cross the leg at a 90-degree angle over the other leg and apply gentle assistance with the hands positioned around the heel and forefoot region. Release to the starting position and repeat the movement.

Repetitions: 5-10.



INVERTOR STRETCH

Muscles Stretched: Medial ankle muscles including the tibialis posterior, tibialis anterior, extensor digitorum, and extensor hallucis.

Muscles Contracted: Lateral subtalar and foot muscles, including the peroneus longus, peroneus brevis, peroneus tertius, and extensor digitorum longus.

Method: Exercise from a seated or supine position with a rope or strap wrapped once around the ball of the foot and maintain dorsal flexion of the foot and ankle. Turn the subtalar joint and foot outward as far as possible by contracting the lateral subtalar and foot muscles, and assisting with the outside positioned strand of the rope or strap. Release the foot and repeat the effort. Gradually plantar flex the ankle (*move foot-ankle downward*) and pronate (*turn outward and upward*) the forefoot to stretch the foot supinators. An alternate technique is to bend the knee 90-degrees, place the hands around the heel and forefoot, and assist at the end of the active effort.

Repetitions: 1-2 sets of 5-10.



FOOT PRONATOR STRETCH

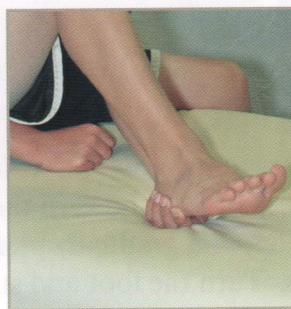
Muscles Stretched: Intrinsic dorsal plantar, abductor and adductor muscles of the forefoot.

Muscles Contracted: Gastrocnemius, soleus and tibialis posterior, flexor digitorum longus, flexor digitorum brevis, flexor hallucis longus, and flexor hallucis brevis.

Introduction: In skills such as walking, running, jumping, and rapid starting and stopping, maximum foot supination is important. The final stage of push-off is more powerful if full range of supination is possible. People with arch weakness, foot or ankle problems, often lack normal supination. (Normal range is 75 to 90 degrees total, passively, without allowing the heel to move).

Method: Bend the knee, plantar flex the ankle (*flex downward*), and turn the foot inward as far as possible contracting the medial (*inside*) lower leg muscles. You must prevent sub-talar (*talus, navicular, cuboid*) joint substitution by stabilizing the heel with the opposite hand. In conjunction with the end of movement, apply gentle stretch with the hand placed around the front of the foot. Release and repeat the effort. Begin the stretch with the hand near the ankle, then move to the mid foot and then use the hand around the distal end of the foot.

Repetitions: 1-2 sets of 5-10.



FOOT SUPINATOR STRETCH

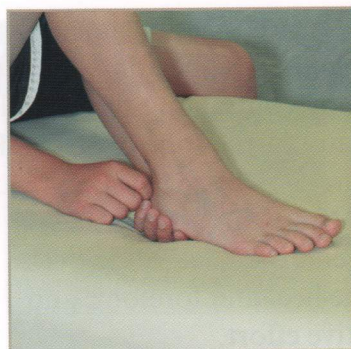
Muscles Stretched: Intrinsic plantar muscles of the forefoot including the flexors, extensors, abductors and adductor tissues.

Muscles Contracted: Peroneus longus, peroneus brevis, peroneus tertius, extensor digitorum longus and the extensor hallucis muscles.

Introduction: People with foot problems or limited flexibility may have decreased movement of the forefoot. If the foot cannot pronate outward because of limited range, (45 degrees normal) foot pressure will be affected by walking on the outside of the foot, perhaps resulting in pain or stressing other areas such as the knee, hip or back. This will affect normal walking or running techniques.

Method: Positioned with the knee bent 90-degrees, dorsiflex (*lift*) the ankle upward. Stabilize the heel with one hand to prevent sub-talar (*talus, navicular, cuboid*), substitution. Turn the foot outward as far as possible with the opposite hand around the forefoot to provide a maximal assistive stretch. Release and repeat the effort. Begin near ankle, move to the mid-foot and move the hand around the distal foot to complete the effort.

Repetitions: 1-2 sets of 5-10.

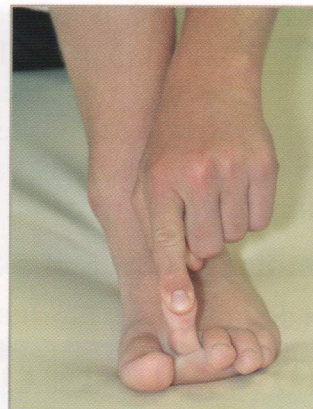


METATARSAL ARCH FLEXORS

Muscles Stretched: Flexor digitorum longus and flexor digitorum brevis.

Muscles Contracted: The foot extensors including the extensor digitorum longus and extensor digitorum brevis.

Introduction: This exercise is beneficial for those with limited extension of the toes (*hammered toes*) and metatarsal arch region due to shortening of the calves, plantar foot muscles (*bottom*), and connective tissue. Assistance may be required.



1.

Caution: Tissue is usually quite sensitive and sometimes sore. Assist slowly and very gently to gradually release the joint limitations and not overstretching or tearing shortened muscles, fascia or shin.

Method

Step 1: One toe at a time. Attempt to extend the toe upward. Stabilize the end of the foot with one hand, stretch the toe flexor tissue using the thumb and index finger of the other hand. Perform one repetition; move to the next toe on down the line for 3 or 4 series.

Step 2: For greater isolation stabilize the distal phalanx using one thumb and index finger just below the distal digit. Assist the extension with the thumb and index finger of the free hand. Finally, move to the most proximal digit with one thumb and index finger stabilizing and repeating the effort performing one repetition and then move to the next toe while repeating a number of series.



2.

Repetitions: 1-3 sets of 5-10 depending on pain and severity of contraction(s).

METATARSAL ARCH EXTENSORS

Muscles Stretched: Anterior metatarsal arch, including extensor digitorum longus, extensor digitorum brevis, extensor hallucis longus, and extensor hallucis brevis.

Muscles Contracted: Gastrocnemius to plantar flex the ankle. Flexor digitorum longus, flexor digitorum brevis, and the flexor hallucis longus to flex all the toes downward.

Introduction: This stretch is especially beneficial for people with limited flexion of the toes, (*hammered toes*) and metatarsal arch region due to shortening of the dorsal (*top*) tissues. Most frequently the gastrocnemius (*calf*) is very tight and a major contributing factor to this condition.

Method: Step 1: Stabilize the foot with one hand and assist the toe flexing forward with the opposite side thumb and index finger.

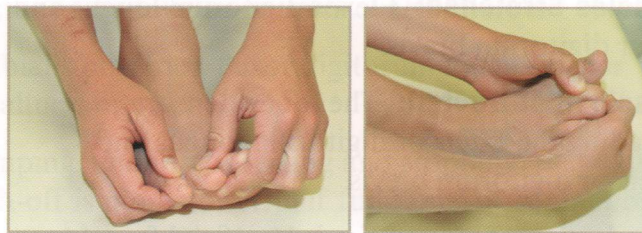


1.

continued next page

METATARSAL ARCH EXTENSORS *continued*

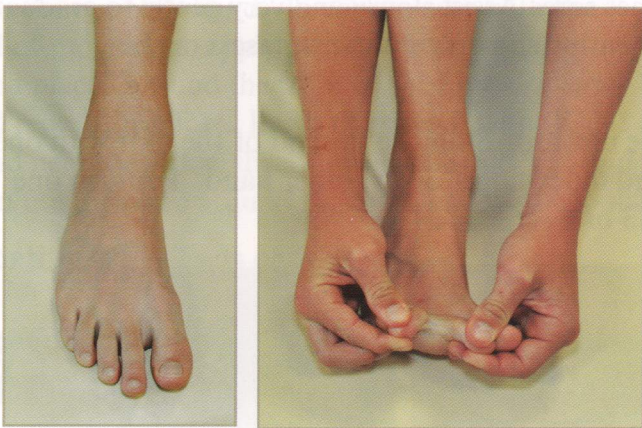
Step 2: A more isolated technique is to stabilize the distal joint employing the thumb and index finger below that joint. Flex the toe downward and assist with the opposite hand's thumb and index finger. Perform the same technique at the proximal (*closest*) joint.



2.

Repetitions: 1-3 sets of 5-10 depending on the amount of pain and the severity of the contraction.

TOE ADDUCTOR (WEB) STRETCH



Muscles Stretched: Adductor hallucis, plantar interossei, connective tissue (*webs*) between the toes.

Muscles Contracted: Abductor hallucis, abductor digiti minimi, and dorsal interossei.

Introduction: Muscles and connective tissues between the toes often become very tight from shoes, the inability to abduct the toes because of (*weakness*), fracture, surgery, or stubbing of the toe.

Method: The subject will use the thumb and index finger of one hand to stabilize a single toe. The toe alongside will attempt to spread (*abduct*). The remaining thumb and index finger will assist the movement with a gentle stretch. Release and repeat the effort. Perform this with each toe. Some toes may require more assistance. Do one toe then move to the next toe and then to the next toe. This is done to prevent tearing of tissue between the toes. Work extremely careful with very gentle assistance.

Repetitions: 1-2 sets of 5-10.

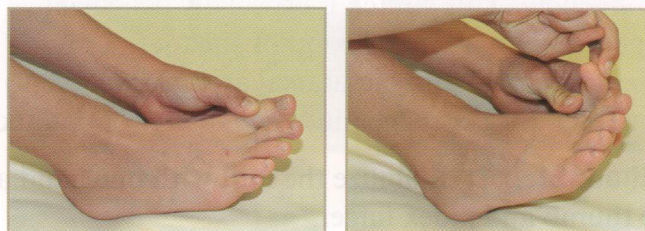
GREAT (BIG) TOE STRETCH (FLEXORS)

Muscles Stretched: Flexor hallucis brevis and flexor hallucis longus.

Muscles Contracted: Extensor hallucis brevis and extensor hallucis longus.

Introduction: An ability to extend the great toe affects balance, coordination, speed, ability to push off properly, and length of stride. Athletes who do extensive training and wear foot orthotics that provide firm support, but limit foot movement, will lose foot mobility unless they consistently perform foot flexibility and strength exercises.

Method Step 1: Stabilize the foot with one hand. Extend the big toe upward by contracting the muscles on top of the big toe. Assist the



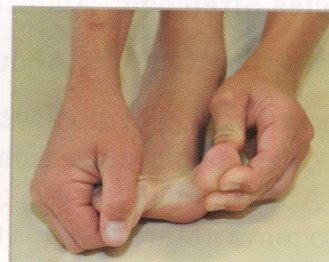
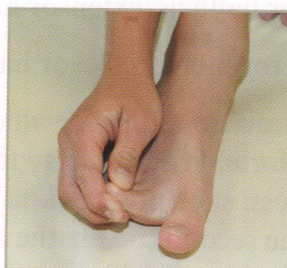
1.

GREAT (BIG) TOE STRETCH (FLEXORS) *continued*

movement gently, using the opposite side thumb and index finger to assist. Beware of great tissue sensitivity.

Step 2: The therapist will stabilize the adjoining toe next to the big toe with the thumb and index finger. The subject shall extend the big toe obliquely upward and outward at a 45-degree

angle to stretch the tissues that are close to the adjoining 1st toe. The assistant will use the thumb and index finger of the free hand to assist the movement into greater stretch. Assist the big toe and release the joint to the starting position. This tissue is usually very tight and may require greater time and more repetitions to lengthen the muscles and fascia. Use great care not to tear the connective tissues.



2.

GREAT (BIG) TOE STRETCH (EXTENSORS)

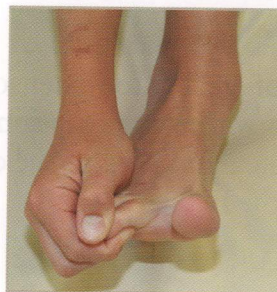
Muscles Stretched: Extensor hallucis longus and extensor hallucis brevis.

Muscles Contracted: Flexor hallucis longus and flexor hallucis brevis.

Introduction: Inflexible big toe extensors and a tight achilles tendon, soleus, or gastrocnemius muscles will lead to limited foot plantar flexion. A weak anterior tibialis muscle may also contribute to the problem. This will affect speed, balance, ability to push off properly, length of stride, and coordination. Conditions such as hammertoe, hallux valgus (*inward angling of the big toe*) claw foot, metatarsalgia (*chronic pain in the bones connecting the ankle to the toes*), and an abnormally high arch may result from limited great toe flexion. Neurological conditions are often characterized by limited great toe control.

Method: Flex (*bend*) the big toe downward by contracting the muscles on the bottom (*plantar surface*) of the big toe.

Part 1: Immobilize the toes with one hand. Stabilize the big toe with one thumb and index finger immobilizing just below the distal joint. The thumb and index finger assist big toe active effort and provide assistive downward stretch.



1.

Part 2: The proximal joint uses the same procedure, stabilizing just below the proximal joint. The proximal great toe joint is frequently one of the most limited in flexion of any joint in the body due to calcification, bunion or inward joint angulation. Flex the toe downward and gently assist the movement using the free thumb and index finger. Remember, the joint, muscle, and tendon may be quite sensitive. Assist, release, and repeat the effort.



2.

Repetitions: 1-3 sets of 5.

GREAT (BIG) TOE STRETCH (ADDUCTORS)

Muscles Stretched: Adductor hallucis, extensor hallucis longus, and extensor hallucis brevis.

Muscles Contracted: Abductor hallucis, flexor hallucis longus, flexor hallucis brevis.

Introduction: Quite often we see a condition in which the largest toe is angled inward (*hallux valgus*). This condition may be uncomfortable and lead to formation of a bunion or calcification of the great toe. Abductor hallucis weakness, shoe posture and a tight adductor hallucis muscle influence the big toe to move inward towards the second toe. If the abductor hallucis is too weak to keep the big toe in the normal neutral position, the big toe will angle inward, especially if aided by the force of the shoe. Hallux valgus affects speed, balance, ability to push off properly, length of stride, and coordination. The following stretches help eliminate the inward angling of the big toe and assist in preventing the major cause of a bunion. It also positively affects a bunion that already exists by helping restore the posture of the big toe.

Method:

Part 1: Stabilize the four toes with one hand. Attempt to spread the big toe laterally away from the other toes by contracting the abductor hallucis muscle. Assist the stretching of the adductor hallucis muscle at the end of active movement using the free hand thumb and index finger.



1.

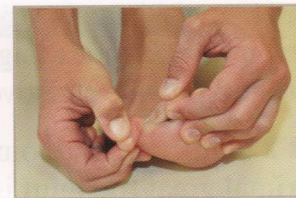
Part 2: To stretch the extensor hallucis longus and extensor hallucis brevis, stabilize the area immediately above the great toe; flex the big toe downward, using the flexor hallucis longus and flexor hallucis brevis (*great toe flexors*). Assist the movement with the thumb and index finger of the free hand. See previous *Big Toe Extensor Stretch*



2.

Part 3: For maximum stretch of the big toe extensors and adductors follow up the stretching of the big toe extensors and adductors with a combination moving downward and outward at a 45 degree angle. Stabilize the foot with one hand. Assist the downward, outward movement of the great toe with the thumb and index finger of the free hand.

Caution: Assist gently because the joints, muscles, connective tissue, scar tissue, or nerve endings will be sensitive. Joint and muscle distortion takes time to correct. Release and repeat the effort.



3.

Repetitions: 2 or 3 sets of 5-10.

LITTLE TOE STRETCH

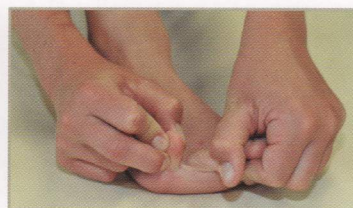
Muscles Stretched: Flexor digitorum longus.

Muscles Contracted: Extensor digitorum longus.

Introduction: Frequently the little toe is postured in the shoe in a position of flexion, hyperadduction, and medial rotation. This fifth toe slides under or above the fourth toe rendering both functionally limited and placing greater stress on the medial foot and arches.

Method:

Stage 1: Attempt to lift the little toe upward, contracting the extensor digitorum longus. Isolate the area, placing the thumb and index finger around the 4th toe and prevent the toe from moving. Assist the active extending effort of the little toe with the remaining thumb and index finger.



1.

Stage 2: To stretch the little toe extensors (*extensor digitorum*s) flex the little toe downward. One hand will stabilize the 4th toe as the thumb and index finger of the free hand assist the downward movement. Release and repeat the effort.



2.

Stage 3: To stretch the adductor interossei muscle and web portion on the little toe try to spread the toe, stabilize the adjoining toe, and assist in spreading of the little toe, with the free thumb and index finger. Release and repeat the effort very carefully to prevent tissue tearing.



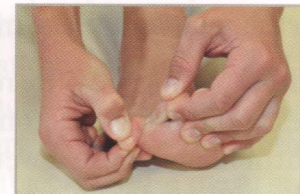
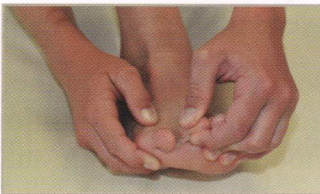
3.

Stage 4: Following spreading of the web, and adductor muscle, stabilize the 4th toe with one hand and have the subject flex the little toe downward and outward at a 45-degree angle. Assist with the thumb and index finger of the free hand. This tissue is usually very tight. Please proceed very carefully.



4.

Stage 5: If the toe is also rotating inward, mildly de-rotate the toe in the opposite direction stabilizing the 4th toe with one hand and assist rotating the little toe outward with the free thumb and index finger. This correction will require a number of repetitions and perhaps more than one session.



5.

Caution: Do these stretches slowly, as the connective tissue will usually be very tight and sensitive.

Repetitions: 2 or 3 sets of 5-10 according to the condition of the toe.

ASSISTED ISOLATED STRETCHING

SHOULDER FLEXIBILITY: ASSISTED

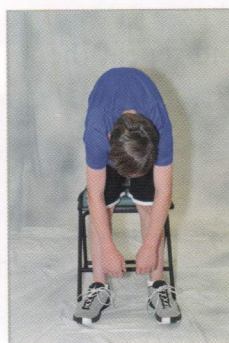
Assisted shoulder flexibility exercises stretch the muscles, fascia and joint connective tissue of the glenohumeral, acromioclavicular, and sternoclavicular joints. Greater flexibility will help prevent injuries, aid post injury or post-surgical recovery, and enhance performance of the shoulder region. For more details concerning the following shoulder exercises, which show where and how active assistance may be beneficial, consult the "Active Shoulder Flexibility" section of this book. When stretching the shoulder region the neck stretching exercises should be included as the two regions function together quite closely. Mild shoulder pressure (*less than one pound*) is most effective in releasing tight muscles and connective tissues. The assisted shoulder flexibility exercises are listed in the order that is most effective in achieving maximum shoulder movement.

SHOULDER CIRCUMDUCTION

Introduction: Circumduction increases circulation in the shoulder complex and arm.

Method: Initiate full arm circles toward and away from the body midline. Arms should hang like wet noodles when performing bent-over circumduction. Lean the body forward, bend the knees, and tighten the stomach muscles. Begin with small circles and gradually increase in circumference. When warm in one direction, reverse the direction of the movement.

Repetitions: 10 to 15 repetitions in each direction.



WEIGHTED SHOULDER WARMUP

Introduction: When the capsule is limited such as adhesive capsulitis (*frozen shoulder*), an active traction may be helpful to improve circulation and increase joint and tissue movement.

Method: Using a 2-5 lb. resistive weight, bend the knees and tighten the stomach muscles and position the arm hanging like a wet noodle. Begin with small circles and gradually increase in circumference. Relax and breathe deeply. Perform 15 repetitions in both directions toward and away from the body midline. A second series may be desirable.

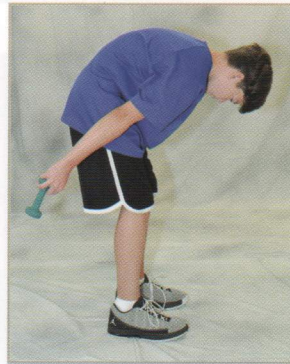


1.

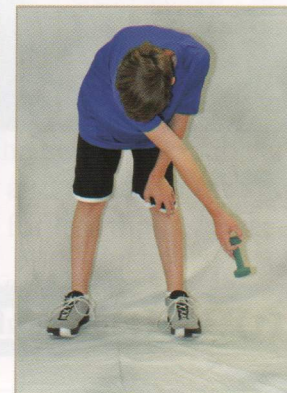
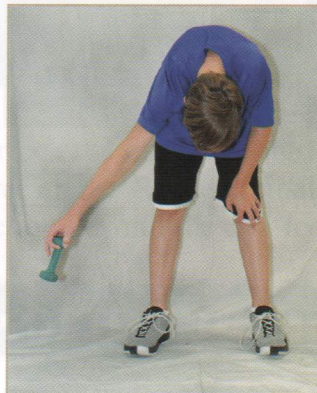
WEIGHTED SHOULDER WARMUP *continued*

A second movement for limited joint range is initiated using a 2-5 pound weight and begins with the knees bent, abdominals tightened and the body leaning forward. Relax and breathe deeply. The arm is relaxed and the effort moves north and south in a gentle, easy effort of 15 repetitions. A second series may be desirable.

A third movement is useful to help improve joint range of motion include using a 2-5 pound weight. Bend the back and both knees and tighten the stomach muscles. The arm is relaxed and the effort moves laterally east and west in a gentle, easy effort of 15 repetitions. A second series may be desirable.



2.



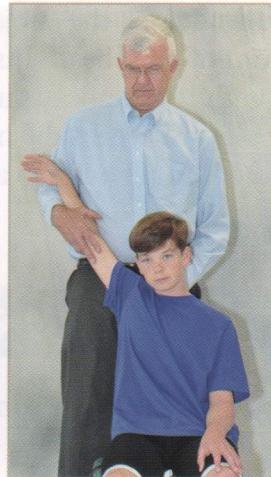
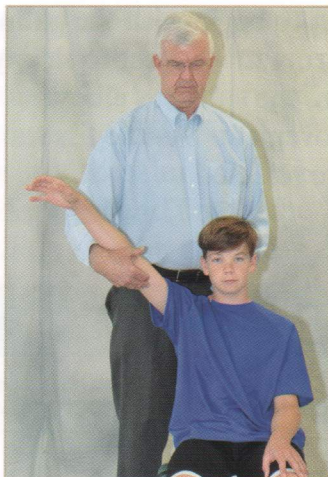
3.

HORIZONTAL (ABDUCTION) SINGLE ARM

Muscles Stretched: The anterior chest and shoulder muscles including the pectoralis major, pectoralis minor, teres major, latissimus dorsi, anterior deltoid and coracobrachialis.

Muscles Contracted: Trapezius, infraspinatus, teres minor, rhomboid major and rhomboid minor muscles.

Introduction: This exercise is important for complete posterior horizontal shoulder range of motion. This is a high priority to help correct forward head, rounded shoulders, or forward thoracic spine (*kyphosis*). It is very important for improving velocity and accuracy of throwing, horizontal and overhead striking movements.



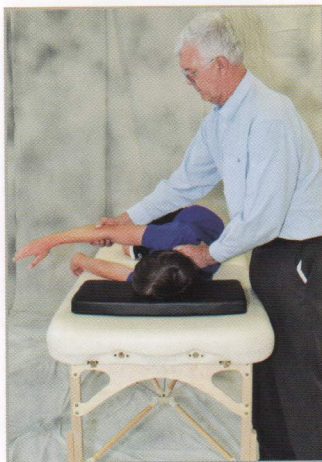
1.

Method 1: When stretching a single arm, extend the elbow in front of the chest. The assistant will stabilize the same side scapula with the inside hand. The outside hand is placed under the elbow. Instruct the subject to exhale and reach back as far as possible, and then assist the effort at the end-feel gently with a few ounces of pressure. Release, inhale and repeat the effort. As the tissues at that angle lengthen, ask the subject to raise the arm 10-15 degrees as each angle loosens.

Repetitions: 1-2 sets of 5-10.

HORIZONTAL (ABDUCTION) SIDE LYING

2.

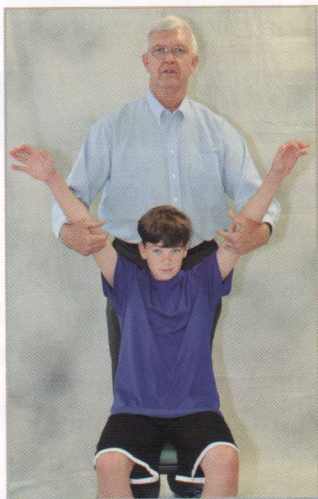


Method 2: Working with conditions of adhesive capsulitis, post-operative shoulder, tendonitis conditions, osteoporosis, muscle diseases, spinal cord or any extreme weakness condition.

The subject will assume a side-lying position. Place one hand around the upper elbow and the free hand stabilizing the upper scapula. The subject will contract the posterior shoulder and move the arm toward the assistant. The assistant will traction the top arm (*humerus*) and assist the active movement, for 1½-2 seconds beyond the end-feel. Return to the starting position and repeat the movement.

Repetitions: 2-3 sets of 5-10.

HORIZONTAL (ABDUCTION) EXTENSION I



Muscle Stretched: The anterior chest and shoulder muscles including the pectoralis major, pectoralis minor, teres major, latissimus dorsi, anterior deltoid and coracobrachialis.

Muscles Contracted: Trapezius, infraspinatus, teres minor, rhomboid major and rhomboid minor.

Introduction: This exercise is important to restore full posterior horizontal range of motion. This is an important stretch to correct forward head, rounded shoulders and forward thoracic spine (*kyphosis*).

Method: Ask the subject to begin with the palms facing toward each other and the elbows extended in front of the chest. Instruct the subject to slowly exhale and reach back as far as possible. The assistant with the hands around the subject's elbows will assist at the end-feel for 1½-2 seconds. Release, inhale and repeat the movement. As the tissues lengthen, raise the arms an additional 15 degrees until the front shoulders are released.

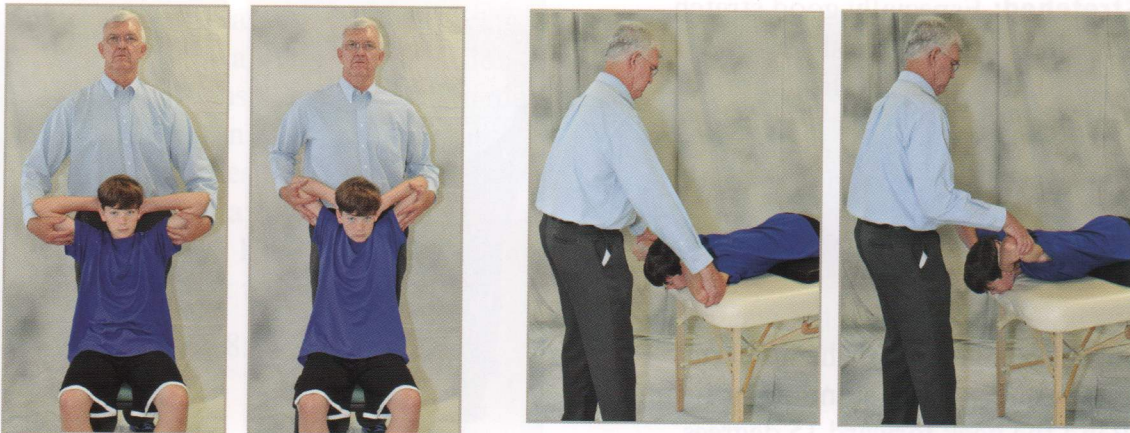
Repetitions: 1-2 sets of 5-10.

HORIZONTAL (ABDUCTION) EXTENSION II

Muscles Stretched: Pectoralis major, especially clavicular fibers. Most complete stretch of pectoralis minor muscle.

Muscles Contracted: Rhomboids, trapezius, infraspinatus, teres minor, and supraspinatus.

HORIZONTAL (ABDUCTION) EXTENSION II *continued*



Method: In a sitting position, ask the subject to interlock the fingers behind the head. The subject will exhale while reaching the arm(s) upward at a 45 degree angle. Release, inhale and return to the starting position. Assist with a gentle upward, backward traction beyond the end-feel for less than two seconds.

This exercise may be performed in a prone (*face down*) position. Reach up at a 45 degree angle. Assist the subject at the end of active movement. Do not lift the head as the arms are extended.

Repetitions: 1-2 sets of 5-10.

SHOULDER HYPEREXTENSION: SINGLE ARMS

Muscle Stretched: Short head of biceps brachii, long head of biceps brachii, anterior deltoid, pectoralis major and pectoralis minor.

Muscles Contracted: Triceps, posterior deltoid(s).

Introduction: Shoulder hyperextension is beneficial for post-surgery, post-injury, pre-activity, extreme shoulder tightness or limited anterior joint capsule movement. The subject may sit or stand with limited forward body bending. The arms should be kept close to the side throughout the entire motion for maximum effectiveness. Bend the neck 15 degrees forward to prevent cervical strain. Instruct the subject to completely extend the elbows and reach backward as far as possible with the palms facing the body for approximately two seconds, release to the starting position and exhale while repeating the movement. The exercise should also be performed with the palm(s) positioned palm pointing downward and finally the palm(s) facing upward isolating different specific fibers in each position.

Repetitions:
1-2 sets of 5-8.



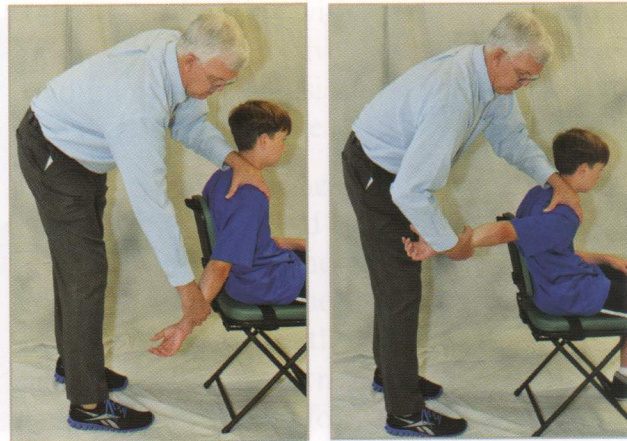
SHOULDER HYPEREXTENSION: PALM OUTWARD

Muscles Stretched: Especially good stretch for the long head of the biceps, short head of the biceps, anterior deltoid, pectoralis major, and pectoralis minor.

Muscles Contracted: Triceps and posterior deltoid muscles.

This is an outstanding stretch for the long head of the biceps brachii and will be felt where it goes through the bicipital groove of the humerus. The subject may be exercised in a standing or sitting position. Bend the neck forward 15 degrees to prevent cervical strain. Ask the subject to completely extend the elbows having the shoulders rotate inward with the palms facing outward in the thumbs-up position. The movement may be performed singly, isolating one arm, or both arms simultaneously depending on the condition of the individual shoulder. Ask the subject to reach back as far as possible, guide the movement and provide gentle assistance at the point of end feel for 1½-2 seconds. Exhale as the exercise is repeated. Both arms may also be exercised simultaneously by interlacing the fingers of both hands, externally rotating both shoulders having the palms facing backwards. Reach upward and have the assistant help with the movement at the end feel for 1½-2 seconds. Release, return and repeat the effort to the starting position.

Repetitions: 1-2 sets of 5-8.

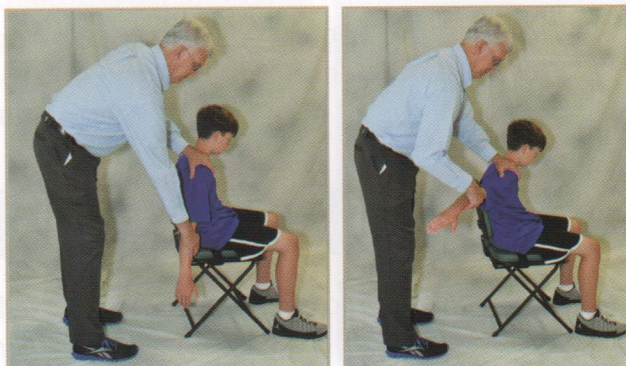


SHOULDER ABDUCTION: POSTERIOR OBLIQUE

Muscles Stretched: Medial belly biceps brachii, coracobrachialis, and anterior deltoid.

Muscles Contracted: Posterior deltoid, triceps brachii.

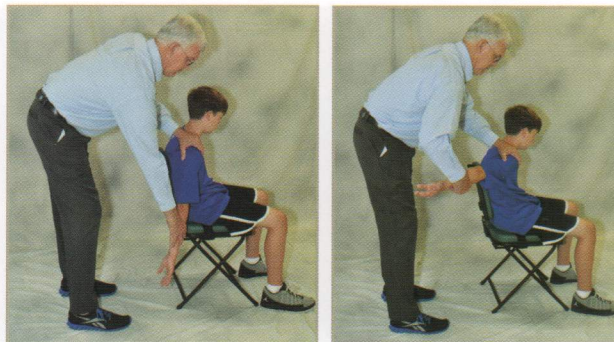
This exercise will further isolate the biceps brachii. The palm faces forward with the arm against the side. The subject reaches backward at a 45 degree angle contracting the posterior arm. The assistant stabilizes the scapula using the near side hand. The subject's free hand will hold onto the posterior stool or chair to prevent the shoulder girdle from rotating forward. The assistant's hand surrounds the subject's elbow. As the arm reaches backward the assistant guides the arm and assists for 1½-2 seconds beyond the end-feel. This is a specific stretch for the medial belly of the biceps brachii and the anterior deltoid muscle. Secondly,



SHOULDER ABDUCTION: POSTERIOR OBLIQUE *continued*

the exercise is performed having the palm facing backward. The exercise is an excellent isolation of the coracobrachialis muscle and the remainder of the medial biceps and anterior deltoid muscle tissues. The assistant guides the movement accurately, stabilizes the scapula and assists at the end-feel for 1½-2 seconds. Release to the starting position, exhale and repeat the effort.

Repetitions: 1-2 sets of 5-8.



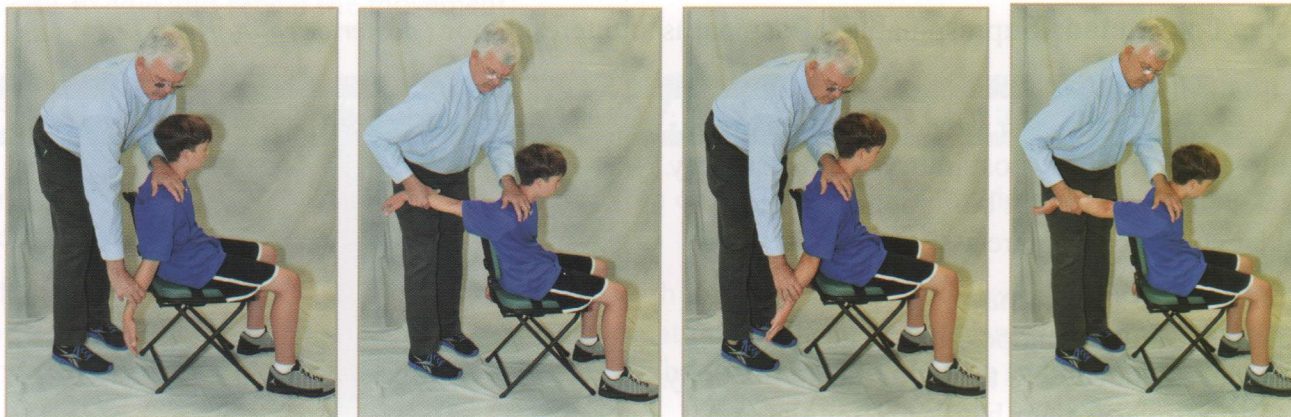
SHOULDER ADDUCTION: POSTERIOR OBLIQUE

Muscles Stretched: Lateral biceps brachii belly, supraspinatus, pectoralis major, pectoralis minor, latissimus dorsi, teres major and subscapularis muscles.

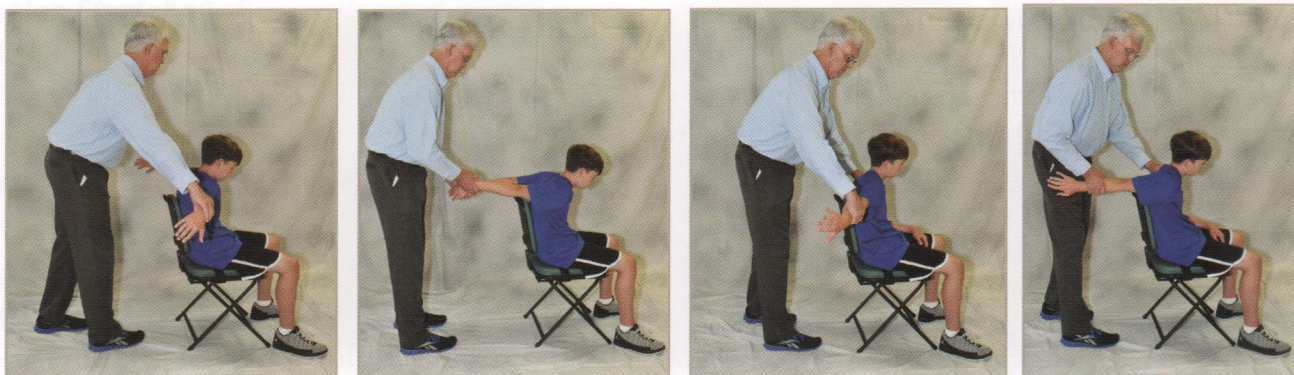
Muscles Contracting: Posterior deltoid, triceps brachii.

Method: The subject begins the exercise positioning the arm by the side and the palm pointing forward. The assistant places the near side hand behind the scapula and the far side hand around the elbow. This is an excellent isolation of the lateral belly of the biceps and includes the supraspinatus and pectoralis major, teres major, subscapularis, and latissimus dorsi origins on the anterior head of the humerus. The subject's free hand will hold onto the posterior stool or chair to prevent shoulder girdle compensatory forward rotation. The arm is moved from the side of the hip into oblique adduction across the midline. The assistant guides the arm to the end-feel and assists for 1½-2 seconds. Release to the starting position and inhale. The exercise is also carefully performed in the same oblique plane positioning the arm by the side with the palm pointed backward at the 45 degree angle. This frees the remaining lateral fibers of the biceps brachii, pectoralis minor, teres major, latissimus dorsi and subscapularis muscles. Exhale during the stretching process. The assistant will guide the movement at a 45 degree angle and assist at the end-feel for 1½-2 seconds. Release to the starting position, exhale and repeat the effort.

Repetitions: 1-2 sets of 5-8 reps.



HORIZONTAL ABDUCTION: POSTERIOR



Muscles Stretched: Anterior deltoid, subclavius, pectoralis minor, clavicular portion of the pectoralis major.

Muscles Contracting: Trapezius, rhomboid major, rhomboid minor, infraspinatus, teres minor, triceps and posterior deltoids.

Note: Perform this stretch after the pectorals and biceps are lengthened.

Method: The subject will position the palms of each hand pointing toward the body midline. The assistant will clasp the moving arms around the elbow(s) or slightly below. The subject will move the arm(s) toward the midline, beginning a few inches below shoulder level and gradually raising the arms to shoulder height as the anterior tissues release. Inhale during the recovery phase, exhale during the stretch. The stretch may be performed one arm at a time because of pain, post-surgery or injury. Move the arm to the muscle-fascia end-feel and stretch for 1½-2 seconds. Release to the starting position and exhale while stretching. Eventually the hands will touch or even cross. The palms must face toward each other to prevent injury or potential dislocation from moving beyond full range if the shoulders were positioned in external rotation. (*palms out*)

Repetitions: 1-2 sets of 5-8.

SHOULDER EXTERNAL ROTATION

Muscles Stretched: Internal shoulder rotators including the pectoralis major, subscapularis, latissimus dorsi and teres major.

Muscles Contracted: Supraspinatus, infraspinatus and teres minor (*posterior rotator cuff*).

Methods: There are especially good techniques for adhesive capsulitis (*frozen shoulder*), joint capsule tightness, post fracture, post injury or post-surgery. Consider the method that best applies to the shoulder condition you are assisting.

Method A: The subject may be positioned in a standing, sitting or lying position. The arm is completely extended with the palm facing the body. The assistant places their hands around the arm



A.

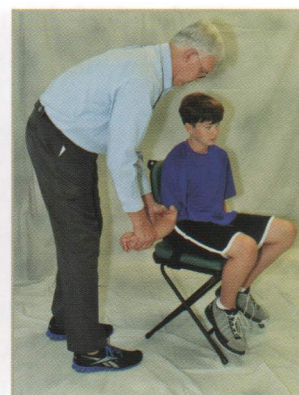
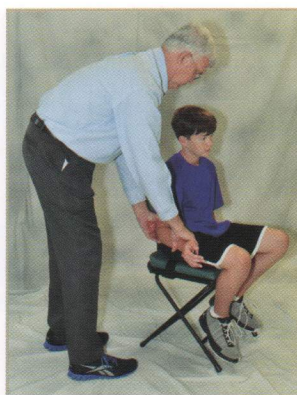
SHOULDER EXTERNAL ROTATION *continued*

just above the elbow. The subject will attempt to rotate the entire arm outward. The assistant will apply downward traction while offering assisted stretch at the end-feel for 1½-2 seconds. Return to the starting position and repeat the exercise.

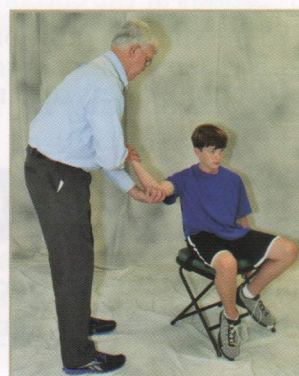
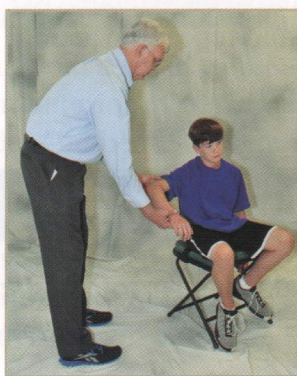
Method B: Position the subject's arm against the side of the body. Bend the elbow 95 degrees. The subject will move the lower arm away from the body by contracting the external shoulder muscles. The assistant will guide the arm and help stretch at the end-feel for 1½-2 seconds. Return to the starting position and repeat the movement. Excellent stretch for rotator cuff problems, tight joint capsule or shoulder pain.

Method C: From a seated position, the elbow is positioned at a 95 degree angle. Position the arm 5 degrees below shoulder level and 5 degrees in front of the shoulder. The arm is externally rotating as far as possible, receiving gentle assistance from the therapist or trainer for 1½-2 seconds. Release to the starting position and repeat the movement.

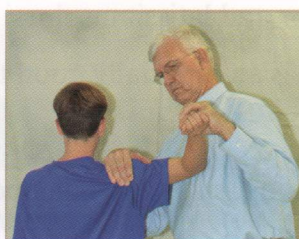
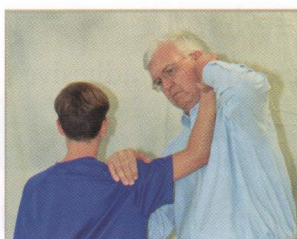
Method D: In order to help prevent major compensation and provide greater isolation of the medial shoulder rotators, place one hand around the posterior head of the subject's humeral head. Stabilize the humeral head upward and then clamp the wrist-forearm over the anterior head of the humerus. This will prevent forward compensation of the humeral head. Rest the subjects elbow on your chest or the front of the shoulder. Maintain the subjects elbow angle at about 95 degrees to prevent biceps brachii interference. This is an especially good isolation stretch of the biceps muscle-tendon juncture and humeral internal rotator tendon attachments, where the greatest stress or force is received. Gently assist the subject's movement at the end of the end-feel and assist for 1½-2 seconds. Release, exhale and repeat the movement.



B.



C.



D.

SHOULDER EXTERNAL ROTATION: PRONE

Introduction: This stretch is helpful in treating frozen or post-operative shoulders that have limited external rotation.

Method E: The subject assumes a prone position with the elbow bent 95 degrees and parallel to the shoulder. Fold a towel a number of times and place it under the anterior (front) head of the humerus to prevent forward compensation of the humerus. The therapist should place stabilizing pressure on

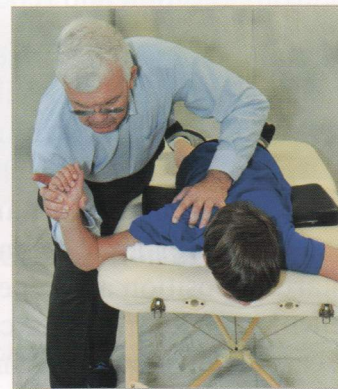
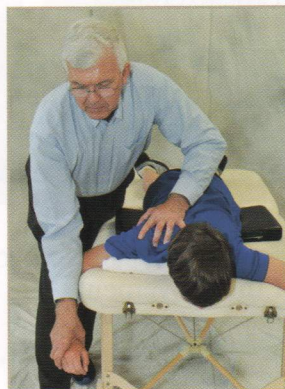
continued next page

SHOULDER EXTERNAL ROTATION: PRONE *continued*

the posterior head of the humerus and the superior border (*top*) of the scapula with the near side hand. The stabilizing pressure on the posterior humerus will maintain the neutral position during rotation. Pressure applied against the upper posterior scapula will help prevent compensatory humeral rotation and posterior scapular tilt.

Next, place the distal hand around the wrist of the subject and rest your forearm on top of the subject's arm to help prevent the subject from lifting the upper arm during rotation. Instruct the subject to reach their lower arm upward as far as possible. The assistant provides gentle aid for 1½-2 seconds at the end of active movement. Release to the starting position and repeat the action.

Repetitions: 2-5 sets of 5 repetitions.



E.

SHOULDER: INTERNAL ROTATION

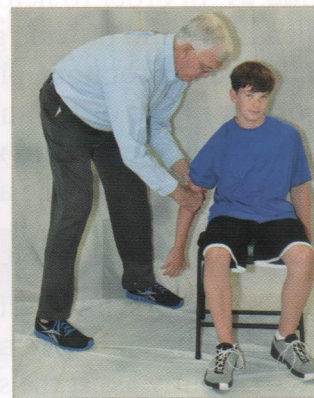
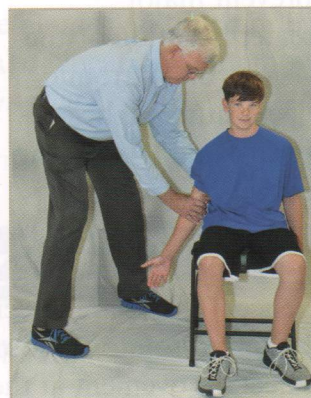
Muscles Stretched: External shoulder rotators (*posterior rotator cuff*) including the supraspinatus, infraspinatus and teres minor muscles.

Muscles contracted: The internal shoulder rotators including the teres major, subscapularis, pectoralis major and latissimus dorsi muscles.

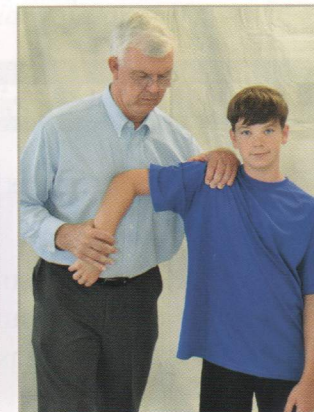
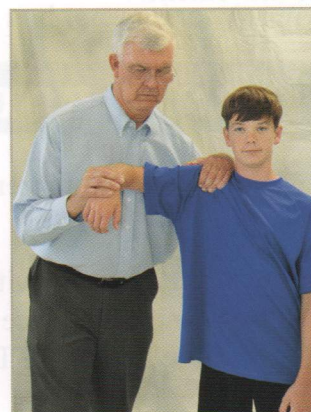
This is an especially good technique for adhesive capsulitis (*frozen shoulder*) or joint capsule tightness. The subject may be positioned in a standing, sitting or lying position.

Method A: The arm is completely extended with the palm facing forward. The assistant places their hands just above the subject's elbow. The subject will attempt to rotate the entire arm inward. The assistant will apply downward traction while maintaining assisted stretch at the end-feel for 1½-2 seconds. Return to the starting position and repeat the exercise 1-3 series of 5-8 repetitions.

Method B: The assistant should be in a position to maintain the head of the humerus in a neutral position. Place the top hand over the shoulder and gently pulling the anterior head of the humerus upward and inward will help attain specific isolation of the humerus. Rest the subject's elbow against your anterior shoulder or chest and stabilize the posterior head of the humerus with your wrist and upper forearm.



A.



B.

SHOULDER: INTERNAL ROTATION *continued*

Placing the lower forearm-elbow firmly against the lower end of the scapula helps prevent forward tilt compensation of the scapula. The assistant will place the outer free hand around the lower forearm to assist the active movement. Assist from end of motion for 1½-2 seconds, release and repeat the motion 1-3 series of 5-8 repetition.

Introduction: This is a good technique for limited inward shoulder rotation, frozen shoulder or post-operative shoulder. These conditions often result in limited internal shoulder rotation.



C

Method C: Have the subject assume a prone position. Fold a small towel a number of times and place it under the front (*anterior*) of the shoulder to prevent anterior movement of the humeral head. Place the subject's elbow in a position parallel to the shoulder and bent 90 degrees. Instruct the subject to reach the lower arm upward, rotating the shoulder inward. To prevent compensation, place firm hand pressure against the posterior head of the humerus. Stabilize the scapula with the elbow/forearm, applying pressure firmly against the lower end of the scapula. At the end of active movement, gently assist the movement for 1½-2 seconds with the opposite hand on the subject's wrist, and rest your forearm on the subject's forearm for greater upper arm isolation and stability. Assist the stretch, release to the starting position and repeat the movement

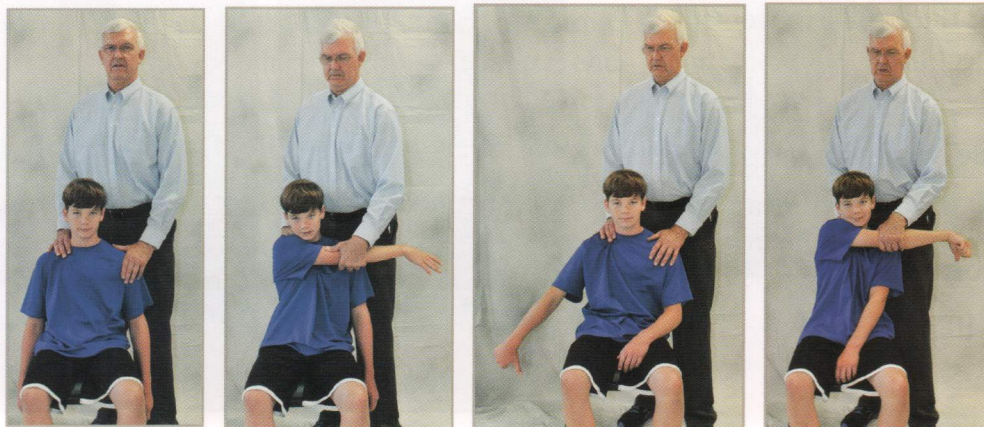
Repetitions: 1-3 sets of 5-8.

HORIZONTAL FLEXION: I

Muscles Stretched: Trapezius, triceps-brachii, rhomboid major, rhomboid minor, infraspinatus and teres minor muscles.

Muscles Contracted: Pectoralis major, anterior deltoid, subclavius and coracobrachialis muscles.

Method: Instruct the subject to extend the elbow, and maintain a thumb up effort and the shoulder in a parallel position. The subject will reach the fully extended elbow toward the top of the opposite shoulder, placed high enough to clear the pectoralis major. The assistant is positioned behind the



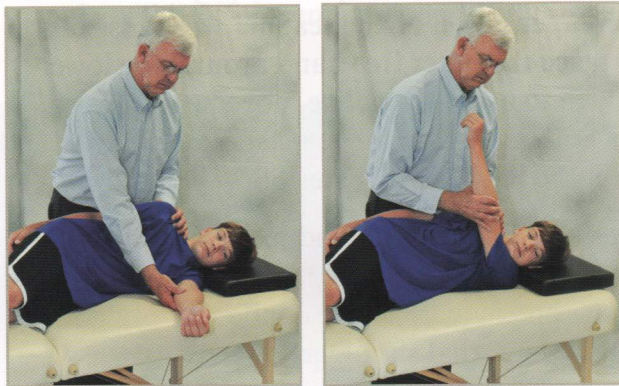
continued next page

HORIZONTAL FLEXION: I *continued*

subject's opposite side shoulder. The far side hand will gently stabilize the exercising side clavicle from moving forward and prevent the shoulder from elevating. The near side hand surrounds the elbow to assist the stretch for 1½-2 seconds at the end of active movement. This movement is followed by the same type performance with the thumb pointing downward. Return the arm to the side of the body after each repetition.

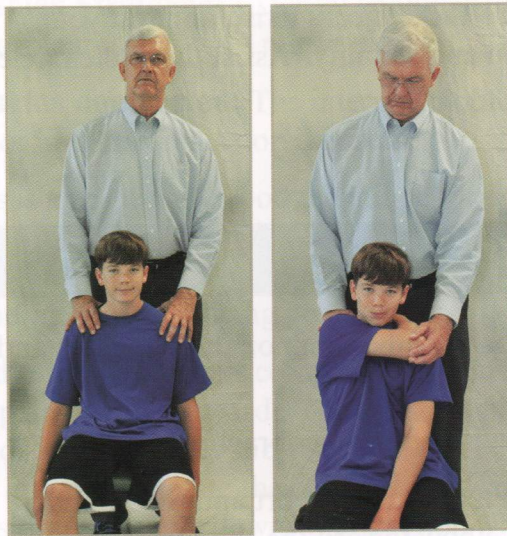
An alternate movement may also be performed in a side lying position keeping the scapula on the table as the subject is gently assisted.

Repetitions: 1-2 sets of 5-10.



Side Lying

HORIZONTAL FLEXION: II



Muscles Stretched: Levator scapula, supraspinatus, triceps brachii, plus the infraspinatus, teres minor and trapezius muscles.

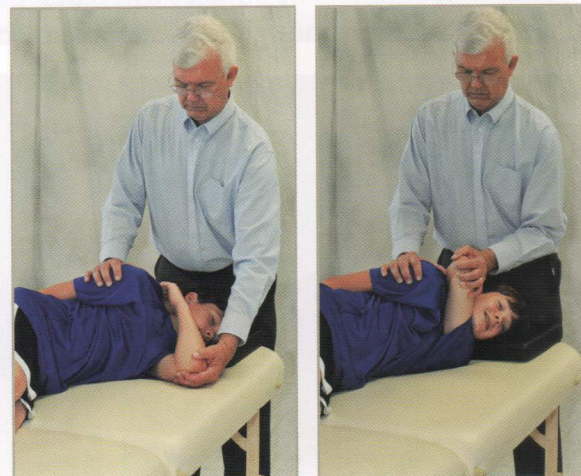
Muscles Contracted: Pectoralis major, pectoralis minor, subscapularis, anterior deltoid and coracobrachialis.

Method: Instruct the subject to place the exercising side hand on the opposite shoulder. The subject will walk down the shoulder blade (*scapula*), exhaling during the movement. The assistant stands behind the subject gently holding the exercising side clavicle back and preventing the shoulder from elevating or moving forward from the neutral position. The free hand is placed around the elbow of the exercising arm.

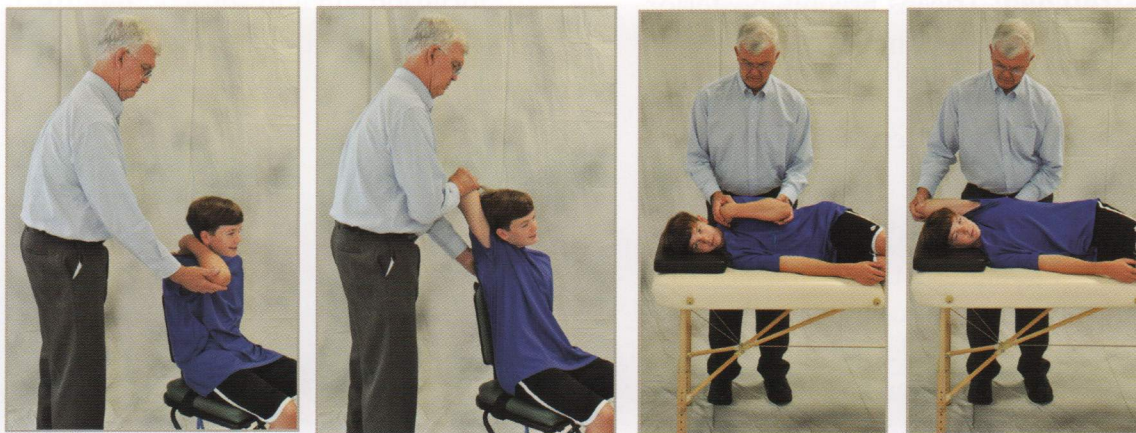
(Example: your left hand on the subject's right elbow)
Provide gentle assistance at the end of movement. Return the arm to the subject's side after each repetition.

An alternate position is side lying with the scapula stabilized against the table. The subjects hand walks down the opposite side scapula as the assistant helps stabilize and assists the effort.

Repetitions: 1-2 sets of 5-10.



TRICEPS BRACHII STRETCH: ASSISTED



1.

Muscles Stretched: Anconeus, triceps brachii, a two-joint muscle of the posterior shoulder and elbow joints, serratus anterior, and teres major.

Muscles Contracted: Biceps brachii and anterior deltoid muscles.

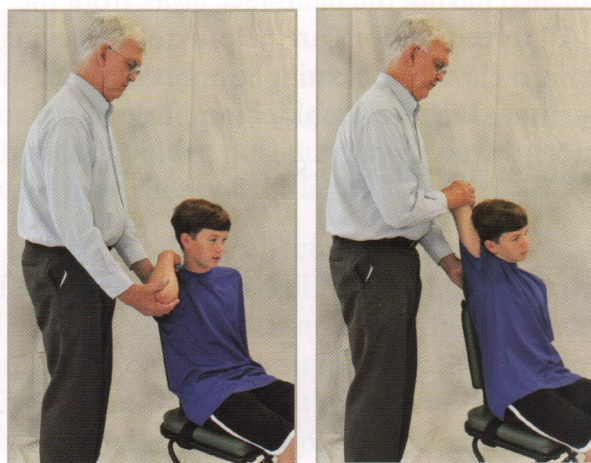
Introduction: It is very difficult to reach the arm completely overhead (*forward elevation*) unless the triceps are flexible.

Method 1: Instruct the subject to bend the elbow with the palm facing the back of the body. Place a rope or strap in the hand and the other end in the free hand behind the back. Stand at the side of the subject with the assistant's front hip parallel to the shoulder. The subject will move the arm upward keeping the arm close to the head throughout the movement. The subject should reach the arm upward as the assistant stabilizes the scapula with one hand and provides traction on the humerus and gentle assistance during the upward movement. Ask the subject to contract the stomach muscles to prevent compensatory arching of the back. Return to the starting position after each repetition. This technique may also be performed in a side lying position.

Repetitions: 1-2 sets of 5-10.

Method 2: The subject will maintain a flexed elbow with the palm facing the back. Incorporate the basic position of Method 1 except the arm will move obliquely behind the head at a 45 degree angle to better stretch the lateral and more angular triceps fibers. The assistant will stabilize the same side scapula and assist the movement from the end-feel for 1½-2 seconds. Lower the arm to the side starting horizontal position and repeat the effort. This technique may also be performed in a side lying position. (*See Method 1*)

Repetitions: 1-2 sets of 5-10.



2.

SHOULDER FORWARD ELEVATION (A)

Muscles Stretched: Triceps brachii, posterior deltoid, anterior serratus, anconeus and latissimus dorsi.

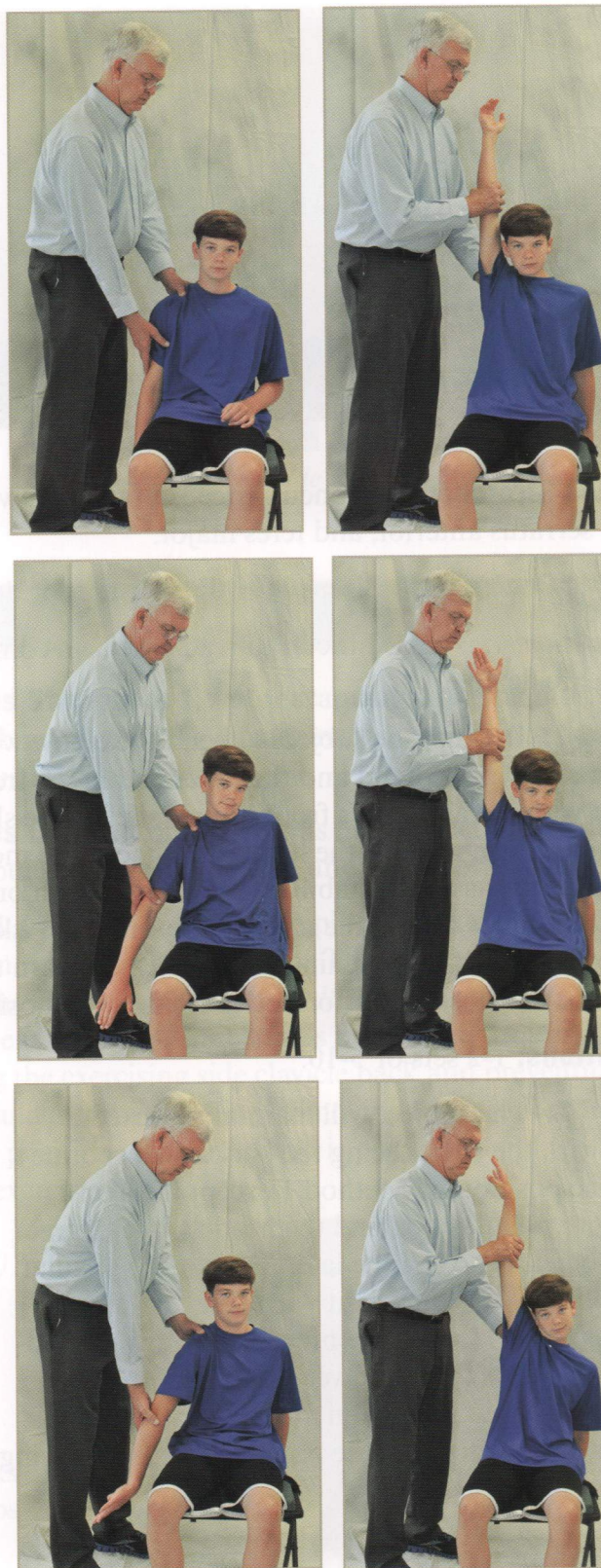
Muscles Contracted: Anterior deltoid, biceps brachii.

Note: A maximum result is more likely to be achieved by first stretching the triceps brachii and internal shoulder rotators. The subject will achieve maximal forward elevation if capable of 90 degrees or greater internal shoulder rotation. This is an excellent stretch for the posterior joint capsule.

Method A: Ask the subject to fully extend the elbow with the palm facing the body. The assistant will stabilize the scapula positioning the near side hand above the clavicle and across the upper scapula to prevent shoulder shrugging. Stand behind the subject and position the inside hip behind the shoulder. The outside hand will gently clasp the elbow and assist the movement upward applying mild traction as the subject exhales and raises the arm as high as possible without bending the elbow or arching the back.

This stretch will help achieve even greater function, if performed with the palm facing forward and applying the same principles as the palm facing the body. The most difficult effort is performed having the palm face away from the body. All three positions are helpful for achieving full forward elevation, helping restore capsule movement and relieve shoulder impingement.

Repetitions: 1-3 sets of 5-8.



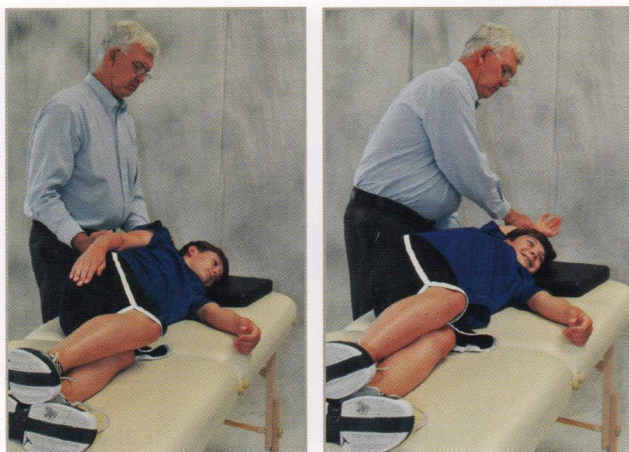
Method A

SHOULDER FORWARD ELEVATION: SIDE LYING (B)

Muscle Stretched: Triceps brachii, posterior deltoid, anterior serratus, anconeus and latissimus dorsi. The tight posterior joint capsule will also become free.

Muscles Contracted: Anterior deltoid and biceps brachii.

Introduction: For conditions involving very painful shoulder, frozen shoulder (*adhesive capsulitis*), arthritis, very weak muscles, post-operative shoulder, muscle diseases, spinal cord injuries. The side lying position may be the preferred position to re-establish forward elevation.



Method B

Method B: The subject will be placed in a side-lying posture. Place a pillow between the knees of the subject. The assistant will stand behind the subject. The near-side hand will be placed on top of the clavicle and across the upper scapula to prevent compensation. The far side hand will surround the subject's elbow providing mild traction, and guidance throughout the movement. Assist with gentle stretch at the end-feel for 1½-2 seconds. Release to the starting position and repeat the movement. First perform with the elbow extended and palm facing the body. This is followed by the palm facing forward. Perform by having the palm facing outward as capable.

Repetitions: 2-5 sets of 3-5 repetitions.

SHOULDER FORWARD ELEVATION: PRONE

Muscles Stretched: Upper triceps brachii, posterior deltoid and anterior serratus. Excellent stretch for tight joint capsule.

Muscles Contracted: Anterior deltoid and biceps brachii.

Introduction: This stretch will help lengthen and restore full forward joint movement and is especially helpful for those with limited overhead joint movement because of muscle tightness, adhesions, or limited posterior joint capsule freedom due to injury, frozen shoulder, post-surgery or post fracture. This is an outstanding stretch to help achieve full forward movement of the arm.

Method: The subject will assume a prone (*face down*) position with the affected arm hanging off the side or over the end of a table or other supportive surface. The shoulder will be flexed. The elbow is completely extended having the palm face the body. The head is supported on the surface if the arm is hanging off the side of the table. A stool or face cradle may be used for support when exercising off the end of the table. Stabilize the scapula with the near-side hand. Stabilize the clavicle (*collar bone*) by pressing down with the thumb. The outside hand will clasp the elbow applying traction, guiding the movement smoothly and providing assistive stretch at the end of active movement for 1½-2 seconds. Return to the starting position and repeat the effort. Initially the exercise is performed with the palm facing the body. Second, assume a palm forward position and repeat the same forward effort.

continued next page

SHOULDER FORWARD ELEVATION: PRONE *continued*



As capable, perform the forward elevation exercise with a palm outward effort, assisted using traction, stabilization and gentle stretch. **Repetition:** 2-5 sets of 3-5 repetitions.

SHOULDER SIDEWARD ELEVATION (A)

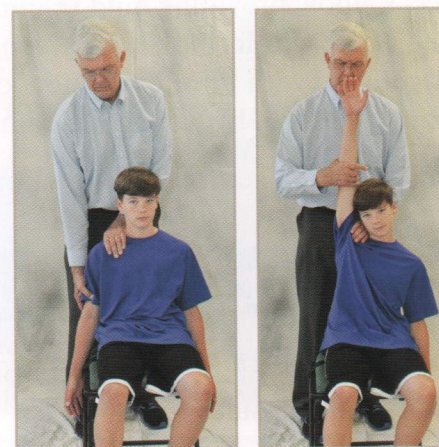
Muscle stretched: Teres major, subscapularis, latissimus dorsi and sternal portion of the pectoralis major.

Muscle Contracted: Deltoid muscles, serratus anterior and trapezius.

Notes: Subject must have near complete forward elevation to perform this exercise. Excellent exercise to establish scapular rotation. This is also an important movement to help stretch many of the trunk muscles and heavy fascia.

Method A: The subject will fully extend the elbow. The exercise begins with the palm facing forward. The subject will contract the middle deltoid muscle and raise the arm laterally overhead. The assistant stabilizes the shoulder complex using the inside hand and assists the lateral movement placing the outside hand around the elbow to prevent flexion of the subject's elbow.

Repetition: 1-2 sets of 5-8 repetitions.

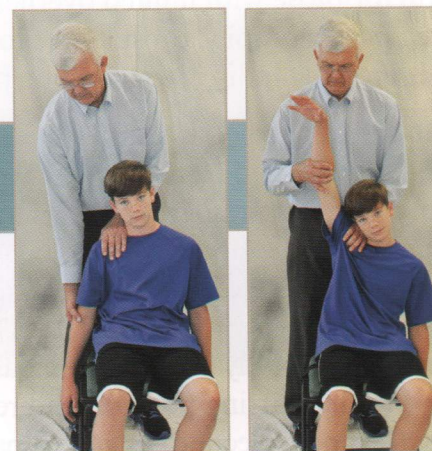


Method A

SIDEWARD ELEVATION: PALM DOWN (B)

Method B: Instruct the subject to externally rotate the shoulder 90 degrees, positioning the palm in a downward position. Instruct the subject to rotate the humerus and the scapula and elevate the arm to a vertical position. This will also help stretch the joint capsule more completely.

Repetitions: 1-2 set of 5-8.

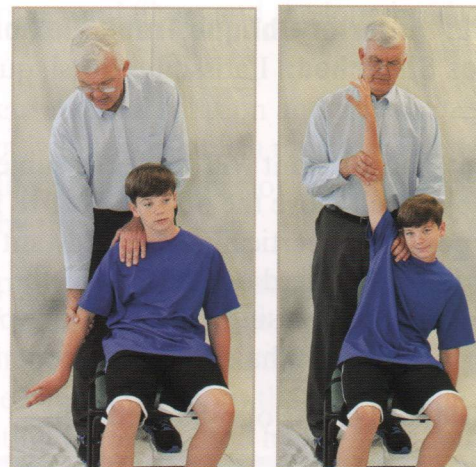


Method B

SIDEWARD ELEVATION: PALM BACKWARD (C)

Method C: The palm is rotated an additional 90 degrees positioning the palm facing backward. This exercise position is designed to help solve a shoulder impingement. The assistant must guide and assist the upward movement with the utmost gentleness to prevent injuring the glenoid fossa area as the movement is facilitated. Proceed with each repetition cautiously from the end feel for 1½-2 seconds.

Repetitions: 1-3 sets of 5.



Method C

LATERAL TRUNK FLEXION: SEATED

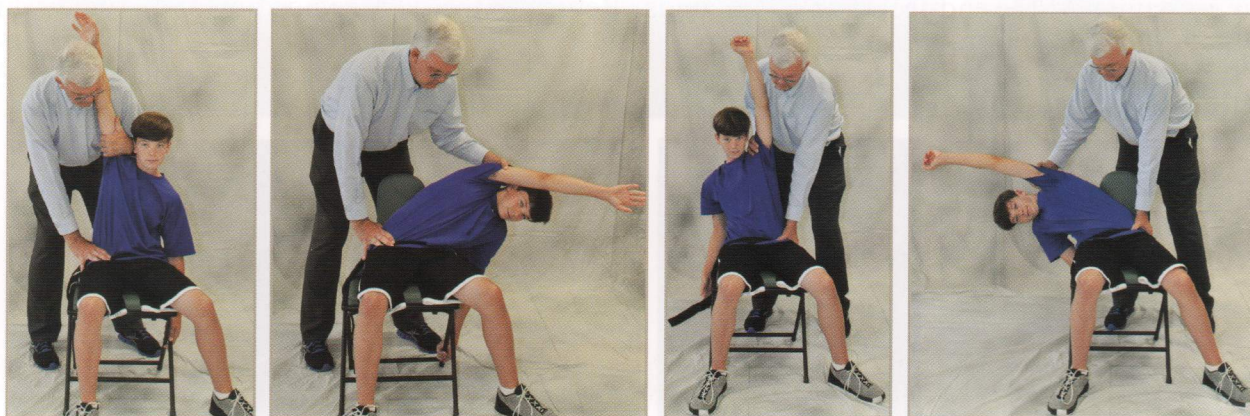
Muscles Stretched: Latissimus dorsi, quadratus lumborum, posterior serratus, infraspinaus and teres minor.

Muscles Contracted: Opposite side lateral spinal flexors including latissimus dorsi, quadratus lumborum, oblique abdominals and erector spinae.

Method:

Stage 1: Lateral Trunk Flexion: This is an excellent stretch of the distal latissimus dorsi and posterior serratus. The assistant will instruct the subject to side, placing the opposite side leg 12-18 inches laterally outside of the hip. The subject will contract the opposite side trunk and shoulder muscles with the exercising side arm positioned vertically and leaning laterally as far as possible, keeping the exercising side buttock positioned on the surface. The assistant will stabilize the subject by pushing downward on the crest of the ilium, assisting with lateral pressure at the end-feel and stretching for 1½-2 seconds. Exhale and repeat the exercise.

Repetitions: 1-2 sets of 5-8.



Stage 1

continued next page

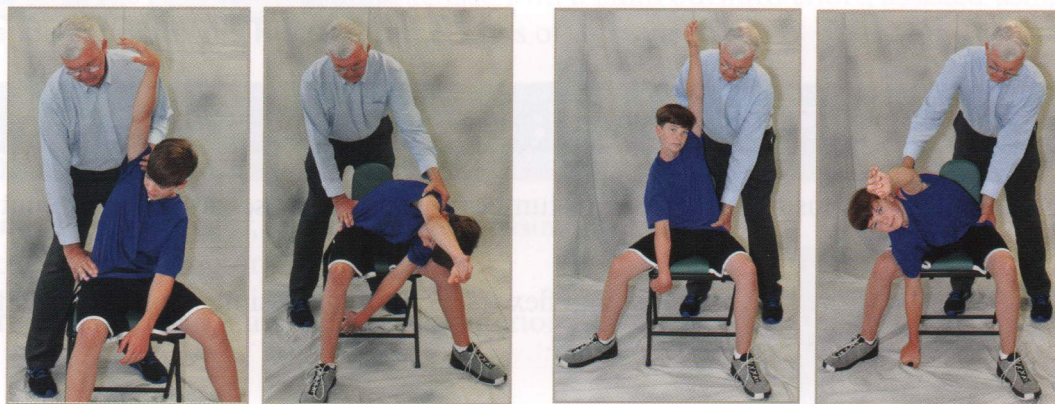
LATERAL TRUNK FLEXION: SEATED *continued*

Stage 2: Anterior Oblique Trunk Flexion:

Muscles Stretched: Latissimus dorsi, quadratus lumborum, infraspinatus, teres minor, same side erector spinae.

Method: The assistant will guide the subject as the upper body is rotated 45 degrees anterior. The subject will move the opposite leg 18 inches laterally and 6-8 inches forward. The exercising arm is positioned vertically. The assistant will assist the exercising side buttock to remain stabilized by pressing downward on the crest of the ilium. The assistant will help direct the 45 degree anterior oblique movement, using gentle angular pressure past the end feel for 1½-2 seconds. Return to the starting position. Exhale while repeating the stretching motion.

Repetitions: 1-2 sets of 5-8 repetitions.



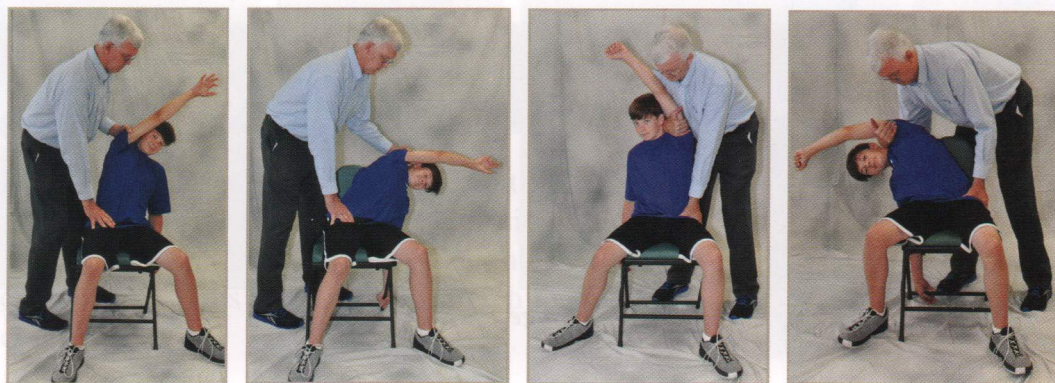
Stage 2

Stage 3: Posterior Oblique Trunk Flexion:

Muscles Stretched: Anterior serratus, anterior internal and external obliques, external intercostals, internal intercostals, pectoralis minor, subscapularis, and teres major.

Method: The assistant will guide the subject as the upper body is rotated 45 degrees posterior. The subject will move the far leg 18 inches laterally and 6-8 inches backward. The exercising arm is positioned vertically. The assistant will help stabilize the exercising side buttock by pressing down on the iliac crest. The assistant will help direct the 45 degree posterior oblique movement using gentle angular pressure past the end-feel for 1½-2 seconds. Return to the starting position and exhale, while repeating the stretching effort.

Repetitions: 1-2 sets of 5-8.



Stage 3

SHOULDER: POSTERIOR HAND CLASP

Muscles Stretched: Top arm-triceps, serratus anterior, upper pectoral fibers and the long head of the biceps brachii.

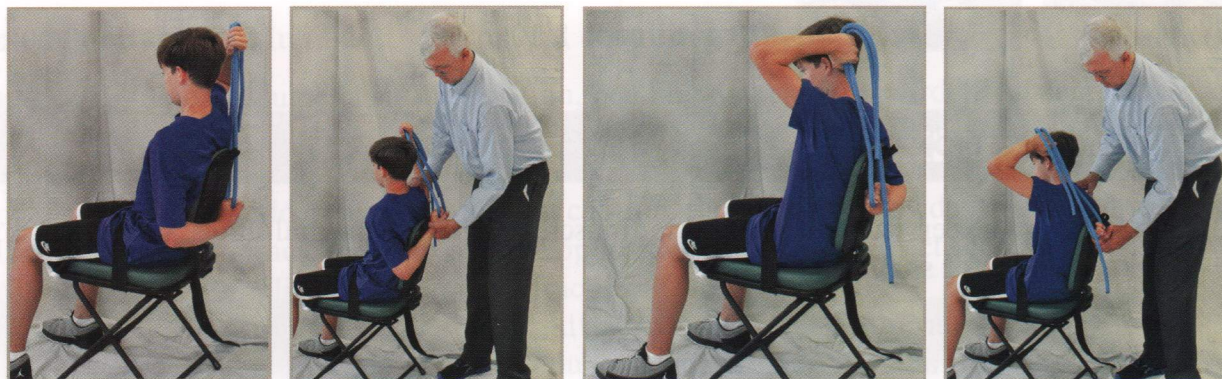
Introduction: This movement helps to test and develop complete external rotation and forward elevation of the top arm. Upward movement of the lower arm will help establish more complete internal shoulder rotation. Completion of the movements will enable the posterior clasping of the hands. It is often achieved slowly and may be assisted gently by the assistant.

Method: Position the upper arm vertically near the neck and position the palm facing the body. As the top hand reaches over (*abduction*) and downward (*lateral rotation*) the triceps, serratus anterior and upper pectoralis major are stretched. Position the opposite lower hand with the palm facing away from the body. Maintaining all four knuckles against the back throughout the effort as the hand moves up the spine between the shoulder blades, attempting to join the top hand. Rotation of the radioulnar joint will result in compensatory biceps contraction preventing most of the potential movement. As the lower arm reaches under (*medial rotation*) and upward (*adduction*) the long head of the biceps brachii, supraspinatus, infraspinatus, teres minor and deltoids are lengthened. Use a rope, strap or towel for assistance. Instruct the subject to walk the hands toward each other. At the end of movement, assist the active effort by moving the lower arm upwards or top arm downward. Depending on which direction you are moving, assist the effort with the opposite end hand.

Caution: *DO NOT* assist either movement unless active effort is sustained.

Notes: It is not unusual that a person can do this well on one side, but not on the other. Work equally on the left and right side or you may experience a greater risk of injuries if you are stressed in extended positions.

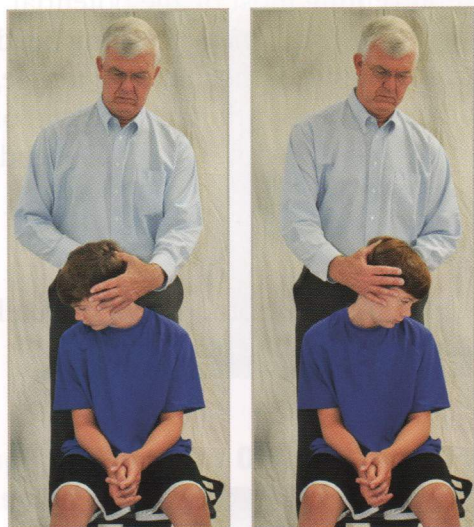
Repetitions: 1-2 sets of 5-10.



NECK FLEXIBILITY ASSISTED: SEATED

Frequently, the cervical spine (*neck*) has decreased range of motion due to age, post injury, surgery, muscle tension, or postural deficiencies. Exercise caution with disc problems, post-accident, post-surgery, nerve involvement, calcium deposits, or osteoporosis. The subject is responsible for the movement; the therapist provides guidance and gentle end of range (6-8 ounces) assistance. Medical authorization may be indicated before providing assistive cervical exercises. Assisted neck exercises are usually followed by active neck exercises to maintain good cervical health and help prevent additional cervical problems.

ANTERIOR SEMI-CIRCLES



Introduction: This motion provides a gentle warm up and increases blood flow prior to the following specific movements, in order to prevent aggravation of the cervical ligaments or endanger the blood vessels or nerves. Do not complete a full circle by going in back of the neutral position.

Method: Begin by moving the chin toward one shoulder, then lower the chin as you move downward toward the breast bone (*sternum*) and continue in an upward movement toward the opposite shoulder. Continue moving the chin toward the sternum and up toward the opposite shoulder. This movement is similar to a pendulum on a grandfather's clock. The therapist may initially need to guide the movement.

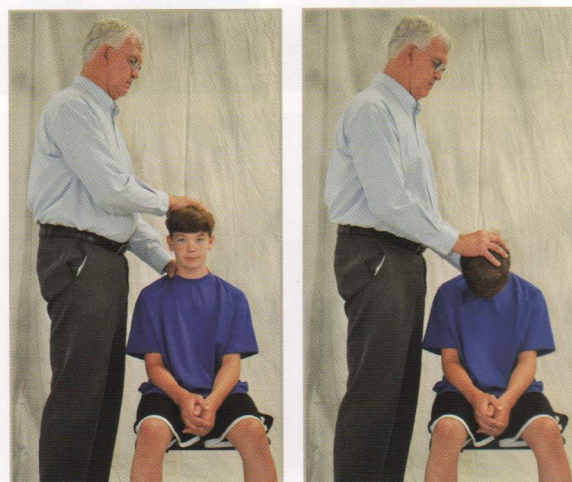
Repetitions: 8-10.

CERVICAL FLEXION

Muscles Stretched: The cervical (*neck*) extensor muscles, including the multifidus, semispinalis, oblique capitus, and erector spinae.

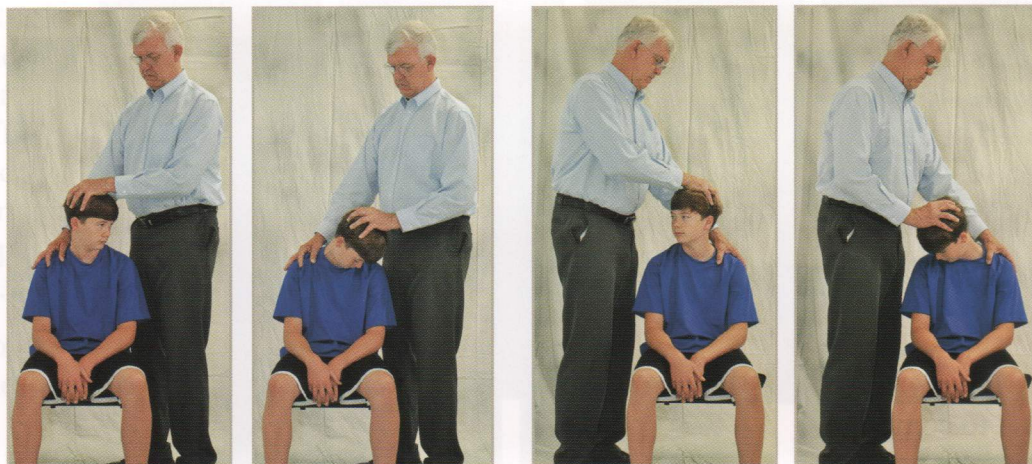
Muscles Contracted: Anterior neck muscles (*flexors*), including the rectus capitus anterior, rectus capitus lateralis, sternocleidomastoid, longus colli, longus capitus and scalene muscles.

Method: Ask the subject to sit up straight and hold the shoulders back. **DO NOT** allow the trunk to bend. Tightening the abdominals helps to prevent trunk compensation. Instruct the subject to tuck the chin as close to the neck as possible, contract the anterior neck muscles (*flexors*), keep the mouth closed and exhale during the movement. The assistant will stand at the side of the subject's shoulder. The assistant will provide



CERVICAL FLEXION *continued*

gentle assistive stretch at the end of the movement by using the front hand to provide a gentle pulling effort at the end-feel for 1 ½-2 seconds. The rear hand is used for stabilizing the shoulders. Inhale, release to the starting position and repeat the effort. The levator scapula is isolated by pointing the nose toward the breast and tucking the chin. The assistant stabilizes the opposite side shoulder and assists the head gently. Do not allow the trunk to bend forward.



Repetitions: 5-10. 2 sets may be necessary

CERVICAL EXTENSION (HYPEREXTENSION)

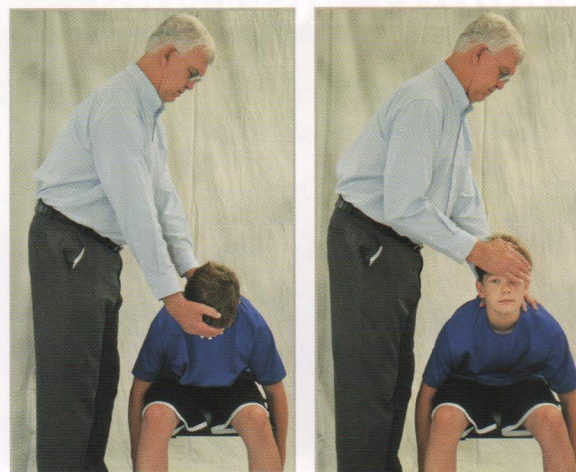
Muscles Stretched: Cervical flexor muscles including the sternocleidomastoid, longus colli, longus capitus, rectus capitus anterior, rectus capitus lateralis, and scalene muscles.

Muscles Contracted: Multifidus, semispinalis, oblique capitus and erector spinae.

Method: The subject assumes a sitting position, bending the trunk forward 45-60 degrees to prevent vertical over extension. Instruct the subject to contract the posterior neck muscles (*extensors*) by gently tilting the head backward. Exhale while extending the head. The assistant will stand at one side of the subject's shoulder. Exercising great caution, the assistant provides direction by placing one hand at the cervical-thoracic juncture and the opposite hand on the subject's forehead to guide and assist the effort. The application of upward traction by the therapist will allow for greater safety and a more successful movement. An assistant can pull with greater accuracy than they can push. Inhale while returning to the starting position.

Caution: Cervical hyperextension from the vertical position may initially be contraindicated for more severe cases of pinched nerve, herniated disc, post whiplash or recent surgery. This exercise will then be performed from the gravity, prone position.

Repetitions: 1-2 sets of 5-8 very gently.



CERVICAL LATERAL FLEXION

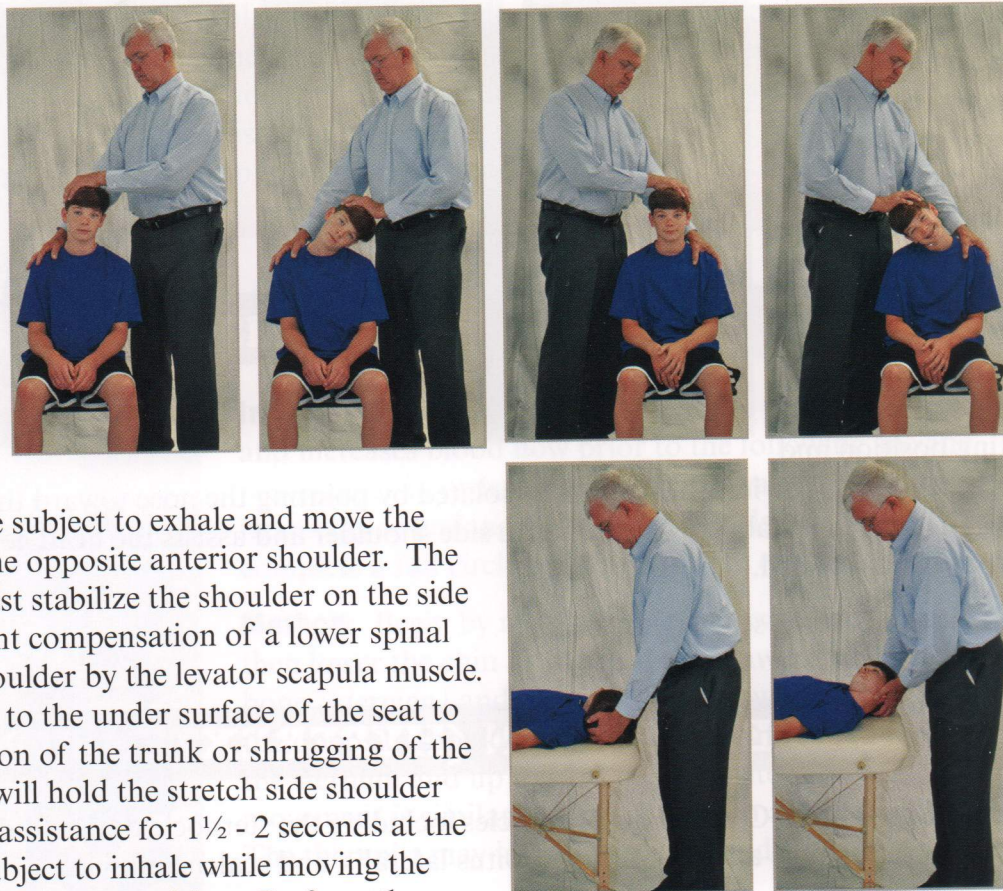
Muscles Stretched: Side lateral flexors-three scalene, sternocleidomastoid, and splenius capitus muscles.

Muscles Contracted:

Opposite side scalene muscles, sternocleidomastoid, and splenius capitus.

Method: This exercise may be performed in the sitting or supine postures. Ask the subject to contract the muscles on the opposite side of those being stretched. Ask the subject to exhale and move the head laterally towards the opposite anterior shoulder. The assistant and subject must stabilize the shoulder on the side being stretched to prevent compensation of a lower spinal area or hiking of the shoulder by the levator scapula muscle. The subject will hold on to the under surface of the seat to help prevent lateral flexion of the trunk or shrugging of the shoulder. The assistant will hold the stretch side shoulder in stability. Give gentle assistance for 1½ - 2 seconds at the end-feel. Instruct the subject to inhale while moving the head upward toward the starting position. Perform the same exercise in the opposite direction. To prevent an out of the plane movement, have the subject fixate the eyes on an object directly in front of the eyes.

Repetitions: 1-2 sets of 5-8 repetitions on both sides, according to the need of the subject.



CERVICAL ROTATION

Muscles Stretched: Neck rotators, including the multifidus, rotatores, semispinalis, and sternocleidomastoid muscles.

Muscles Contracted: Opposite side neck rotators.

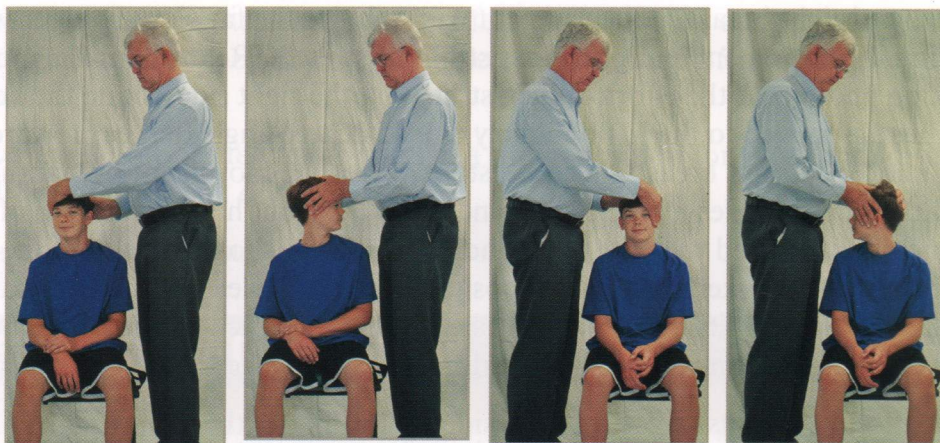
Method: The exercise may be performed in a sitting or supine position. Have the subject exhale while rotating the head in one direction as far as possible. The assistant guides and assists the movement gently with one hand on each side of the head. Have the subject inhale while returning to the neutral position and repeating the movement. Perform the same exercise in the opposite direction.

Compensation Check: Maintain the head in a neutral position and attempt to prevent neck compensation by flexion, lateral flexion, or hyperextension. To prevent rotation of the shoulder girdle

CERVICAL ROTATION *continued*

complex have the subject hold the left shoulder back when rotating right and hold the right shoulder back when rotating left. Holding onto the bottom of the seat with the same side hand will also help prevent compensation.

Repetitions: 1-3 sets of 5 as the condition dictates.



CERVICAL ANTERIOR OBLIQUE

Muscles Stretched:

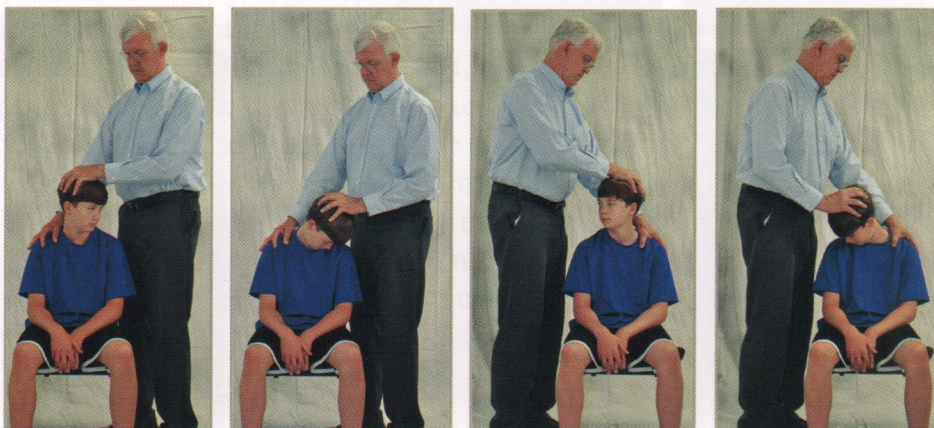
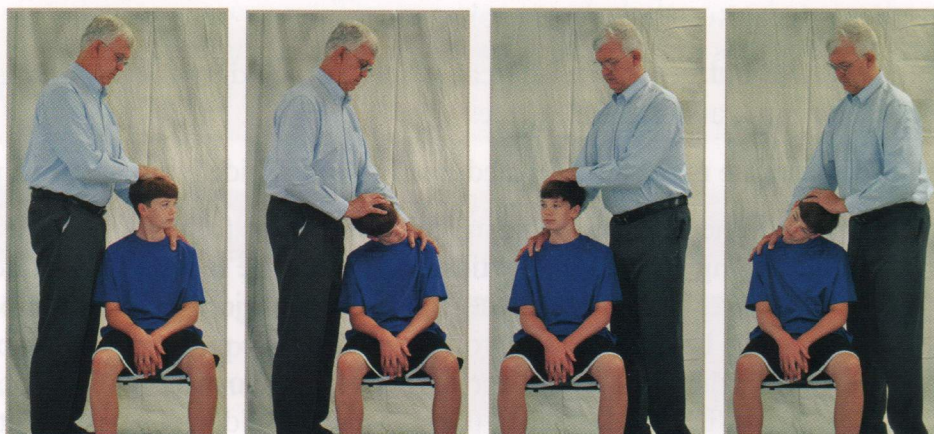
Upper trapezius, which moves the neck and head posterior and lateral. The levator scapula, semispinalis capitus, longissimus capitus, erector spinae, and middle and posterior scalenes are also isolated.

Muscles Contracted:

Rectus capitus anterior, rectus capitus lateralis, sternocleidomastoid, longus colli, longus capitus, and middle and anterior scalene muscles.

Introduction: Tight trapezius and levator scapula muscles are a major source of cervical tension and tension headaches. This exercise may be performed from the sitting or supine positions.

Method: In order to stretch the left side, the subject will rotate the head 45 degrees to the left (*nose centered over the left side breast*). The subject will hold onto the chair or stool with the hand on the side the head is moving from. Exhale and move the head to the right antero-laterally (*obliquely*) at a 45-degree angle (*right*



continued next page

CERVICAL ANTERIOR OBLIQUE *continued*

ear toward right breast). The assistant will stabilize the far side shoulder with the free hand while guiding the movement and gently assisting the stretch. Release, inhale, move back to the neutral position and repeat the effort. When stretching the right side, rotate the head 45 degrees to the right. The head is moved to the left obliquely at a 45 degree angle (left ear toward left breast, nose centered over middle of right breast). The assistant guides the movement by standing at the side of subject's shoulder and provides a gentle assistance with the front hand at the end of the movement. The far side shoulder is stabilized with the free hand. The subject should also hold the far side shoulder downward. Perform the same exercise in the opposite direction. Release to the vertical neutral position and repeat the effort. Now position the nose toward the breast. Tuck the chin and assist the subject in stretching the levator scapula muscle. This is performed both to the left and to the right.

Repetitions: 1-3 sets of 5-8 on both sides according to the subject's need.

CERVICAL POSTERIOR OBLIQUE

Muscles Stretched: One side anterior acalenus, lateral scalenus, sternocleidomastoid, longus colli cervicis, longus capitus, and rectus capitus.

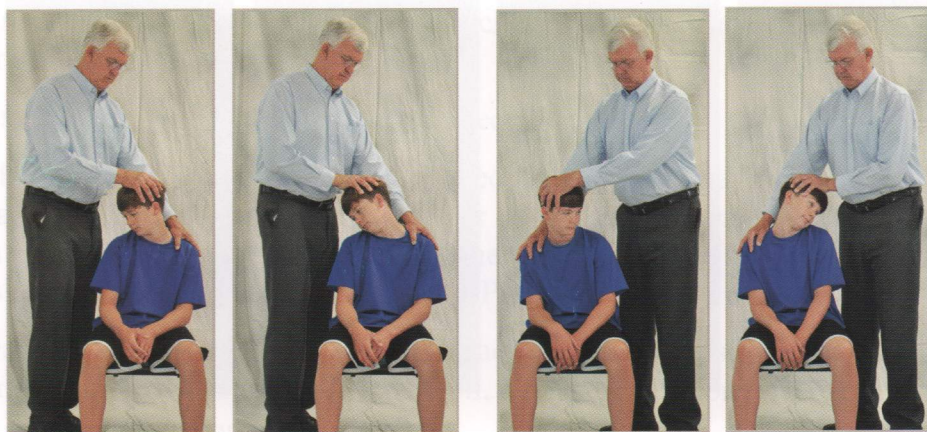
Muscles Contracted: One side cervical extensors including the multifidus, semispinalis, oblique capitus, trapezius I, and erector spinae.

Notes: This exercise may be performed from a seated, side lying or prone position.

Method: Position the subject in a posture 45-60 degrees forward from the vertical position to prevent the head from moving beyond the vertical position. The subject will rotate the head 45 degrees having the nose centered over the center of the breast. The subject will hold onto a chair or stool placing the hand on the side the head is moving from. Exhale while moving postero-obliquely at a 45-degree angle; ear pointed toward the same side outer border of the shoulder blade. At the end of active movement, the assistant is standing at the side of the subject's shoulder. The assistant uses the far side hand to stabilize the shoulder while the near side hand assists the movement. Gently assist the movement for two seconds. Inhale and release to the neutral position and repeat the effort. The left side flexors are isolated by rotating the head to the right 45 degrees (*nose centered over the middle of the right breast*) and moving the head postero-obliquely toward the outside of the right scapula with stretching help provided by the assistant. The same breathing pattern is followed. Stretch the right side flexors with

the nose above the left breast and the left ear moving towards the outer scapula.

Compensation Check: The assistant may stabilize the shoulder on the side of the muscles being stretched. The subject may assist by placing the hand of the side being stretched under the chair seat edge which helps



CERVICAL POSTERIOR OBLIQUE *continued*

hold the shoulder down. The subject may be stretched with less fear and potential danger, providing greater involvement of the antagonist muscles by having the subject lean forward 45 to 60 degrees or performing in a prone position.

Note: This exercise is initially more appropriately performed in a prone position for those with disc involvement, post-surgery, following whiplash, or severe trauma.

Repetitions: 1-3 sets of 5-8 according to the subject's need.

NECK FLEXIBILITY ASSISTED: GRAVITY

Introduction: Assisted neck flexibility exercises are intended to aid people who lack range of motion due to weakness, display postural problems, or have suffered a muscle strain or ligament sprain. There may be a headache history, disc involvement, post-surgery, and need neck flexibility and strengthening exercises. (See Neck Protocol listed in Appendix).

Method: The subject moves the head against gravity and is guided by the therapist in the correct plane and gently assisted where necessary. The assistant counterbalances whatever the patient cannot control without excessive muscle strain. This series of exercises also specifically strengthens the agonist muscles moving the head upward.

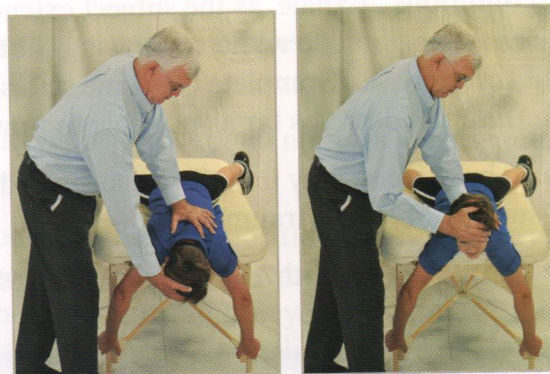
CERVICAL HYPEREXTENSION

Muscles Stretched: Sternocleidomastoid, longus colli, longus capitis, rectus capitis anterior, rectus capitis lateralis and anterior scalene and middle scalene muscles.

Muscles Strengthened: The upper erector spinae, splenius cervicis, splenius capitis, semispinalis cervicis and the semi-spinalis capitis.

Method: Exercise in the prone position with the neck extended beyond the end of the table. The subject grasps the legs of the table to keep the movement localized in the cervical spine. The assistant stands at the side of the subject, placing one hand under the forehead and the other hand on the upper thoracic spine to prevent thoracic movement. The hand on the forehead guides the head in the sagittal plane and applies gentle stretch at the end of active movement. Exhale, exercise through the full range of motion and stretch gently. Inhale, while returning to the starting downward position. Use great care with herniated disc conditions, post-surgery or post-traumatic neck. Outward mild traction of the neck with the hands placed on the forehead and the base of the posterior skull will allow for greater safety and a more successful stretching movement involving disc or post traumatic neck conditions. The cervical hyperextension exercise will help restore the cervical curve.

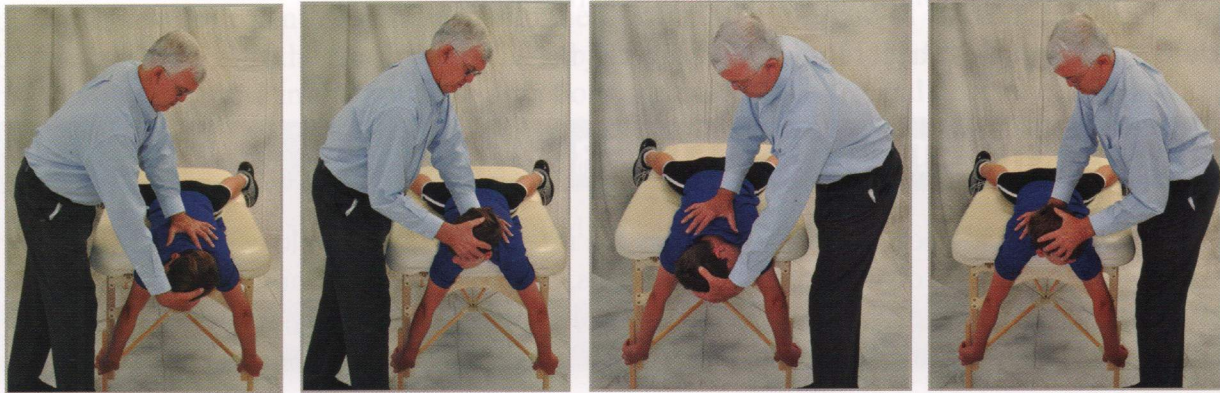
Repetitions: Begin with 1-3 sets 5-8 and gradually increase to 10 repetitions when the subject is ready. 2-3 sets may be indicated.



CERVICAL HYPEREXTENSION: OBLIQUE

Muscles Stretched: One side sternocleidomastoid, anterior scalene, longus colli, longus capitis, rectus capitis anterior, rectus capitis lateralis, and middle scalene.

Muscles Strengthened: One side upper erector spinae, splenius cervicis, splenius capitis, semispinalis cervicis and semispinalis capitis.



Method: The subject performs the exercise with the head extending beyond the edge of a table or bed or in a four-point position on the hands and knees. Inhale and initiate the exercise by lowering the head toward a supportive surface and rotate the head 45-degrees (*nose centered over the breast*). The assistant places the hand on the outside of the head to guide the proper angle and assist at the end of active movement. The opposite hand will firmly stabilize the thoracic spine and is placed at C7-T1. Mild traction of the neck during the movement will allow for greater safety and a more successful stretching movement for the loss of the cervical curve, disc involvement or post traumatic neck conditions. Exhale, as the subject extends the head obliquely toward the same side outer shoulder blade as far as possible without allowing thoracic movement. Return to the starting position and repeat the exercise. Complete the same series on the opposite side of the neck. If positioned on a table, reach the arms down as far as possible to prevent lower spinal compensation.

Note: The exercise may initially be contraindicated for severe bulging/herniated disc conditions, post-surgery or severe trauma.

Repetitions: Begin with 1-3 sets of 5 progressing to 10. More than one set may be beneficial.

CERVICAL LATERAL FLEXION: RIGHT

Muscles Stretched: The right side anterior scalenus, middle scalenus, posterior scalenus, sternocleidomastoid, erector spinae, and prevertebral muscles on the left side.

Muscles Contracted: Anterior scalenus, middle scalenus, posterior scalenus, sternocleidomastoid, erector spinae, and prevertebral muscles.

Method: The subject assumes a left side-lying position with the neck beyond the end of the table and the lower hand grasping a table leg. The assistant stands behind the patient placing one hand on the lower side of the head. The subject begins the exercise with the head near the left (*lower*) shoulder. The assistant places the near side hand on top of the shoulder to prevent shoulder shrugging which tenses the right levator scapula muscle. The subject should also help hold the top shoulder down. The

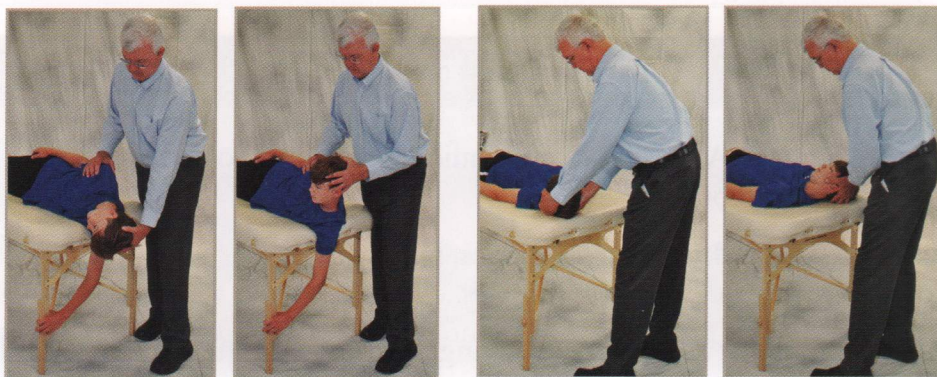
CERVICAL LATERAL FLEXION: RIGHT *continued*

assistant helps guide the head to prevent forward movement, backward movement, or rotation. The subject exhales as he/she moves the head (*ear towards front of shoulder*) as far as possible. A gentle stretching effort is then provided by the assistant. Inhale, while returning to the starting position and repeat the exercise. If necessary the exercise may be performed with the lower arm and shoulder on top of the surface. If extremely weak the exercise is performed in a supine position and the head gently moved to the right.

Compensation Check: 1). To prevent shrugging of the top shoulder by the levator scapula muscle (*compensation*), the assistant places the upper hand on top of the shoulder. 2). Verbally and with mild assistance encourage the subject to prevent movement of the trunk area between the pelvis and the base of the neck.

3). Have the subject focus the eyes on an object eye level to help prevent rotary compensation of the head.

Repetitions: Begin with 1-3 sets of 5 to 8 and gradually increase to 10 as the subject is ready.

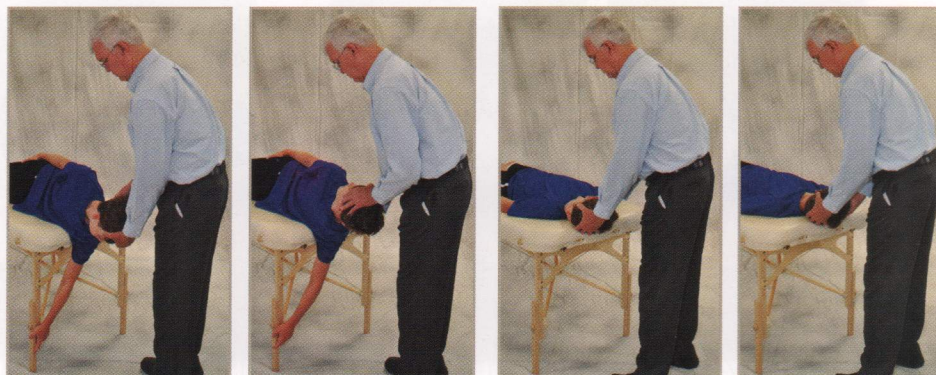


CERVICAL ROTATION: RIGHT

Muscles Stretched: The left sternocleidomastoid, deep posterior spinal muscles, longissimus cervicis, splenius capitus, splenius cervicis and erector spinae muscles.

Muscles Strengthened: The right sternocleidomastoid, deep posterior spinal muscles, longissimus cervicis, splenius capitus, splenius cervicis, and the erector spinae muscles.

Method: Ask the subject to assume a left side-lying position with the neck positioned beyond the end of the table and the lower hand clasping the table leg. If necessary the exercise may be performed with the lower arm and shoulder on top of the surface. The assistant stands beyond the top of the subject's head and places the hands on the forehead and back of the head to help counterbalance the weight of the head and prevent flexion, hyperextension, or lateral flexion. The subject should rotate the head from a downward position slowly upward (*right*) with the therapist assisting the stretch at the end of active movement. Most subjects will rotate the shoulder girdle in the direction the head is rotating. The assistant will help develop the subject's awareness and



continued next page

CERVICAL ROTATION: RIGHT *continued*

have him/her hold the top of the shoulder back to prevent the problem. The subject who is quite sore and extremely weak may initially exercise in a supine posture. The assistant will guide and assist the effort to the right gently.

Compensation Check: To prevent the top shoulder from being shrugged by the levator scapula muscle you should ask the subject to gently grasp the side of their pants. Purposefully, hold the shoulder down and if necessary temporarily place the hand on top of the shrugging shoulder to remind the subject of compensation.

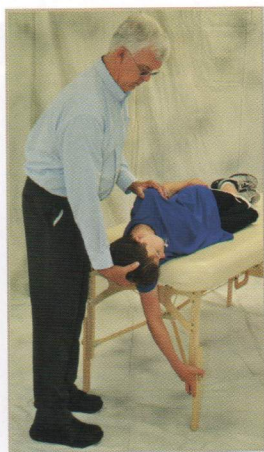
Repetitions: Begin with 1-3 sets of 5-8 repetitions and increase to 10 when the subject is ready.

CERVICAL LATERAL FLEXION: LEFT

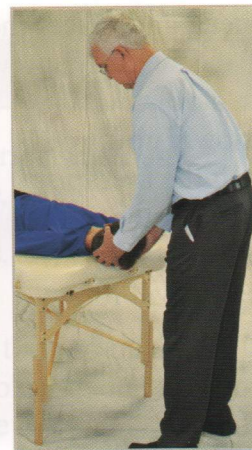
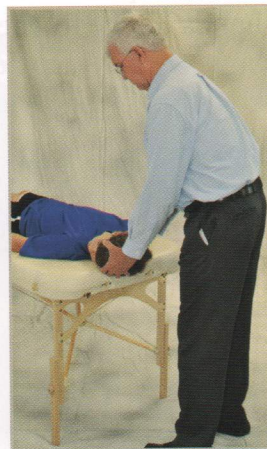
Muscle Stretched: Anterior scalenus, middle scalenus, posterior scalenus, sternocleidomastoid, erector spinae, and prevertebral muscles.

Muscles Contracted: Anterior scalenus, middle scalenus, posterior scalenus, sternocleidomastoid, erector spinae, and prevertebral muscles.

Method: The subject assumes a side-lying position with the neck beyond the end of the table and the lower hand grasping a table leg. The assistant stands behind the subject and places one hand on the lower side of the head. The subject begins the exercise with the head near the right (*lower*) shoulder. The assistant places the near side hand on top of the shoulder to prevent shoulder shrugging which tenses the left levator scapula muscle. The assistant guides the head to prevent forward movement, backward movement, or rotation. The subject focuses on an object that is eye level to prevent the head from rotating out of the frontal plane. The subject exhales when moving (*ear to the front shoulder*) the head as far as possible with guidance and a gentle stretching effort provided by the assistant. Inhale while returning to the starting position and repeat the effort. If necessary, the exercise may be performed with the lower arm and shoulder on top of the surface. When the subject is very weak and sore, the subject may initially assume a supine position. The assistant will guide and gently assist the movement a number of times.



On Side



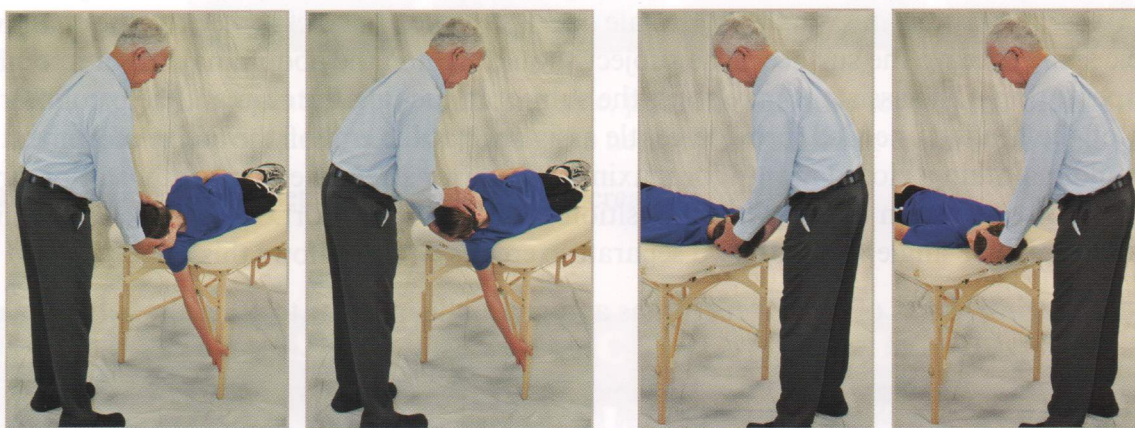
Supine

CERVICAL LATERAL FLEXION: LEFT *continued*

Compensation Check: 1.) Beware of shoulder shrugging compensation, which frequently happens. Place the upper hand on top of the shoulder to prevent compensation.
2.) Verbally and with mild assistance, encourage the subject to prevent movement of the trunk area between the pelvis and the base of the neck.
3.) The subject shall focus the eyes on an object that is eye level throughout the entire movement.

Repetitions: Begin with 1-3 sets of 5 to 8 and gradually increase to 10 when the subject is ready.

CERVICAL ROTATION: LEFT



Muscles Stretched: Right sternocleidomastoid, deep posterior spinal muscles, longissimus cervicis, splenius capitis, splenius cervicis, and erector spinae muscle.

Muscle Contracted: Right sternocleidomastoid, deep posterior spinae muscles, longissimus cervicis, splenius capitis, splenius cervicis and erector spinae muscles.

Method: Exercising from a side-lying position, the subject should extend the neck beyond the end of the table and grasp a table leg with the lower hand. If necessary, the exercise may be performed with the lower arm on top of the table. The assistant stands beyond the top of the subject's head and places the hands on the forehead and back of the head to help counterbalance the weight of the head and prevent flexion, hyperextension, or lateral flexion. The subject rotates the head from the downward position slowly upward (*left*) with the assistant guiding and assisting the stretch at the end of active movement. Develop subject awareness that they may be rotating the shoulder girdle and the top shoulder is moving backward or upward which is maximum compensation. Instruct the subject to consciously hold the top shoulder downward and forward while rotating the head upward. If unable to perform from a side-lying position, initially place the subject in a supine position and assist while rotating left.

Compensation Check: Make the patient aware of shoulder shrug compensation. You may temporarily place the upper hand on top of the shrugging shoulder to remind the subject of compensation, or have the patient gently grasp the side of the pants to help prevent shrugging by the levator scapula muscle.

Repetitions: Begin with 1-3 sets of 5 to 8 repetitions and gradually increase to 10 when the subject is ready.

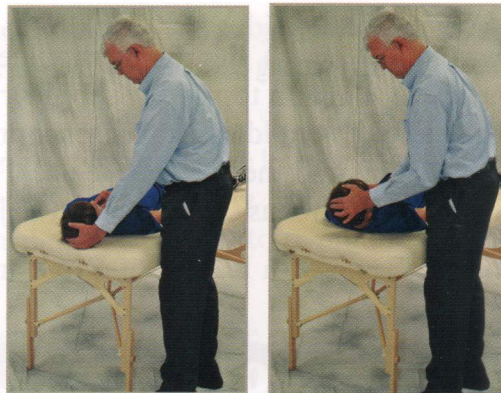
CERVICAL FLEXION: SUPINE

Muscles Stretched: Upper erector spinae, splenius cervicis, splenius capitis, semispinalis cervicis and semispinalis capitis.

Muscles Contracted: Sternocleidomastoid, anterior scalene, and prevertebral muscles.

Method: Ask the subject to assume a supine position with the head on the table. The shoulders and upper back should remain on the table throughout this exercise. The assistant stands at the side of the subject with one hand behind the upper-posterior head and the other hand around the lower border of the jaw. Beginning in the neutral position, ask the subject to tuck the chin as close as possible near the neck, exhale and lift the head in a close tuck without allowing the thoracic spine to leave the surface. The subject should tighten the abdominal muscles to prevent trunk compensation. The assistant may assist the subject in tucking the chin and help counterbalance the weight of the head. If needed, provide gentle assistance at the end of the active movement. The subject should maintain a closed mouth for maximum anterior strengthening and posterior stretching results. Inhale, slowly return to the starting position and repeat the effort. This exercise is also executed at a 45 degree angle and with two separate exercises which follows this.

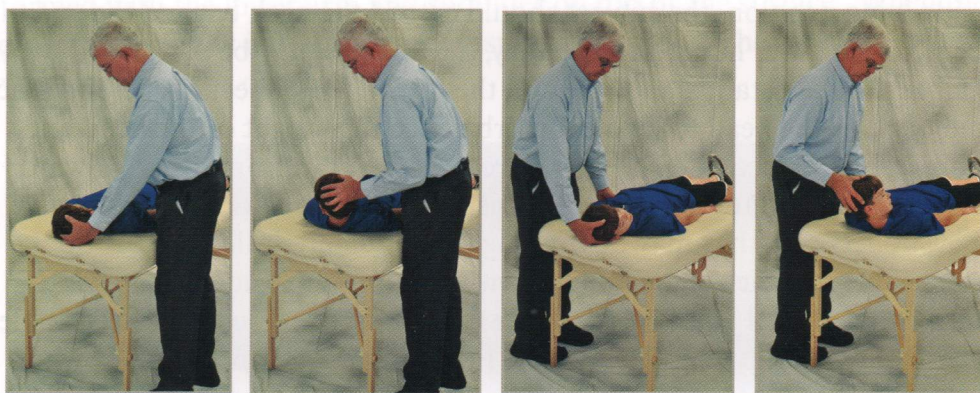
Repetitions: Begin 1-3 sets of 5 to 8 repetitions and gradually increase to 10 as the subject is ready.



CERVICAL FLEXION: OBLIQUE

Muscles Stretched: One side upper erector spinae, splenius cervicis, splenius capitis, semi spinalis cervicis and semispinalis capitis.

Muscles Contracted: One side sternocleidomastoid, anterior scalenes and prevertebral muscles.



1.

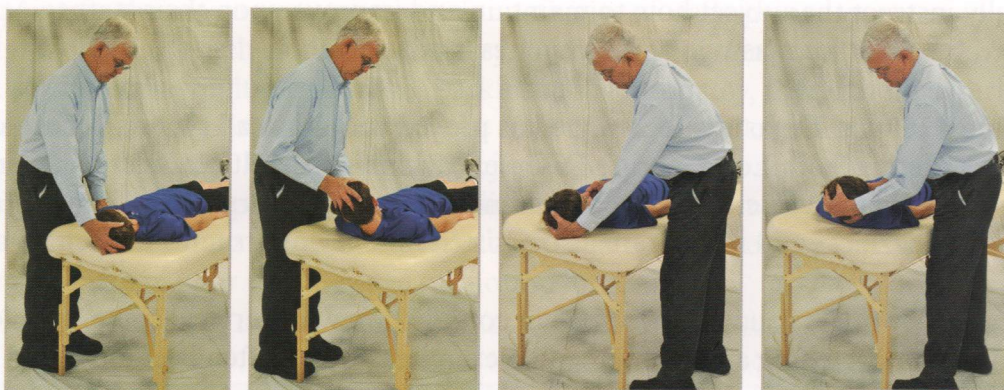
Method 1: The subject assumes a supine position on the table. The subject rotates the head 45 degrees positioning the nose over the opposite breast. The shoulders remain on the table throughout the movement. The

subject moves the front ear at an oblique angle towards the opposite breast. (*Example: move the right ear toward the center of the right breast, move the left ear toward the left breast*). The assistant stands at the side of the movement placing the hands on both sides of the head. The subject will mildly tuck the chin and move the ear toward the opposite side breast. The assistant will guide the effort and assist with gentle stretch at the end-feel for 1 ½-2 seconds. The subject will inhale while lowering the

CERVICAL FLEXION: OBLIQUE *continued*

head and exhale as the head lifts forward off the table. The subject will tighten the abdominals to help prevent thoracic spinal movement.

Method 2: Cervical flexion oblique is also executed at a 45 degree angle by pointing the nose toward the center of one breast. Tuck the chin and move toward the center of the breast. Tuck the chin on the return to



2.

the table. This exercise is repeated to the opposite side, pointing the nose toward the breast, tucking the chin and flexing the neck forward and also flexing the neck when returning toward the table surface.

Repetitions: Begin with 1-3 sets of 5-8, gradually increasing to 10.

“AARON MATTES’ DIGASTRIC TECHNIQUE”

The Digastric Muscle arises from two sites: the posterior belly from the mastoid notch of the temporal bone and the anterior belly from the digastric fossa on the internal surface of the anterior aspect of the mandible. The two parts of the muscle link via a tendon. The tendon is attached to the hyoid bone by a fibrous connection. The action of the digastric muscle is to depress the mandible, elevate the hyoid bone and assist in retraction of the mandible. When hypertonic the digastric places a load onto the contralateral temporalis and masseter muscles which attempt to balance the deviation that a tight digastric can produce.

Trigger points in the posterior belly of the digastric can refer to the upper portion of the sternocleidomastoid muscle as well as neck and head pain. These points of irritation also relate to rounded shoulders, thoracic kyphosis, forward head and loss of the normal cervical spinal curve.

Following many years of cadaver study and patient experimentation, I noted that gradual freeing of the digastric and stylohyoid muscles helped resolve temporomandibular jaw pain (*TMJ*), headaches, including migraine and cluster headaches, and neurological problems. Problems such as chewing, talking and swallowing responded favorably to external soft tissue myofascial work under the jaw.

The anterior digastric is relieved by using the thumb and following under the mandible toward the lower posterior jaw. This is helpful to swallowing and talking symptoms. Work gently and carefully when pressuring the digastric fibers. Use mild friction massage and linear planar massage following each digastric stroke.

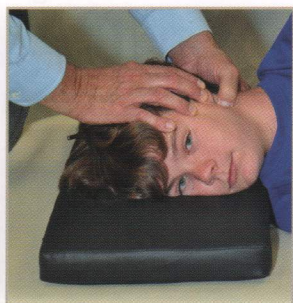
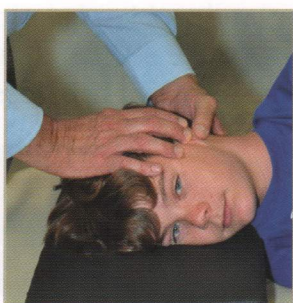
continued next page

"AARON MATTES' DIGASTRIC TECHNIQUE" *continued*

Normally, 5-8 repetitions on each side of the mandible is suggested. A second series of 2-5 repetitions each session can be very helpful. A number of ongoing treatments may be necessary if quite severe. Carefully instruct the subject how to maintain and improve upon their status. Applying an analgesic followed by direct ice massage of 3-5 minutes is advisable.

The Aaron Mattes' Digastric Technique has proved helpful to all types of neurologically affected subjects suffering from Lou Gehrig's Disease, Parkinson's, Multiple Sclerosis, Cerebral Palsy and Cerebral Vascular Accident (*C.V.A.*) to name a few. Problems such as tinnitus (*ringing in the ears*), headaches, dizziness and nausea are also assisted in relieving irritation, often on a permanent basis.

The digastric work is usually performed in conjunction with cervical spine, shoulder complex and thoracic spine stretching and strengthening exercises. It has often been observed that numerous neurological problems, upper body orthopedic problems and many conditions of stress are aided by external stylohyoid and digastric muscle release.



The work commences by having the subject lay on the side and supporting the head on 4-5 inches of head support. Roll back the ear lobe using the thumb and index finger to secure the ear posture and expose the jaw origin. Positioned next to the external auditory meatus (*ear hole*), employ the opposite side thumb as the tool to free the entrapped muscles. The thumb is bent at a 45 degree angle. Begin working very gently under the

jaw to first free the posterior belly of the upper digastric muscle and the stylohyoid muscle. Gently, repeat the upper phase a number of repetitions until this tissue is free. Following the upper jaw treatment, work carefully under the lower jaw freeing the anterior digastric, tongue and throat to enable chewing, swallowing and talking freedom.

ELBOW, RADIOULNAR, WRIST, FINGER AND THUMB FLEXIBILITY: ASSISTED

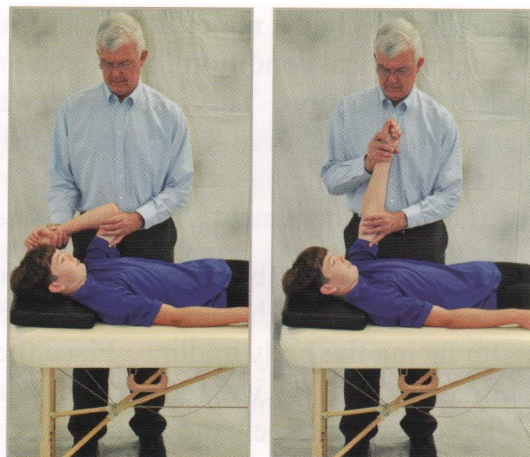
Some of the vital joints for almost everything we do are located in the lower arm. Stretching helps to restore or maintain the movements necessary for activities of daily living, sports or repetitive work skills. Conditions such as carpal tunnel syndrome, dupuytren's contracture, fibromyalgia, lupus, scleroderma, multiple sclerosis, Parkinson's, neuropathy, rheumatoid arthritis and osteoarthritis are examples of problems that may be relieved with these exercises. This is also intended to assist following stroke (*CVA*), spinal cord injuries, head trauma and other long term or self-limiting problems. Following periods of immobilization because of injury, fracture or surgery, active and assistive stretching exercises are helpful to regain movement, circulation and sensation, reduce or eliminate pain or regain range of motion limitations.

ELBOW FLEXOR STRETCH

Muscles Stretched: Elbow flexors including the biceps brachii, brachialis and brachioradialis.

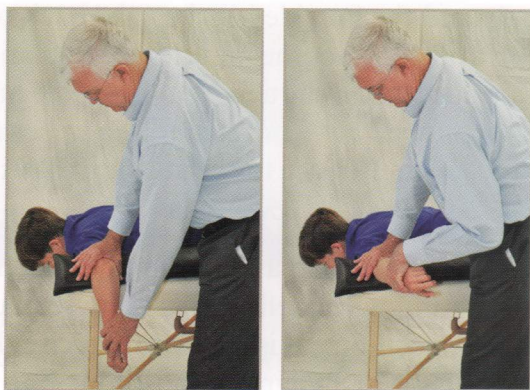
Muscles Contracted: Triceps brachii and anconeus.

Method I: Position the subject in a supine position with the elbow pointing vertical and the palm of the hand facing the body. The assistant will stabilize the upper arm using one hand and resting the elbow region against the trunk surface of the assistant. Indicate how to involve the extensor muscle contraction by tapping the triceps and then aiding the active movement with the assistant's free hand placed along the lower forearm. Inhale, release to the starting position and exhale while repeating the effort. This is helpful following injury, post fracture or post-surgery.



1.

Method II: Position the subject in a prone position. Place a pad or rolled up towel under the bend of the elbow to cushion and help stabilize the elbow. The subject's hand will face backward with the thumb pointed towards the body. The assistant will position one hand just above the elbow to help stabilize the joint. The outer hand will clasp the lower arm. Tap the triceps a couple of times to help stimulate the elbow extensors to contract, prior to the subject's attempt to extend the elbow. Do a mild assistive stretch for 1½-2 seconds at the end of active movement. Release to the starting position and repeat the movement. This is an excellent stretch for helping re-establish greater elbow extension.



2.

Repetitions: 2-3 sets of 5-8 according to the condition.

TRICEPS STRETCH

Muscles Stretched: Triceps brachii, a two joint muscle of the shoulder and elbow joints. Anconeus muscle.

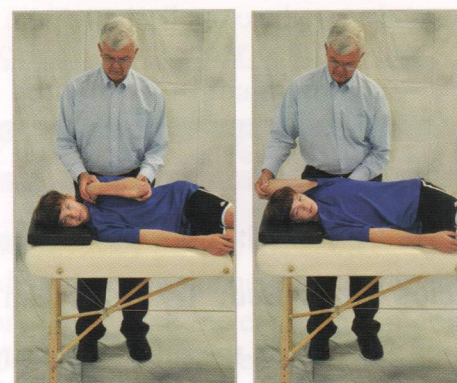
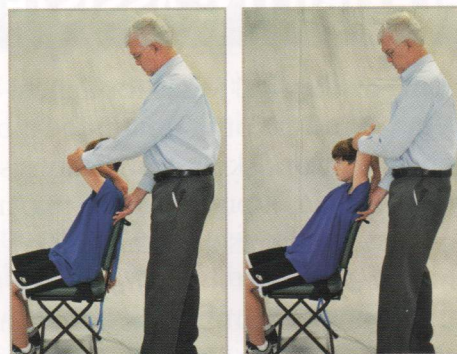
Muscles Contracted: Biceps brachii, and anterior deltoid muscles.

Method Part I: The subject is positioned in a standing or seated posture. The elbow is flexed in a horizontal position and the palm facing the body midline. If the opposite hand is workable, place the rope in the top hand and have the subject clasp the rope in the free hand at the lower portion of the back. The assistant will place one hand upon the same side shoulder blade (scapula) and the free hand on the distal posterior elbow. Have the subject lift the lower arm as high and close to the head as possible using the rope and the assistant to provide gentle stretch at the end of the movement. Release to the starting position and repeat the effort. 1-3 sets of 5-8 repetitions.

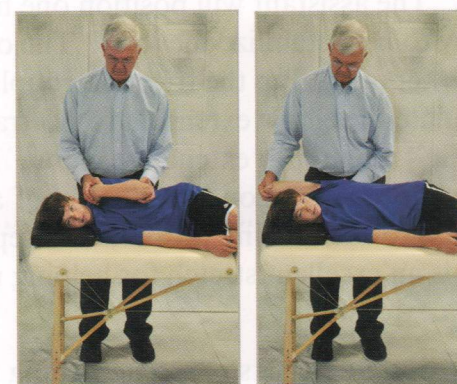
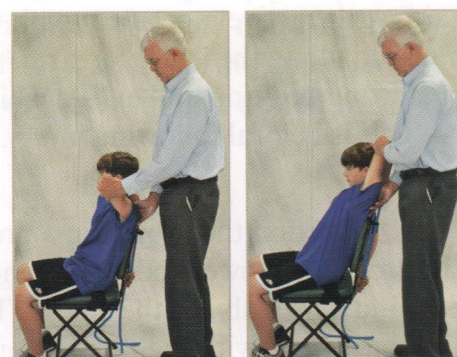
If the subject has had a major injury, surgery or is suffering from a neurological condition this exercise may be performed in a side lying position. This enables the weaker muscles to be more involved in the agravity position. Tap the triceps to help provide the brain with stimulus for greater involvement of the triceps and anconeus muscles. The assistant will stabilize the elbow and provide assistance at the end of the active movement. Perform 2-4 sets of 5 repetitions.

Method Part II: The subject is positioned in a standing or seated posture placing the elbow in a horizontal position and the palm facing the body midline. Place the loop of the rope in the hand or around the wrist if necessary and have the subject clasp the rope in the free hand at the lower portion of the back. The assistant will place the near side hand on the same side scapula and the far side hand on the back of the elbow. The subject will contract the anterior deltoid and biceps moving the arm upward and obliquely at a 45 degree angle in back of the head to provide better stretch to the upper and outer triceps brachii fibers. Release to the starting position and repeat the effort. 2-4 sets of 5 repetitions.

If the subject has had a major injury, surgery, or is suffering from a neurological deficit, this exercise may be performed in a side-lying position. It is easier to exercise the more profoundly affected tissue in an agravity position. Tap the triceps to help provide the brain with stimulus for greater involvement of the triceps brachii and anconeus muscles. The assistant will stabilize the elbow and provide assistance at the end of active movement. Hold the shoulder blade with one hand and assist at the elbow with the free hand. Perform 2-4 sets of 5 repetitions.



1.



2.

RADIAL-ULNAR PRONATION

Muscles Stretched: Biceps brachii and supinator (*muscles that turn the forearm outward*).

Muscles Contracted: Pronator quadratus and pronator teres.

Note: Radial-ulnar pronation is intended for conditions such as post fracture, post-surgery, head trauma, spinal cord injury, cerebral vascular accident-CVA (*stroke*) and neurological problems such as Parkinson's, Multiple Sclerosis and Cerebral Palsy.

Method: The subject is seated positioning the elbow at a 90 degree angle and positioned against the side of the body to prevent medial shoulder rotation. The assistant assumes a hand shake position holding the subject's hand. The assistant offers mild resistance as the subject pronates the forearm inward. At the end of active-assisted pronation the assistant clasps the subject's forearm with the free hand and helps stretch the tight supinator muscles. (*muscle's that turn the forearm outward*). Return to the starting position and repeat the active-assisted palm down movement for 1½-2 seconds.

Repetitions: 2-4 sets of 5 repetitions according to the condition.



RADIAL-ULNAR SUPINATION

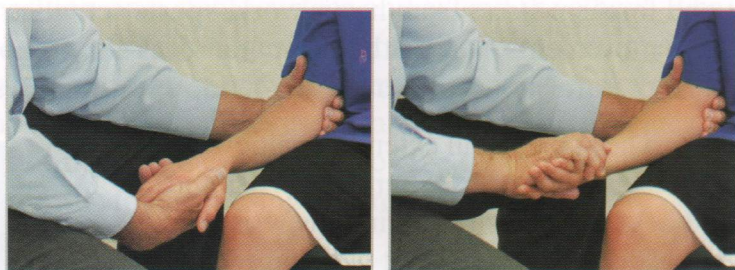
Muscles Stretched: Pronator teres and pronator quadratus.

Muscles Contracted: Supinator, biceps brachii and brachioradialis.

Note: This exercise is intended for conditions such as post fracture, post-surgery, head trauma, spinal cord injury, cerebral vascular accident-CVA (*stroke*), and neurological problems such as Parkinson's, Multiple Sclerosis and Cerebral Palsy.

Method: The subject will bend the elbow at a 90 degree angle positioning the elbow against the side to prevent shoulder lateral rotation. The assistant assumes a hand shake position holding the subject's hand. The assistant offers mild resistance as the subject turns the palm outward supinating the forearm. At the end of active-assisted supination the assistant clasps the subject's forearm with the free hand and helps stretch the tight pronator muscles and radio-ulnar joint. Inhale, return to the starting position and repeat the effort for 1½-2 seconds.

Repetitions: 2-4 sets of 5 according to the condition.



WRIST EXTENSION: PRONE

Muscles Stretched: Wrist and finger flexors with greater emphasis at the distal attachments, including the flexor carpi radialis, flexor carpi ulnaris, flexor digitorum longus and flexor digitorum brevis.

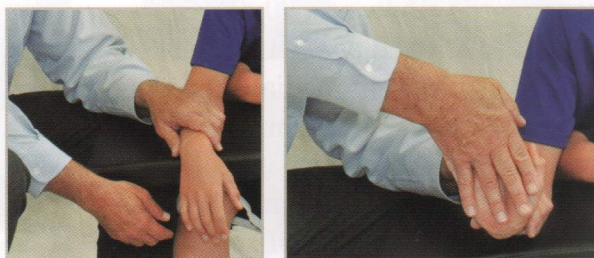
Muscles Contracted: Wrist and finger extensors including the extensor carpi radialis longus, extensor carpi radialis brevis, and extensor carpi ulnaris.

Note: This exercise stretches the wrist and finger flexors, while assisting to reduce hand, wrist, forearm and elbow stress and pain. This is intended for post fracture, injury, spinal cord and various neurological conditions.

Method: The subject extends the elbow and places the hand in a prone position (*palm down*).

DO NOT allow the fingers to bend forward or the stretch will be minimal. The assistant places one hand over the palmar surface of the hand and the entire length of the fingers. The wrist and fingers extend backward contracting the wrist-finger extensor muscles. If the arm is paralyzed perform gentle passive stretch through the end feel for 1½-2 seconds and release. Stretch and allow the hand to return to the starting position and repeat the movement.

Repetitions: 2-4 sets of 5 repetitions according to condition.



WRIST EXTENSION: SUPINE

Muscles Stretched: Wrist and finger flexors with greater emphasis at the proximal end attachments, including the flexor carpi radialis, flexor carpi ulnaris, flexor digitorum longus and flexor digitorum brevis.

Muscles Contracted: Wrist and finger extensors including the extensor carpi radialis longus, extensor carpi radialis brevis, extensor carpi ulnaris, extensor digitorum longus and extensor digitorum brevis.

Note: This exercise helps provide greater stretch of the wrist and finger flexors and helps reduce hand, wrist and forearm stress from heavy work, sports activities, arthritis, neurological conditions or specific repetitive movements such as the computer. It is also important for those suffering from extreme weakness or paralysis to prevent tissue-tendon contractures.

Method: The subject will extend the elbow having the palm facing upward. Extend the wrist and fingers backwards by contracting the wrist and finger extensors. The assistant will place a hand over the palmar surface of the subject's hand and entire length of the fingers.

DO NOT allow the fingers of the subject's hand to bend toward the palm or the stretch will be minimal. At the end-feel stretch 1½-2 seconds, release and repeat the movement. Use the same technique passively if the subject has paralysis.

Repetitions: 1-3 sets of 5 repetitions as condition dictates.



WRIST FLEXION

Muscles Stretched: Wrist and forearm extensor muscles including the extensor carpi radialis longus, extensor carpi radialis brevis and extensor carpi ulnaris.

Muscles Contracted: Wrist flexor muscles including the flexor carpi radialis and flexor carpi ulnaris.
Note: Included in rehabilitation following wrist fracture, surgery or injury to regain range of motion. Helps reduce hand, wrist, forearm or elbow stress.



Method: Place the subject's arm on a stable surface and extend the elbow. The subject slowly bends the wrist downward by contracting the wrist flexor muscles. The assistant will use mild traction and gently assist the stretch at the end-feel for 1½-2 seconds. Release the wrist to the starting position and repeat the movement. This exercise may also be performed in a supine (*palm upward*) position using mild traction throughout the effort. Patients that have limited feeling due to neurological conditions or paralysis, the wrist may be exercised in a thumb up (*agray*) position, apply gentle traction and mild assistance. Gently tap the wrist flexor muscles to help stimulate greater nerve involvement and wrist flexor contribution and then provide assisted stretch including passively if necessary.

Repetitions: 2-4 sets of 5 sets.

WRIST RADIAL FLEXION (ABDUCTION)

Muscles Stretched: Extensor carpi ulnaris and flexor carpi ulnaris.

Muscles Contracted: Flexor carpi radialis and extensor carpi radialis longus.

Method: Place the subject's arm in a prone position on a stable surface and extend the elbow. The assistant will clasp the hand positioning the assistant's four fingers under the palm of the hand and the thumb across the dorsal surface of the fingers. The assistant may also employ a hand-shake position having the thumb vertical. If unable to pronate the forearm because of an injury or neurological deficit, place the exercising wrist in a palm up position and clasp in one of the same positions as previously described. The assistant will stabilize the forearm using the free hand. The subject attempts



continued next page

WRIST RADIAL FLEXION (ABDUCTION) *continued*

to move the wrist toward the radial (*thumb*) side. The assistant applies mild traction throughout the movement and applies gentle assistive stretch at the end-feel for 1½-2 seconds. If active muscle contraction is currently not possible, apply passive movement and stretch. Release to the starting position and repeat the effort.

Repetitions: 1-4 sets of 5 depending on the status of the joint.

WRIST ULNAR FLEXION (ADDUCTION)

Muscles Stretched: Flexor carpi radialis and extensor carpi radialis longus.

Muscle Contracted: Extensor carpi ulnaris and flexor carpi ulnaris.

Method: Place the subject's arm on a stable surface having the free hand clasp the forearm just above the wrist joint. The assistant may position the hand in a palm down or palm up position placing the fingers on one side of the hand and the thumb on the opposite side. The subject attempts to move the hand toward the little finger side of the wrist, contracting the ulnar muscles. The assistant applies a steady, gentle traction throughout the movement, assisting wherever needed and gently stretching at the end-feel for 1½-2 seconds. Return to the starting position and repeat the entire effort.

Repetitions: 1-4 sets of 5 repetitions depending on the status of the joint.



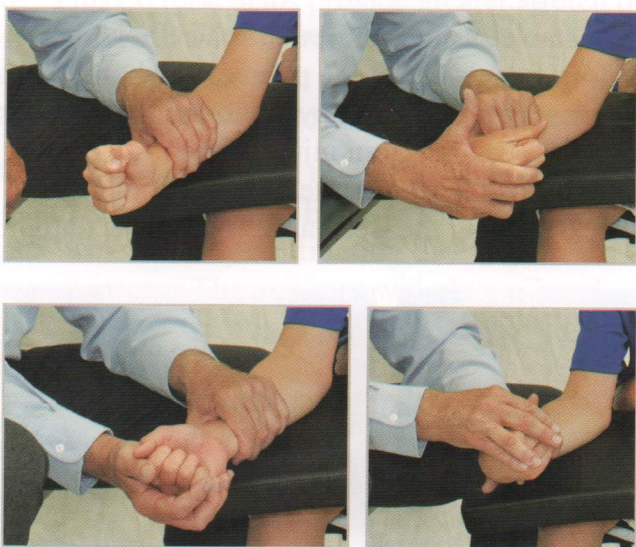
WRIST-FINGER EXTENSOR STRETCH

Muscles Stretched: The extensor carpi radialis longus, extensor carpi radialis brevis, extensor carpi ulnaris, extensor digitorum longus, extensor digitorum brevis, extensor indicis and extensor digiti minimi.

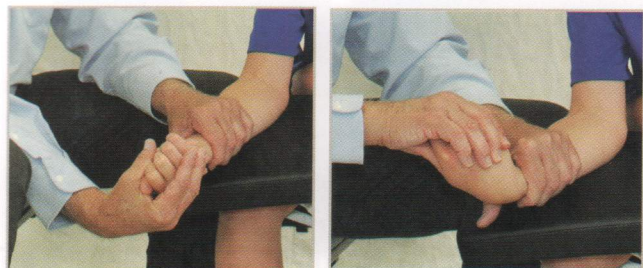
Muscles Contracted: Flexor carpi radialis, flexor carpi ulnaris, flexor digitorum superficialis, flexor digitorum profundus, and flexor digiti minimi brevis.

Note: Outstanding stretch for athletes, therapists, musicians, and computer operators. Excellent for carpal tunnel syndrome and repetitive stress jobs.

Method: Instruct the subject to extend the elbow and make a firm fist. The assistant will stabilize the forearm by holding the forearm above the wrist and clasp the remaining hand around the subject's fingers to prevent the hand opening up during the effort. Instruct the subject to flex the wrist-hand muscles downward to stretch



WRIST-FINGER EXTENSOR STRETCH *continued*



the extensor muscles and fascia. Supinating the subject's hand 45 degrees and then flexing the wrist at the 45 degree angle will thoroughly stretch the ulnar side lower wrist, ring finger and little finger extensor muscles. Stretching the index and middle finger extensors and the radial side lower wrist muscles, pronate the wrist hand 45 degrees and flex the wrist-hand at a 45 degree angle with gentle end-feel assistance for 1½-2 seconds. Return to the starting position and repeat 1-3 sets of 5 repetitions.

FINGER EXTENSOR STRETCH

Muscles Stretched: The extensor digitorum longus, extensor digitorum brevis, extensor indicis and extensor digiti minimi.

Muscles Contracted: Flexor digitorum superficialis, flexor digitorum profundus, flexor digiti minimi brevis, flexor digitorum longus and flexor digitorum brevis.

Method 1: Working the hand in a supine, prone or side lying position the assistant shall stabilize the distal end of the finger with the thumb and index finger of one hand. The subject shall attempt to flex the distal phalanx and the assistant provide gentle stretch with the remaining thumb and index finger providing assistance. Release and repeat movement 1-2 sets of 5-10 repetitions.



1.

Method 2: Resume the exercise emphasizing the middle phalanx. The assistant will stabilize below the middle interphalangeal joint with one thumb and index finger. The subject shall flex the finger muscles and the assistant providing gentle stretch, using the remaining thumb and index finger through full motion gently beyond the joint end-feel. Release and repeat the movement 1-3 sets of 5 repetitions.



2.

Method 3: The assistant will stabilize the proximal joint (*knuckle*) using one thumb and index finger and holding below the joint. The subject will bend the wrist as near to 90 degrees as possible. The finger is straight and the subject will flex the extended finger as far as possible.



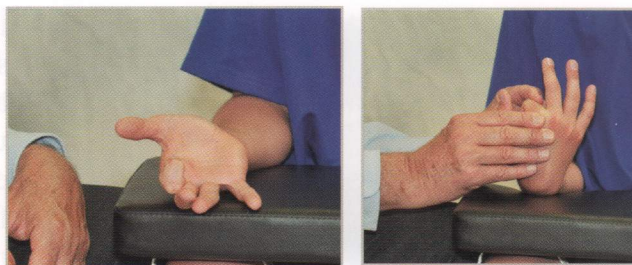
3.

At the end-feel the assistant will provide mild assistance, using the non-involved hand to help provide stretch. Repeat the movement 1-3 sets of 5 repetitions as necessary.

continued next page

FINGER EXTENSOR STRETCH *continued*

Method 4: Bend the entire finger into a tightly flexed position. The assistant will help maintain this position throughout the entire range. Assist the range development by gently helping bend the wrist at the end-feel for 1½-2 seconds. Release the wrist and repeat the movement 1-3 sets of 5 repetitions.



4.

Greater emphasis may be required on individual joints that are affected by surgery, fracture, arthritis, etc. Paralyzed joints are carefully worked passively avoiding overstretching of the tendons or ligaments.

Note: The finger extensor stretches and the following finger flexor stretches are very helpful for post-surgery, post-fracture, Parkinson's, scleroderma, fibromyalgia, carpal tunnel, stroke and various hand conditions including Dupuytren's Contractures, Scalenus Anticus Syndrome, Thoracic Outlet Syndrome, Multiple Sclerosis and congenital deformities.

FINGER FLEXOR STRETCH

Muscles Stretched: The finger flexors including the lumbricales, flexor digitorum longus, flexor digitorum brevis, flexor digitorum superficialis, flexor digitorum profundus and flexor digiti minimi.

Muscles Contracted: The extensor muscles of the fingers including the extensor digiti minimi, extensor digitorum longus, extensor digitorum brevis and extensor indicis.

Method 1: The subject will be positioned with the palm facing downward or in a side-lying position. The assistant will clasp the finger with the thumb and index finger below the joint. The subject attempts to extend the distal joint with gentle help from the assistant's other thumb and index finger.



1.

Method 2: The assistant will repeat the stability by having the thumb and index finger below the interphalangeal joint (*middle joint*). The subject will extend the finger and the assistant will help assist at the end-feel using the remaining thumb and index finger.



2.

Method 3: "Finger Flexor Prone"

The palm is positioned in a downward or side lying position. The finger is fully extended. The assistant stabilizes below the proximal phalange (*knuckles*) using a thumb and index finger or the entire palm of the hand. The assistant uses the entire hand across the full length of the finger. The subject extends the finger and the assistant



3.

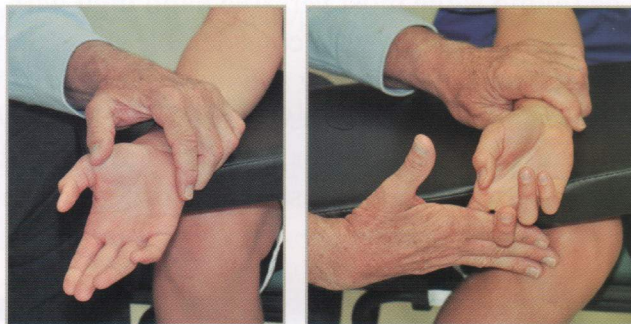
FINGER FLEXOR STRETCH *continued*

applies stretching at the end-for 1½-2 seconds. Release the finger to the starting position and repeat the movement. Excellent stretch for the flexor carpal tunnels.

Method 4: "Finger Flexor Supine"

Place the hand in a supine (*palm up*) position on a stable surface having the wrist completely extended. The remaining tunnel tissue in the flexor tunnels may be released in this position. The

assistant places the entire palm across the length of one finger. The free hand will stabilize the forearm just above the wrist. The subject extends the finger backward contracting the extensor muscles. At the end-feel the assistant provides gentle help for 1½-2 seconds. Release the finger to the starting position and repeat the movement 1-3 sets of 5 according to the limitation.



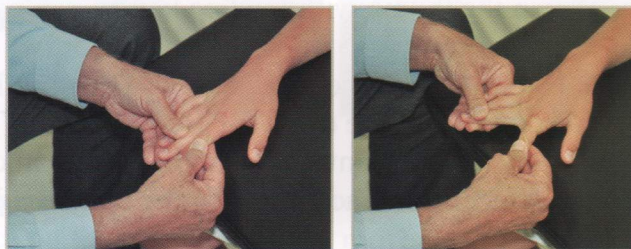
4.

FINGER ADDUCTION (Web) STRETCH

Muscles Stretched: The webs, fascia and the interossei palmaris muscles located between each finger.

Muscles Contracted: Interossei dorsalis and abductor digiti minimi.

Method: Place the hand in a prone, supine, or side lying position. The assistant will clasp two fingers and assist the subject who is actively spreading both fingers and receiving gentle stretch at the end-feel for 1½-2 seconds. Twenty degrees is the normal active range of finger abduction. Release and gently repeat the movement 1-3 sets of 5 according to the tissue conditions.



FINGER ABDUCTOR STRETCH

Muscles Stretched: Interossei dorsalis and abductor digiti minimi.

Muscles Contracted: Interossei palmaris-located between each finger.

Method: Place the hand in a prone (*palm down*), supine (*palm up*), or side lying position. The assistant will clasp one finger to stabilize that finger. Instruct the subject to move the finger toward the center line of the hand and eventually across that finger. Twenty degrees is the normal active range of finger adduction. At the end of active movement the assistant will help stretch the abductor muscles and fascia. Lower the neighboring fingers allows for great range of adduction. 1-3 sets of 5 repetitions or as the specific condition requires.



THUMB STRETCHING

The thumb is the most versatile hand digit with greater range of movement and is used countless times per day, often with considerable stress. The thenar muscles at the flexor base of the thumb are used in most grasping activities. The radial wrist and thumb join to add greater versatility to the hand. Repetitive use in work or play may result in pain or inflammation. The specific stretches of the thumb for performance or rehabilitation are described below. For the finest results perform the exercises in the order that follows

THUMB ADDUCTOR (Web) STRETCH

Muscles Stretched: The adductor pollicis longus and adductor pollicis brevis move the thumb inward toward the index finger forming an inward pinching motion. The web between the thumb and index finger is a strong, supportive group of tissues, but often becomes shortened because of the thumb's major actions.

Muscles Contracted: The thumb abductor muscles include the abductor pollicis longus and abductor pollicis brevis.

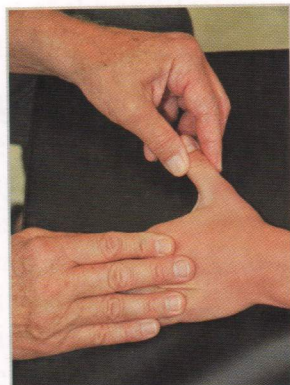
Method: The assistant will stabilize the palm of the hand and four fingers with one hand. Grasp the thumb with the free hand and instruct the subject to move the thumb horizontally away from the index finger (*abduct*). The assistant will guide the movement, applying help at the end-range of active effort for 1½-2 seconds. The adductor muscles, web and fascial fibers, are lengthened by the assistant's free hand. Release and move back to the starting position and repeat 1-3 series of 5-8 repetitions, according to the range achieved.



THUMB ABDUCTOR STRETCH

Muscles Stretched: The muscles that move the thumb horizontally away from the index finger are seldom stretched. These include the abductor pollicis longus and abductor pollicis brevis.

Muscles Contracted: The adductor pollicis longus and adductor pollicis brevis move the thumb horizontally toward the index finger.



Method: The subject places the hand downward on a stable surface. The assistant places one hand in position to stabilize the palm and four fingers. The free hand is positioned around the thumb. Instruct the subject to move the thumb horizontally across the top (dorsal) of the hand. Gently assist the effort at the end-feel for 1½-2 seconds and repeat the movement.

Repetitions: 1-3 sets of 5 repetitions.

THUMB OPPOSITION STRETCH

Muscles Stretched: Muscles that are involved in opposition include the opponens pollicis, flexor pollicis brevis and adductor pollicis.

Muscles Contracted: Extensor pollicis longus, extensor pollicis brevis and adductor pollicis.

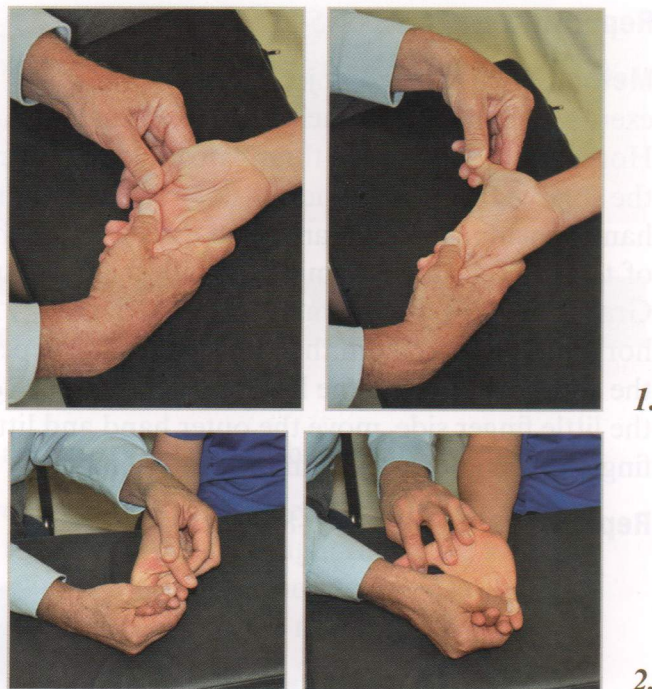
Note: The carpometacarpal and metacarpophalangeal joint, abductor and extensor movements are an excellent stretch of the thenar eminence.

Method Part 1: Position the subject with the palm facing upward or facing away from the body. The fingers are in full extension and pointed outward. The thumb is positioned at a 90-degree angle in relation to the index finger. The assistant will place one hand in position to stabilize the palm and four fingers. Use the free hand to assist the thumb. Instruct the subject to horizontally abduct the thumb away from the palm. The assistant will guide and assist at the end-feel. Release and repeat the movement.

Repetitions: 1-3 sets of 5.

Method Part 2: The subject will perform this exercise with the palm facing upward (supine). Horizontally abduct the thumb downward toward the surface below with the assistant stabilizing the hand while providing the guidance and assistive stretching of the subject's thenar eminence with the free hand. Gradually move the thumb additional degrees horizontally away from the index finger and repeat the effort. Stretching the hypothenar eminence on the little finger side, move the outer hand and little finger down and away from the center line.

Repetitions: 1-3 sets of 5-8.

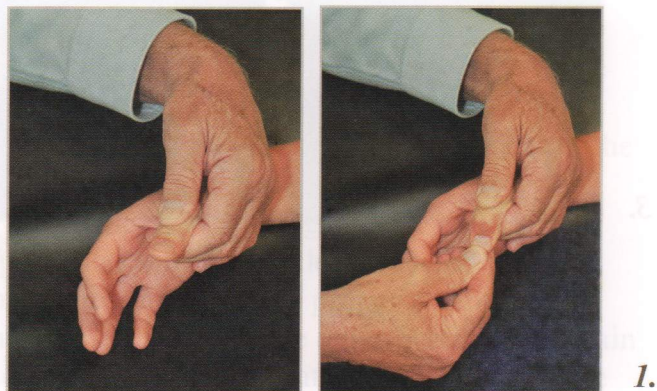


THUMB EXTENSOR STRETCH

Muscles Stretched: Muscles that extend the thumb include the extensor pollicis longus and extensor pollicis brevis which act upon the phalanges and metacarpals.

Muscles Contracted: Muscles that flex the thumb and provide opposition include the opponens pollicis, flexor pollicis brevis and adductor pollicis.

Method Part 1: This exercise is intended for those whose distal phalanx is affected by arthritis, fibromyalgia, post injury, post-surgery, fractures,



continued next page

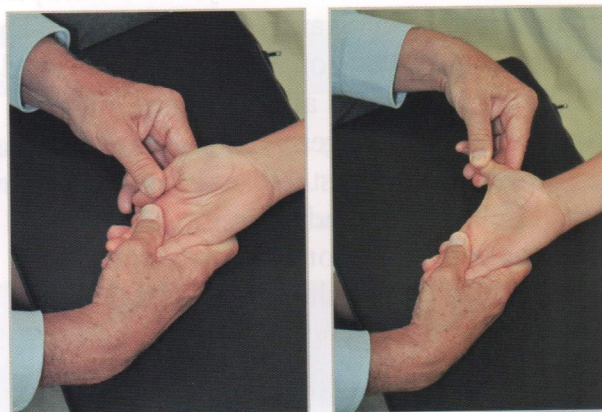
THUMB EXTENSOR STRETCH *continued*

etc. The subject's thumb may face in any direction that is comfortable. The assistant will stabilize with one thumb and the index-finger placed just below the distal phalangeal joint to prevent the area below the distal phalangeal joint from moving. The opposite thumb and index finger will clasp the end of the thumb. Instruct the subject to attempt to move the end of the thumb downward. The therapist will assist very gently at the end-feel for 1½-2 seconds. Release to the starting position and repeat the effort.

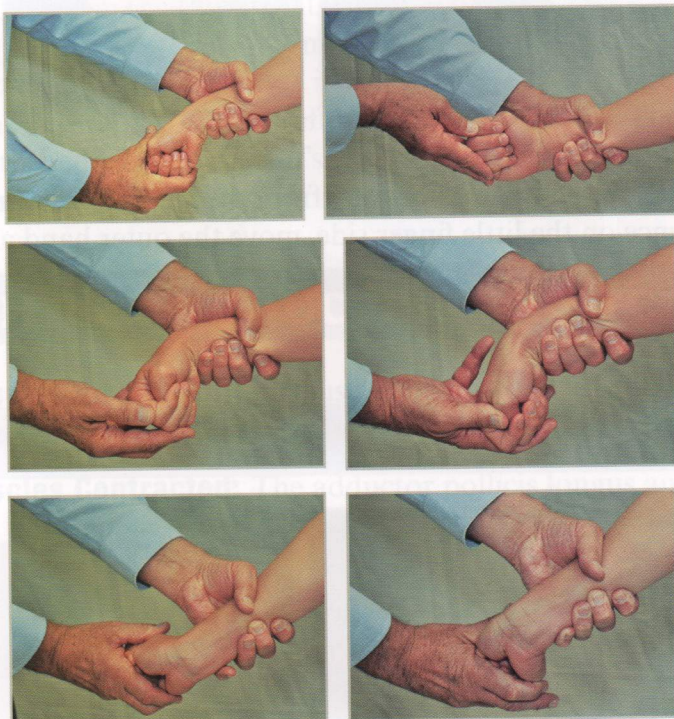
Repetitions: 1-3 sets of 5-8.

Method Part 2: The subject will perform this exercise with the palm facing upward (*supine*). Horizontally abduct the thumb downward toward the surface below with the assistant stabilizing the hand providing the guidance and assistive stretching of the subject's thenar eminence with the free hand. Gradually move the thumb additional degrees horizontally away from the index finger and repeat the effort. Stretching the hyperthenar eminence on the little finger side, move the outer hand and little finger down and away from the center line.

Repetitions: 1-3 sets of 5-8.



2.



3.

Method Part 3: If capable, the subject will place the thumb inside the four fingers as far as possible while forming a fist. The subject will move the wrist and hand downward toward the little finger side ulna bone. The assistant will guide the effort and assist at the end of movement. This is the finest stretch of the thumb extensor muscles. In order to isolate additional radial wrist and thumb extensor fibers from the above described position.

Flex the wrist inward 45 degrees and perform the same basic stretch.

Extend the wrist backward and bend the flexed hand downwards toward the ulna.

Repetitions: 1-3 sets of 5-8.

HIP/KNEE/TRUNK FLEXIBILITY: ASSISTED

Increased hip flexibility helps prevent injuries and improve athletic and everyday performance. The hip joint muscles are often limited in total range, frequently resulting in pain, injuries including hip joint wear and muscle-fascia strain. Performance is affected by limited flexibility, which reduces length of stride, speed and agility. Weakness and inflexibility of the hip muscles is related to problems involving the knees, ankles-feet, and lower back. Specific assisted stretching can improve limited hip flexibility and will assist in full recovery from injuries, and increases performance potential in sports activities. Functional leg length discrepancy, postural faults, sciatica, piriformis syndrome, and various back problems, will benefit from increased hip flexibility.

(See the Hip/Back Stretching protocol listed in the appendix)

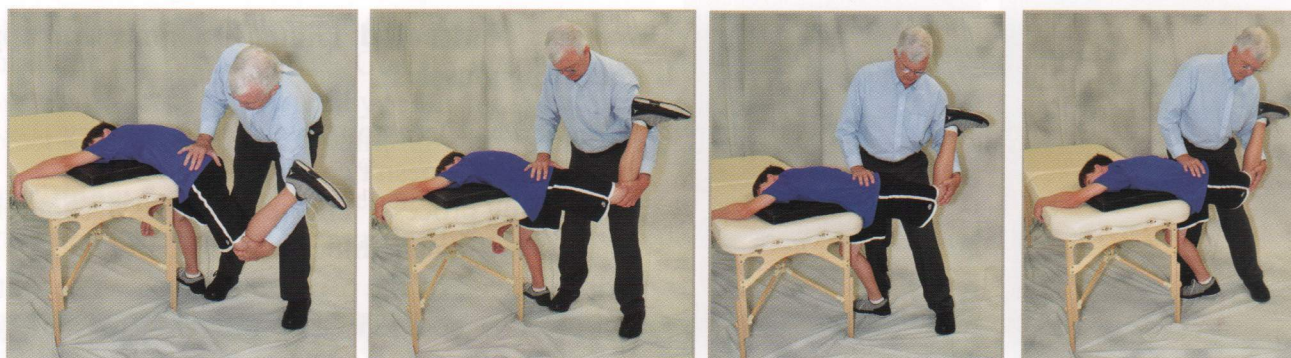
(See the knee protocol listed in the appendix)

HIP FLEXORS-PSOAS-ILIACUS-SARTORIUS

Muscles Stretched: Psoas, iliacus and sartorius muscles.

Muscles Contracted: Hip extensors, gluteus maximus and proximal end of hamstrings.

Introduction: This method is the most effective and thorough technique to release tight psoas and iliacus muscles. Once the psoas and iliacus are released the subject can be taught the active kneeling technique. *(See Active Psoas Stretch Kneeling)*. This method of stretching the psoas-iliacus helps eliminate compensation, frees hip limitation, and helps reduce back pain and radiating sciatica.



Method: Exercising from the prone position, ask the subject to lean across the table. The head is rotated toward the side being stretched to prevent same side upper body tension. Position the upper body and pelvis well supported on the table. Place the non-exercising leg 18-24 inches in front of the proximal end of the table to prevent compensation of the pelvis and lumbar spine. Have the subject release major weight bearing on the non-exercising leg. The assistant places their inside foot under the subject's front foot to discourage major weight bearing on the front foot and help prevent radiating pain in the lower back. Maintain the exercising leg at a 95-100 degree knee angle to prevent the rectus femoris muscle from being a limiting factor, and position the exercising leg adducted toward the non-weight bearing resting leg. Assist in maintaining the resting leg in the proper position to prevent lumbar hyperextension. Place the near side hand across the top of the outer pelvis to maintain stabilization. Place your opposite hand under the knee clasp around the outside area to guide the

continued next page

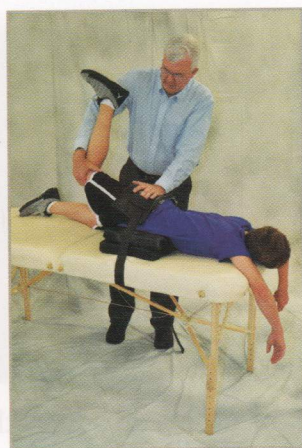
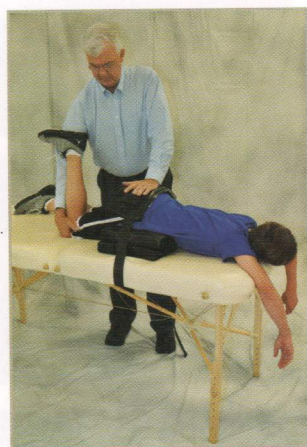
HIP FLEXORS-PSOAS-ILIACUS-SARTORIUS *continued*

subject's leg through the stretching motion, while maintaining the 90 plus degree knee angle and the adducted thigh position. This is accomplished by the therapist being positioned at the inside of the exercising hip. Instruct the subject to contract the gluteus maximus and hamstring muscles throughout the movement. Assist the stretch at the end-feel for 1½-2 seconds, then return to the starting position and repeat the effort. For the best isolation of the iliacus muscle, adduct the exercising leg 10-15 additional degrees across the midline and hyperextend the hip as performed during the psoas stretch. Isolation of the sartorius muscle is achieved by adducting the thigh 20-25 degrees across the center line. The assistant will help maintain this position during hip hyperextension and gently assist at the end-feel for 1½-2 seconds. Release to the starting position and repeat the effort.

Caution: The client should relax the pelvis on the table, bearing very little weight on the front leg or discomfort may result in referred lower back discomfort. The assistant must be aware that the subject may attempt to lift the pelvis off the surface when performing the exercise. Tapping the thigh-buttock area and verbally instruct the subject to continue lifting the exercising leg toward the ceiling. Twenty degrees above horizontal is normal. Horizontal (*zero degrees*) is normal for an artificial hip replacement.

Repetitions: The psoas-iliacus muscles are often among the tightest muscles in the body. 1-5 sets of 5-8 depending on the degree of flexibility.

PSOAS-ILIACUS PRONE (On Table)



Muscles Stretched: Psoas and iliacus muscles.

Muscles Contracted: Gluteus maximus and upper hamstring muscles.

Introduction: Occasionally the psoas is very inflexible and doesn't cooperate well in the lengthening process. This technique is acceptable for those extremely difficult cases to obtain a proper release of the psoas and iliacus. The seat belt prevents compensation and allow for a more perfect stretch.

Method: Position the subject in a prone position with 3-5 inches of firm padding under the pelvis.

Position the subject toward the nearside edge of the table, placing the non-exercising leg below the table's edge. Place padding across the subject's buttocks and using a therapeutic seat belt to fasten the pelvic girdle down firmly. The assistant places the far side hand under and around the far side knee. The subject will contract the buttock and upper thigh, lifting the leg toward the ceiling. Exhale as the effort is repeated. When stretching the iliacus muscle, move the leg 10 degrees across the midline and help guide and hyperextend the hip. Repeat 2-3 sets of 5-8 until released. For the opposite leg, position the subject on the opposite side of the table and repeat the entire process on the opposite leg.

Repetitions: 2-3 sets of 5-8 or additional if extremely tight.

PSOAS-ILIACUS STRETCH (Side Lying)

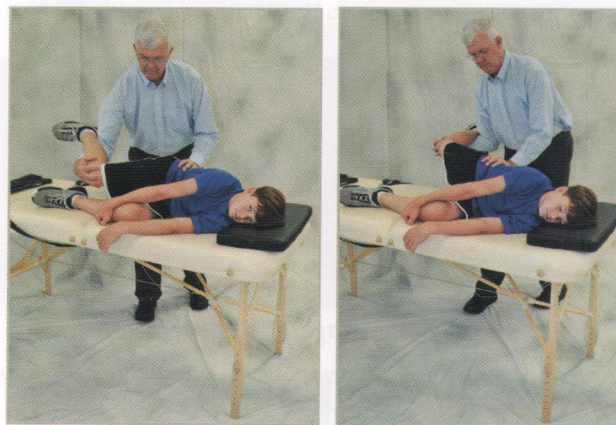
Muscles Stretched: Psoas and iliacus muscles.

Muscles Contracted: Hip extensors (*gluteus maximus and proximal end of hamstrings*).

Note: This is the proper position for stretching the tight hip flexors throughout the duration of the pregnancy.

Method: This is for conditions such as pregnancy, severe disability or having problems lying on the stomach. Please allow the subject to be exercised in a side lying position. Have the subject move the lower leg as close to the chest as possible to prevent lower back hyperextension (*compensation*). A strap or seatbelt may be helpful to stabilize the pelvis and upper hip. The assistant places the inside hand in back of the top hip to stabilize the pelvis. The subject will tighten the abdominals and maintain the lower leg as close to the chest as possible to prevent lower back hyperextension. The assistant will place the free outer hand under the upper leg and surrounding the knee. The exercising leg is maintained greater than 90 degrees at the knee to help prevent the rectus femoris muscle from being a limiting factor. The subject will contract the buttock-upper thigh muscles and reach back slowly, as far as possible. Tapping these muscles with 2-3 light taps on the buttock and upper hamstrings may stimulate the muscles to contract properly, especially if weak, painful, or having trouble initiating the effort. Gently assist at the end-feel for 1½-2 seconds and repeat the effort. The assistant will help prevent the top of the pelvis from rolling backward by placing the near side hand behind the top of the pelvis. Compensation will jeopardize an effective stretch result. The iliacus muscle is effectively isolated by lowering the exercising leg down near the table surface and asking the subject to extend the hip, maintaining the same principles as the prior psoas stretching.

Repetitions: 2-3 sets of 5-8 depending on the degree of discomfort or loss of flexibility. This may be performed one or more times a day to relieve discomfort during pregnancy.



HIP ADDUCTORS (GROIN) STRETCH: SINGLE

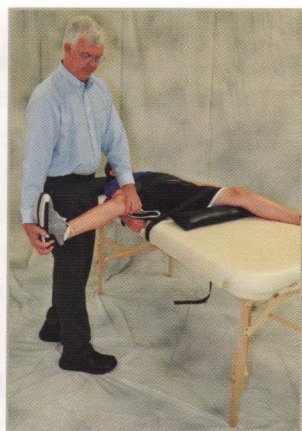
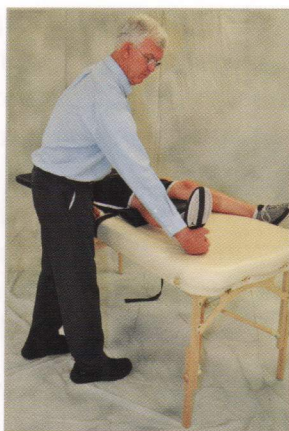
Muscles Stretched: Adductor magnus, adductor longus, adductor brevis, pectinius, gracilis, and sartorius muscles.

Muscles Contracted: Gluteus medius, gluteus minimus and tensor fascia latae muscles.

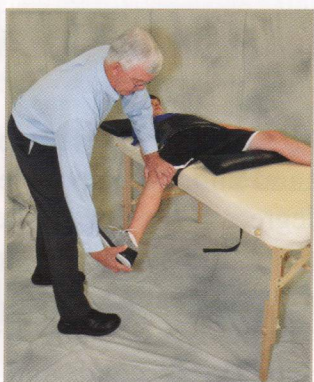
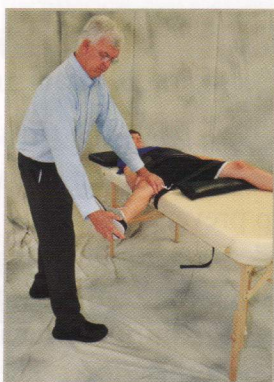
Introduction: This series is for situations involving extreme tightness of the groin, or following a fracture or injury of the hip. Stretch the adductor muscles cautiously, one leg at a time. Three specific stretches are required to stretch the adductor group. On all stretches the non-involved leg is abducted (*spread*) and turned outward. This, along with a seat belt (*strap*) and pad are strapped 1- 1½ inches above the anterior-superior iliac crest to help stabilize the pelvis and best prevent compensation during the three stretches.

continued next page

HIP ADDUCTORS (GROIN) STRETCH: SINGLE *continued*



Stage 1



Stage 2

Method:

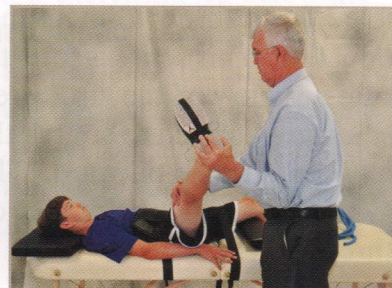
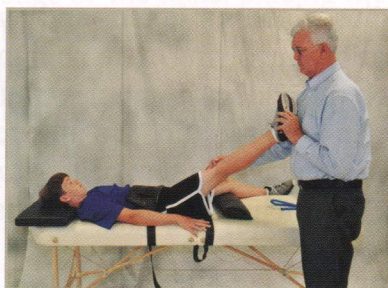
Stage 1: Horizontal Movement. The purpose is primarily to stretch the mid to distal adductor fibers. The assistant will have the subject maintain an extended knee, stabilizing the knee and assisting the movement at end-feel, using the inside hand. The outside hand helps hold the foot and prevent external rotation of the hip. You may also wish to instruct the subject about self-assistance by wrapping a rope or strap under the foot and around the inside of the lower leg (*ankle*). Exhale while stretching and inhale while returning to the starting position.

Stage 2: Oblique Hyperextension. This exercise is an excellent isolation of the adductor magnus muscle. This is also helpful to the gracilis; both muscles also affect the knee. Extend the knee and externally rotate the hip no greater than 45 degrees. Position the exercising foot on the assistant's hand, wrist and forearm to prevent external rotation greater than 45 degrees. Abduct (*spread*) the non-exercising leg 50-60 degrees and strap the leg above the knee to prevent compensation. Position the pelvis near the edge of the table. Place a padding and seatbelt 1-1½ inches above the anterior-superior

iliac crest. The subject will move the leg lateral in abduction and extend downward at a 45 degree angle of movement, obliquely downward from the edge of the table. Assist the effort for 1½-2 seconds from the end-feel. Release and repeat the effort, always double checking each repetition, for maximum accuracy and results.

Stage 3: Vertical Oblique: The proximal to mid-thigh adductors are well isolated by extending the knee and rotating the hip inward (*medial*) as far as possible. The subject will move the same side arm (*elbow*) in a line 90 degrees laterally from the shoulder. The pelvis is stabilized by a seatbelt or strap. The non-exercising leg is abducted 50-60 degrees and rotated externally. Strap the leg above the knee to prevent compensation. The exercising leg will move vertically above the knee and moving toward the subject's elbow approximately 12 inches outside the shoulder to the end-feel for 1½-2 seconds. The subject may assist by using the outside hand. Return to the starting position and repeat the effort. The next stage is to wrap a rope or strap under the foot and around the inside of the lower leg. The subject will lift the leg toward the target area while walking the hands up the rope.

Repetitions: 1-3 sets of 5-8.

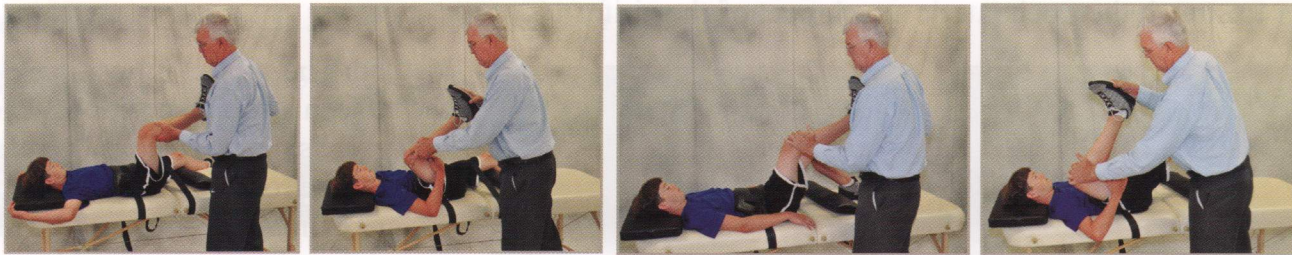


Stage 3

SINGLE LEG PELVIC TILT-HIP FLEXION

Muscles Stretched: This Williams Back Exercise will help achieve hip and lower back movement, stretching the proximal hamstring muscles, gluteus maximus, proximal hip adductors, low back and sacrospinalis muscles.

Muscles Contracted: Psoas major, iliacus, rectus femoris, rectus abdominus, and oblique abdominus.



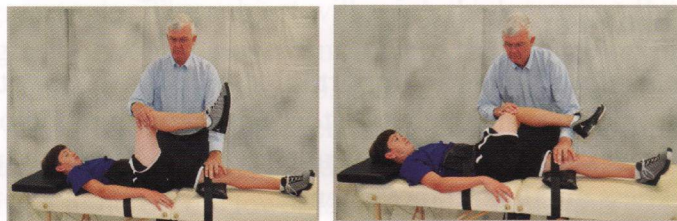
Method: The subject is positioned in a supine (*face upward*) position. The knee is flexed at a 90 degree angle. Moving the knee toward the chest will limit the result because of the stomach, chest and hip joint range potential at that angle. Instruct the subject to contract the hip flexor and lower abdominal muscles and exhale while pulling the knee outside the rib cage toward the axilla (*arm pit*). The subject may place the hands behind the thigh to prevent pressure on the knee and provide slight assistance at the end of free movement. Place a small pad under the extended, non-involved knee and strap the leg above the knee. If the condition is post-operative, there is painful disc involvement, or there is severe radiating pain involving the sciatic nerve or piriformis syndrome, then bend the non-exercising leg 25-30 degrees. The assistant may gently assist the active movement by using the same side hand or the front of the shoulder to aid the effort for 1½-2 seconds. Inhale, while returning to the starting position and repeat the effort.

Repetitions: 1-3 sets of 5-8 according to the condition.

LATERAL GLUTEAL STRETCH

Muscles Stretched: Lower back rotators, especially lateral gluteus maximus fibers, gluteus medius and gluteus minimus.

Muscles Contracted: Psoas, iliacus, rectus femoris, medial hip rotators and hip adductors.



Introduction: This is a gentle stretch for lower back and hip flexibility problems.

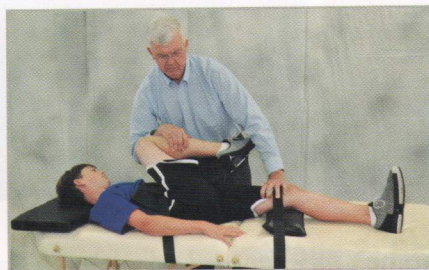
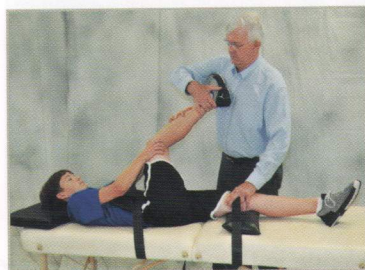
Method: Exercising from a supine position the subject and assistant will help stabilize the pelvis by moving the non-exercising leg across the midline and maintaining the leg in a full internal rotated position. A seatbelt may be used to help secure the thigh. A pad and seatbelt may be used above the pelvic girdle. Ask the subject to contract the abdominal muscles and the inner thigh (*groin*) muscles while assisting with the opposite side hand. The assistant should help the subject move the leg across the opposite side hip and stretch at the end-feel for 1½-2 seconds, and at the same time help maintain the inward rotated position of the non-involved leg with the free hand. Return to the starting position and inhale after each repetition. If the subject has a feeling of impingement in the upper groin during the stretch, circumduct the leg up toward the same side shoulder and slowly move down and across toward the opposite side hip. **Repetitions:** 1-3 sets of 5-8 depending on tightness of the outer, upper hip.

OBLIQUE GLUTEUS MAXIMUS STRETCH

Muscles Stretched: Lower back rotators, gluteus medius, gluteus minimus, especially oblique (rotary) gluteus maximus.

Muscles Contracted: Lower abdominals, hip flexors, hip internal (medial) rotators and hip adductors.

Introduction: This is a gentle stretch for the lower back and hip flexibility problems and important in order to stretch the trochanteric attachment of the piriformis.



Method: The subject is positioned on the table in a supine position. The non-exercising leg is moved across the midline rotating the leg to an inward extreme. The assistant helps to stabilize the non-involved leg. A pad and seat belt may also be used to help provide more complete pelvis

stabilization. Rotate the exercising hip 45 degrees externally and move the exercising leg toward the opposite axilla. The subject may learn to assist the stretch with both hands on the outside of the knee. The assistant should guide and assist the stretch effort and at the same moment maintain the inward rotated position of the non-involved leg. Inhale and return to the starting position after each repetition. If the subject has a feeling of impingement in the groin during the stretch, circumduct the leg up toward the same side shoulder and then move the leg toward the bottom of the opposite side shoulder.

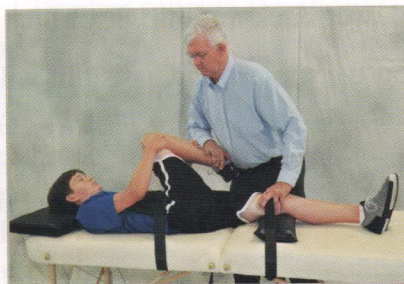
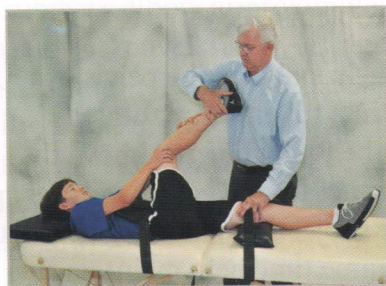
Repetitions: 1-2 sets of 5-8.

PIRIFORMIS STRETCH: FEMORAL ATTACHMENT

Muscles Stretched: Especially femoral attachment of the piriformis and gluteus maximus.

Muscles Contracted: Quadratus femoris, gemellus inferior, obturator internus, gemellus superior, and obturator externus.

Introduction: This is an important stretch for those with a back history. For releasing piriformis syndrome, releasing pelvis distortions including long or short leg syndrome and for helping to free sciatic plexus nerve pressure called sciatica. It is also important for athletes who wish to improve quickness and lateral movement.



Method: Following the stretching of the gluteus maximus fibers, rotate the non-exercising leg inward and hyperadduct the same leg across the midline to stabilize the pelvis and isolate the muscles to be stretched. The location of the proximal piriformis fibers located

on the femur necessitate hyper-adducting the exercising leg as close to the opposite side shoulder as possible (*gluteus maximus flexibility*). The subject will use the same side hand and the assistant's help to maintain the knee near the opposite shoulder. The subject uses the far side hand to clasp

PIRIFORMIS STRETCH: FEMORAL ATTACHMENT *continued*

the outside of the ankle. With aid provided by the assistant, rotate the hip outward by moving the lower leg downward toward the surface. The assistant must help maintain the non-exercising leg in medial (*inward*) rotation throughout the stretching range or proper results cannot be obtained. Exhale and apply gentle assistance at the end-feel for 1½-2 seconds. Inhale and release the limb to the starting position and repeat the movement. The second phase of the piriformis is to release the distal attachment of the muscle located on the anterior sacrum.

Repetitions: 2-4 sets of 5-8 depending on individual needs.

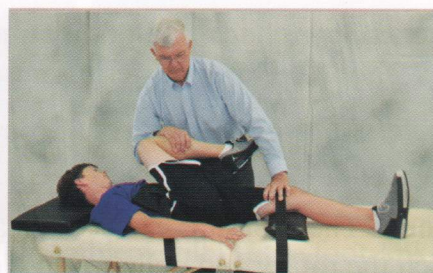
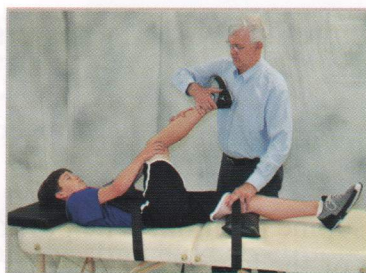
PIRIFORMIS STRETCH: SACRAL ATTACHMENT

Muscles Stretched: Lower back rotators, gluteus maximus, gluteus medius, and gluteus minimus. This is an especially good stretch for the sacral attachment of the piriformis muscle.

Muscles Contracted: Lower rectus abdominus, lower obliques, pectinius, gracilis, adductor magnus, adductor longus, adductor brevis and sartorius.

Introduction: This is an important stretch for back histories, for releasing distortion of the pelvis, pressure on the hip and for helping to free sciatic plexus nerve pressure (*sciatica*). It is also important for those who wish to improve sport quickness and lateral movement.

Method: Exercising from a supine position, the subject will rotate the non-exercising leg inward and hyperadduct the leg across the midline as far as possible to help stabilize the pelvis and isolate the muscles to be stretched. The use of a seatbelt will better help stabilize the pelvis. The exercising knee is bent at a 95 degree angle. The subject will reach the leg across the body as far as possible, moving the leg at a 15 degree horizontal movement toward the last rib on the opposite side. Greater isolation is achieved when the scapulae (*shoulder blades*) and pelvis remain on the surface. The assistant places one hand above the knee on the non-exercising leg to help maintain maximal internal hip rotation and pelvic stabilization. The opposite hand should assist the exercising leg to maximal stretch. The subject may assist with a hand on the lower lateral leg. Inhale and return to the starting position and repeat the movement.



Repetitions: 1-3 sets of 5-8 depending on individual needs.

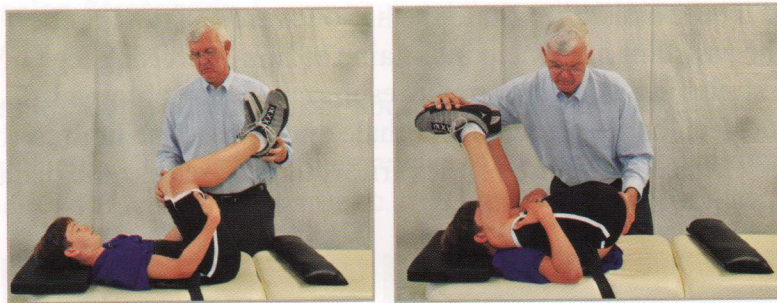
DOUBLE LEG PELVIC TILT

Muscles Stretched: Gluteus maximus, lower erector spinae, sacrospinalis (*low back*) muscles, sacral and coccyx muscles.

Muscles Contracted: Hip flexors including the psoas major, iliacus and rectus femoris. The lower rectus abdominus and the lower internal and external obliques.

continued next page

DOUBLE LEG PELVIC TILT *continued*



Method: The subject should begin with the knees and hips flexed at a 90 degree angle and the thighs pointed vertical. Instruct the subject to contract the hip flexors and abdominal muscles, pulling the thighs toward the axilla (*armpits*). The subject may place the hands under the thighs and assist the contracting hip and abdominal muscles in the

stretching movement. Assist the subject's active effort by placing one hand under the pelvis and the opposite hand under the feet with each repetition. Return to the starting position (*thighs vertical*) and attempt to gently move the thigh closer to the axilla. Strapping a pad with a seatbelt just above the pelvis will stabilize the lumbar region and facilitate a more specific, exacting stretch. Exercise caution with back problems, lowering each leg back to the surface one at a time to prevent psoas contraction and possible resultant back pain.

Repetitions: 1-2 sets of 5-8.

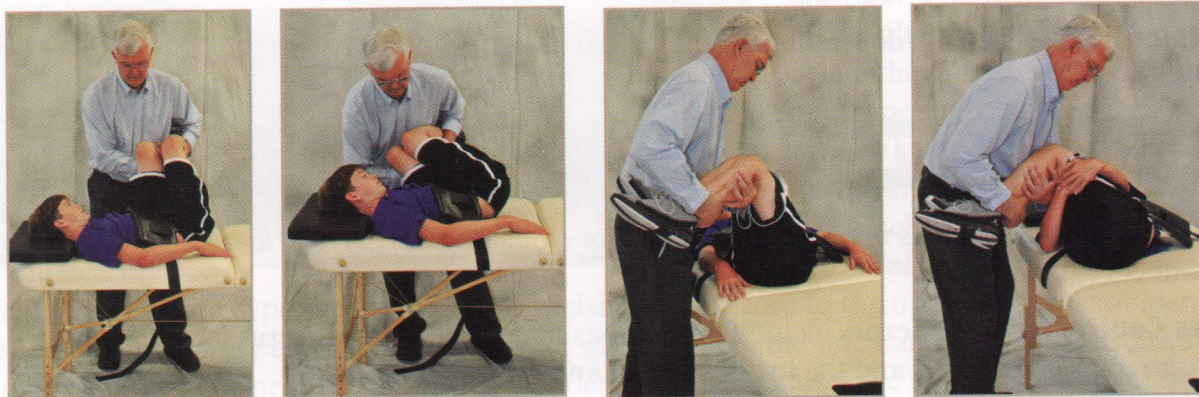
OBLIQUE DOUBLE LEG PELVIC TILT

Muscles Stretched: Multifidus, quadratus lumborum, transversospinalis, iliocostalis, longissimus thoracic, and serratus posterior muscles.

Muscles Contracted: Rectus abdominus, internal obliques, external obliques, psoas major and iliacus muscles.

Method: The subject is exercised in a supine position. The purpose of the oblique pelvic tilt is to stretch the rotary and oblique muscles of the lower back and buttocks. Position both knees in a vertical position. Stabilize the pelvis with a seatbelt or strap. Rotate the pelvis on the table as close as possible toward one side rib cage. The subject will contract the hip flexor and abdominal muscles moving both knees toward the axilla. The assistant and the subject surround the lower thighs with both hands and assist the movement. Return to the starting position and repeat the effort. Complete the same movement to the opposite side.

Repetitions: 1-2 sets of 5 repetitions.



GASTROCNEMIUS (CALF) STRETCH

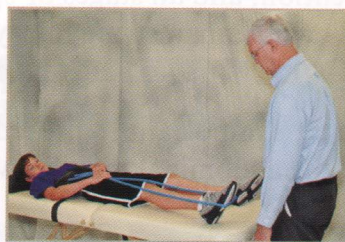
Muscles Stretched: Gastrocnemius, soleus, and the achilles tendon.

Muscles Contracted: Anterior tibialis, extensor digitorum longus, extensor digitorum brevis, extensor hallucis longus, and extensor hallucis brevis.

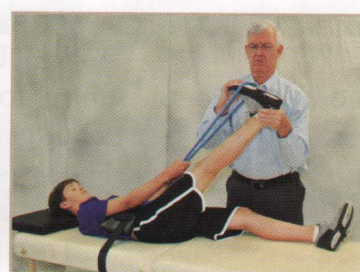
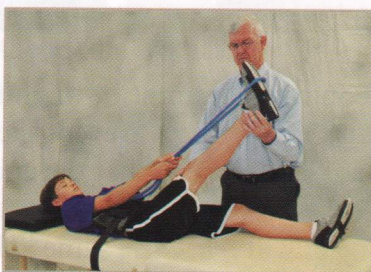
Introduction: The heel cord stretch lengthens the two-joint gastrocnemius muscle and reduces the pressure on the back of the lower leg which helps the individual to walk better. Freedom of the calf reduces foot-ankle, knee, hip and back stress.

Method:

A. The subject assumes a supine position having the entire body extended. This is a primary posture for stretching the distal end of the gastrocnemius (*calf*). Ask the subject to dorsal flex the ankle and foot by lifting the ankle and toes. Assist the subject in pulling back the foot beyond the end-feel for 1½-2 seconds. A rope or strap may be used by the subject in conjunction with the assistant. Following this neutral foot posture the foot will turn inward 20 degrees and then pull backward for greater isolation of the outer lower gastrocnemius muscle fibers. Turning the foot outward 20 degrees and lifting backward will have the greatest effect on the inner lower gastrocnemius muscle fibers.



B. For those with back/hip pain or who have trouble sitting the subject may best isolate the proximal end (*posterior knee*) muscle fibers from the supine position, extending the knee and elevating the leg 45 degrees or more as capable. The knee must be fully extended throughout the stretching repetition. The subject will lift the foot-ankle backward using the rope or strap and aided by the assistant for 1½-2 seconds, repeating the effort several repetitions. Repeating the work with the foot turned inward 20 degrees will further isolate the outer belly of the gastrocnemius. Turning the foot outward 20 degrees and lifting the ankle-foot will best isolate the medial belly of the calf.



C. The proximal gastrocnemius may effectively be lengthened in a seated position. The knee is fully extended as the foot-ankle lifts backward. A rope or strap may be used effectively to help lengthen the proximal calf. The assistant rope will be helpful to alleviate the tissue shortness. Turning the foot inward 20 degrees and pulling the foot backward will best isolate the lateral belly of the gastrocnemius. Turning the foot outward 20 degrees and pulling the foot backward will best isolate the medial (*inner*) belly of the gastrocnemius. Exhale and stretch for 1½-2 seconds at the end-feel of the effort. Release the effort to the starting position and repeat the exercise.



Repetitions: 1-3 sets of 5-8 depending on the limitation.

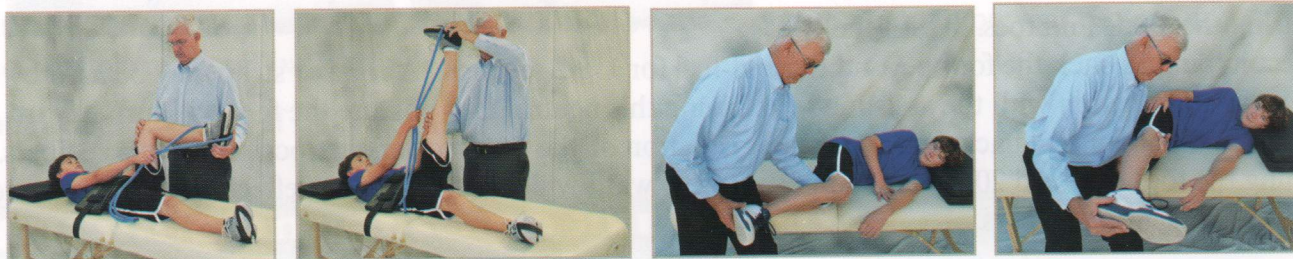
HAMSTRING STRETCH: BENT KNEE

Muscles Stretched: Lower posterior thigh muscles which are the distal hamstrings and include the semitendinosus, semimembranosus, and biceps femoris.

Muscles Contracted: Quadriceps, which include the vastus medialis, vastus lateralis, vastus intermedius and rectus femoris. Always perform bent knee hamstrings before the straight leg hamstring stretches.

Introduction: This is an effective distal hamstring stretch for those who are weak, are suffering from a stroke or muscle disease (*neurological*), or spinal cord injury. It is also very important for back, hip or hamstring histories, injury prevention, and all stages of sports performance improvement. Pain, extreme shortness, immediately following a hamstring injury or suffering from a neurological problem. The side lying bent knee hamstring stretch may initially be most effective.

Note: Bending the opposite side knee is important to prevent back or hip irritation. Subjects who have back problems should also tighten the abdominal muscles when nearing the stretch position.



Method: Instruct the subject to contract the anterior thigh muscles (*quadriceps*) and fully extend the knee. The lower leg extends over the upper leg. Prevent the upper leg from moving downward during the stretching action. The assistant aids the effort at the end feel for 1½ -2 seconds. Bend the lower exercising leg 100-120 degrees after each repetition and repeat the effort. If capable, the subject may also use a rope to assist. The subject will place the same side hand on the front of the thigh and clasp the rope with the opposite hand. As the tissue elasticity increases, move the thigh closer toward the chest. It is not unusual to improve 2-3 degrees each repetition. Painful or difficult efforts may sometimes be best accomplished in a side-lying position, applying the same previously mentioned principles. Because of paralysis or inability to extend the knee, the stretch may be gently performed passively.

Repetitions: 2-3 sets of 5-8 repetitions. Alternate legs after each set in the supine position.

BENT KNEE "INNER" HAMSTRINGS

Muscles Stretched: Medial hamstrings. Semitendinosus and semimembranosus.

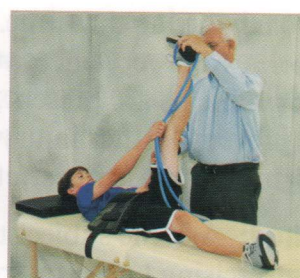
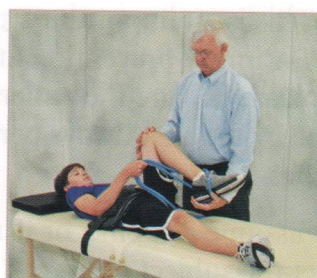
Muscles Contracted: Quadriceps (*anterior thigh*) including the vastus medialis, vastus lateralis, vastus intermedius and rectus femoris.

Method: In order to isolate the inner (medial) lower hamstrings, including the semitendinosus and semimembranosus, rotate the lower leg outward. **DO NOT** allow the upper leg to turn outward or move downward during the stretch. Instruct the subject to contract the front thigh and completely extend the knee. Assist the subject by placing a rope under the foot and both strands around the outside region of the lower leg to maintain the outward rotated lower leg position. The assistant will place one hand on the thigh just above the knee. The opposite hand will assist the subject to maintain

BENT KNEE "INNER" HAMSTRINGS *continued*

an outward rotation of the lower leg (*tibia*) and will assist the quadriceps to extend the knee beyond the end-feel for 1½-2 seconds. Exhale, and release to the starting position and repeat the effort. Bend the lower leg 100-120 degrees to the starting position after each repetition.

Repetitions: 1-3 sets of 5-8



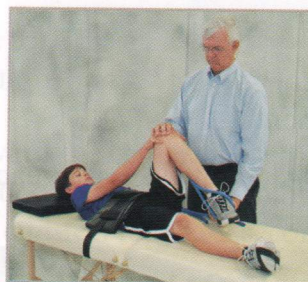
BENT KNEE "OUTER" HAMSTRING

Muscles Stretched: Lower biceps femoris (*outer hamstring*).

Muscles Contracted: Quadriceps (*anterior thigh*) including the vastus medialis, vastus lateralis, vastus intermedius and rectus femoris.

Method: In order to isolate the distal outer hamstring (*biceps femoris*), instruct the subject to rotate the lower leg inward without allowing the femur (*thigh*) to rotate inward during the stretch. The knee must extend completely by extending the lower leg above the upper leg, without allowing the upper leg to move downward. Help the subject to place the rope under the foot and wrap both strands around the inside of the lower leg to help maintain the medial rotated lower leg position. The assistant will help maintain the upper leg position with the top inside hand and the lower leg rotation while assisting the stretch by using the outside hand. Bend the lower leg below horizontal 100-120 degrees after each repetition. The subject may often improve 2-3 degrees with each repetition.

Repetitions: 2-3 sets of 5-8 depending on amount of limitation.



HAMSTRING STRETCH: STRAIGHT LEG - NEUTRAL

Muscles Stretched: Primarily proximal end (*ischial*) to belly of muscles. Semitendinosus, semimembranosus and biceps femoris.

Muscles Contracted: Psoas major, iliacus, rectus femoris, vastus medialis, vastus lateralis, and vastus intermedius.

Introduction: This stretch provides increased upper posterior thigh and hamstring flexibility. It is an effective stretch for those who are weak, quite inflexible following an accident or surgery or are suffering from a stroke, spinal cord injury or conditions such as fibromyalgia, multiple sclerosis, Parkinson's or other muscle problems. This is an excellent stretch for total hip and total knee replacement.

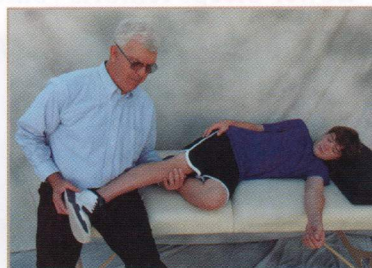
Notes: This exercise may be more difficult for acute, post-operative or severe back problems involving disc or nerve involvement. Performing this exercise in a side-lying position may be the most effective

continued next page

HAMSTRING STRETCH: STRAIGHT LEG – NEUTRAL *continued*

approach during that time. This is an important stretch for people with back, hip or hamstring histories. It is very effective for injury prevention and for improvement of athletic performance. If back problems are present, please be sure the patient maintains flexion of the opposite side knee to help prevent further injury or irritation. Always perform the bent leg hamstring stretches prior to the straight leg hamstring stretches.

Method: Ask the subject to assume a supine, or if necessary, a side-lying position and to bend the non-exercising knee. Instruct the subject to lift the leg by contracting the anterior thigh muscles (*quadriceps*). Assist the subject to maintain an extended knee by placing the near side hand just above the patella. If the knee bends, the stretch becomes ineffective. The assistant will place the far side hand behind the heel or lower leg and assist the lifting motion. Exhale and provide gentle assistive stretch at the end-feel for 1½-2 seconds. Return to the starting position and repeat the effort. If a rope is used to



assist the motion, instruct the subject in a method of walking the hands up the rope hand over hand

Compensation Check: It may be necessary to place a pad and strap above the pelvis to prevent pelvic compensation. Be aware of the subject's compensation through external rotation of the femur while completing the lifting movement.

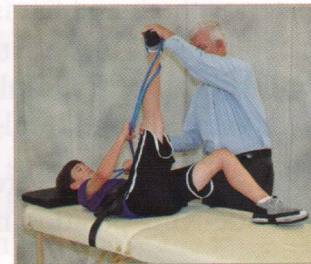
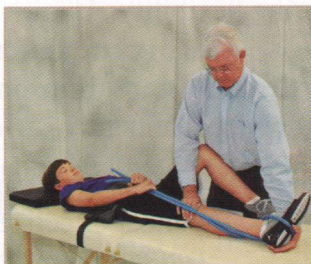
Repetition: 2-3 sets of 5-8. Alternate legs after each set if in a supine position.

STRAIGHT LEG “INNER” HAMSTRING

Muscles Stretched: Semitendinosus, and semimembranosus (*inner hamstrings*).

Muscles Contracted: Psoas major, iliacus, rectus femoris, vastus medialis, vastus lateralis, vastus intermedius, and tensor fascia latae.

Method: The finest stretch for isolating the semitendinosus and semimembranosus proximal end tissues, including the angled fibers. Instruct the subject to maintain full knee extension and rotate the femur (*upper leg*) inward as far as possible. A rope or strap may be used to assist the movement. Place



the rope under the bottom of the foot and wrap both strands around the inside of the lower leg. Instruct the subject to move the inward rotated leg toward the sternum (*breast bone*) by contracting the quadriceps and tensor fascia latae. Instruct the subject to assist where the thigh muscles have the least strength, by walking the hands up the rope hand over hand to provide assistance with a

STRAIGHT LEG "INNER" HAMSTRING *continued*

rope at the end-feel for 1½-2 seconds. Release the leg to the starting position and repeat the movement. The assistant will place the near side hand just above the patella to prevent the subject from bending the knee or the stretch will not be effective. The far side assistive hand is placed in back of the ankle or lower leg. The lower hand must also help maintain a maximal inward rotation of the femur to isolate the inner muscles and angular fibers.

Repetitions: 2-3 sets of 5-8 repetitions.

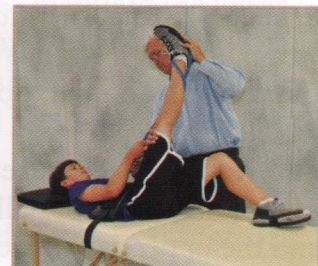
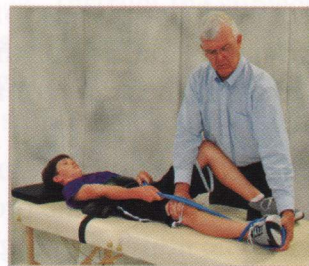
STRAIGHT LEG "OUTER" HAMSTRINGS

Muscles Stretched: Biceps femoris, tensor fascia latae and oblique gluteus maximus.

Muscles Contracted: Psoas major, iliacus, quadriceps including the rectus femoris, vastus medialis, vastus lateralis, and vastus intermedius muscles.

Note: During this position, contracting the quadriceps is necessary to keep the knee straight. The hip adductors (*inner thigh, groin*) perform the movement.

Method: Optimal isolation of the biceps femoris oblique angular tissues and proximal end muscle fibers, necessitate rotating the femur outward 45 degrees. The non-involved leg is bent 45-60 degrees and rotated outward. The instructors near side hand and the quadriceps muscle contraction by the subject will maintain an extended knee. Instruct the subject to contract the inner thigh (*hip adductors*) and reach the leg toward the center of the opposite side shoulder. The assistant places the far side hand around the ankle-foot region to help maintain outward hip rotation and assist the movement. Stretch after reaching the end-feel for 1½-2 seconds and return to the starting position and repeat the movement. The subject may also use a rope fastened under the bottom of the foot, placing both strands around the outside of the lower leg. Instruct the subject how to walk the hands up the rope, hand over hand, while reaching the leg toward the center of the opposite side shoulder. Hamstring flexibility precede the iliotibial band.



Repetitions: 2-3 sets of 5-8.

HIP ABDUCTOR STRETCH

Muscles Stretched: Lateral hip muscles including the gluteus medius, gluteus minimus, tensor fascia latae, gluteus maximus (*outer fibers*), vastus lateralis, biceps femoris, and the iliotibial band.

Muscles Contracted: Hip adductors including the pectiniis, gracilis, adductor magnus, adductor longus, adductor brevis and sartorius.

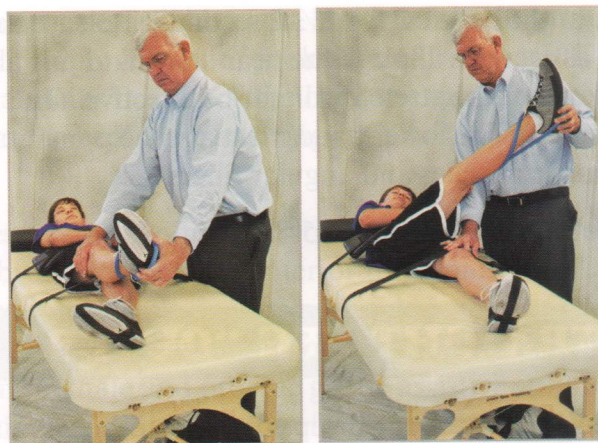
Introduction: The hip muscles of the lateral hip and thigh might be tight and cause problems related to the back, hip, knee, ankle and foot. Always exercise the hamstring stretch before the hip abductor.

continued next page

HIP ABDUCTOR STRETCH *continued*

Method: The lengthening of the hip abductors depends on maintaining an extended knee and externally rotated femur throughout the process.

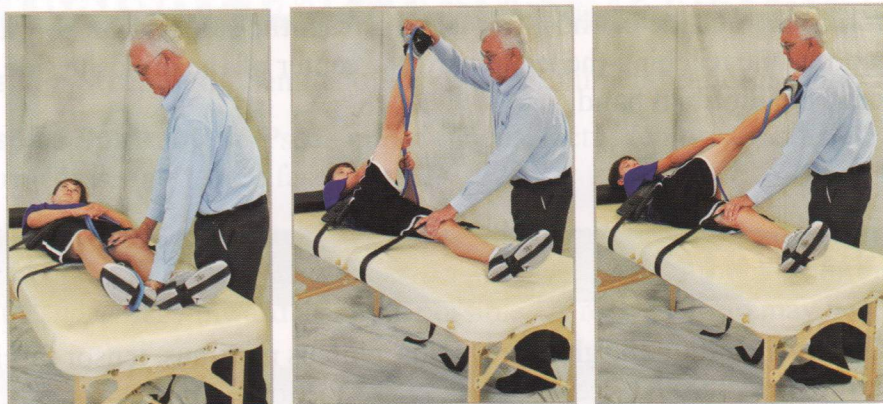
Stage 1 Horizontal: The horizontal exercise is primarily intended to stretch the distal and lower end fibers of the tensor fascia latae and iliotibial band. The gluteal fibers are less involved. The non-involved leg must hyperadduct and internally rotate along with a seat belt and pad above the pelvis for maximal stabilization and least compensation. The assistant helps maintain a fully extended leg, gripping the ankle-foot to help maintain external hip rotation. The near side hand is required to help the non-involved leg remain hyperadducted and internally rotated. The subject will guide and assist the exercising top leg while moving across the body midline (*hyperadduction*) as far as possible. A slightly higher elevated leg is necessary for the male subject. The subject may use a rope to help maintain the moving leg position and assist the movement. Instruct the subject on the proper use of a rope (*strap*) by placing the rope under the foot and wrapping both strands around the outside of the lower leg. Demonstrate how the subject may use the outside hand on the rope to assist the adductor muscles.



Stage 1

Stage 2 Vertical: This exercise helps isolate the gluteus medius, gluteus minimus, and outer gluteus maximus and is an especially good stretch of the proximal tensor fascia latae and the heavy fascia around the upper, lateral pelvis. The non-exercising leg is hyperadducted and medially rotated to help prevent pelvic rotation. A seat belt and pad above the pelvis is also employed for greater stabilization. The exercising leg is fully extended and turned outward. Lift the leg to a vertical position and then move the leg toward the opposite hip joint. As the leg becomes free the angle of leg movement will change to 15 degrees above the hip socket to release the heavy fascia in that area. The assistant helps

to maintain an extended knee and keep the exercising leg turned outward. Assist the movement and help the free leg remain medially rotated. Lower the leg to the surface, exhale as you repeat the effort.



Stage 2

Repetitions: 2-3 sets of 5-8.

QUADRICEPS SIDE LYING

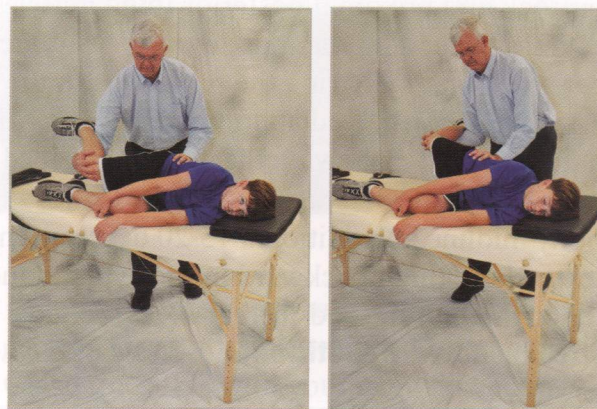
Muscles Stretched: Rectus femoris, vastus intermedius, and vastus medialis and vastus lateralis.

Muscles Contracted: Gluteus maximus, semitendinosus, semimembranosus, and biceps femoris.

Note: High patella syndrome, Osgood-Schlatters, and quadriceps strains or tears, are largely products of very tight quadriceps.

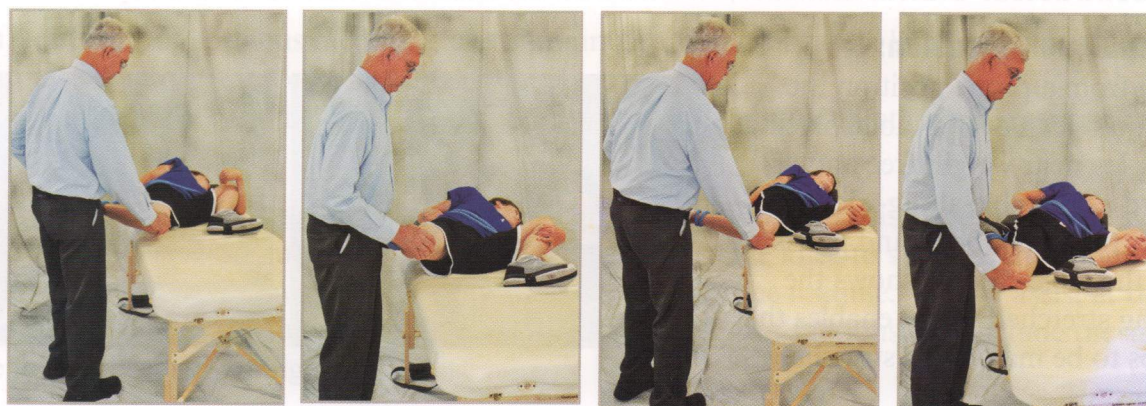
Method: The subject assumes a side-lying position and moves the bent lower leg toward the chest. Maintain this position by placing the hand under the foot or cradling the lower arm around the thigh. The top hip should remain centered over the lower hip. Do not allow the top hip to tip backward. A seat belt is excellent to maintain the entire lower leg and hip position.

Stage 1: Bent Knee Hip Extension: The assistant will position the top leg at a 95-100 degree angle and place one hand in back of the top hip, while the top hand is under the top leg and around the knee. Instruct the subject to maintain the lower leg near the chest and tighten the abdominals. The subject will extend the thigh backward and assist the movement with a rope. If the psoas muscle is tight it prevents hip extension and the proximal quadriceps cannot be effectively stretched. The assistant will clasp the hand around the knee to help guide and assist the effort. **Repetitions:** 1-2 sets of 5-8.



Stage 1

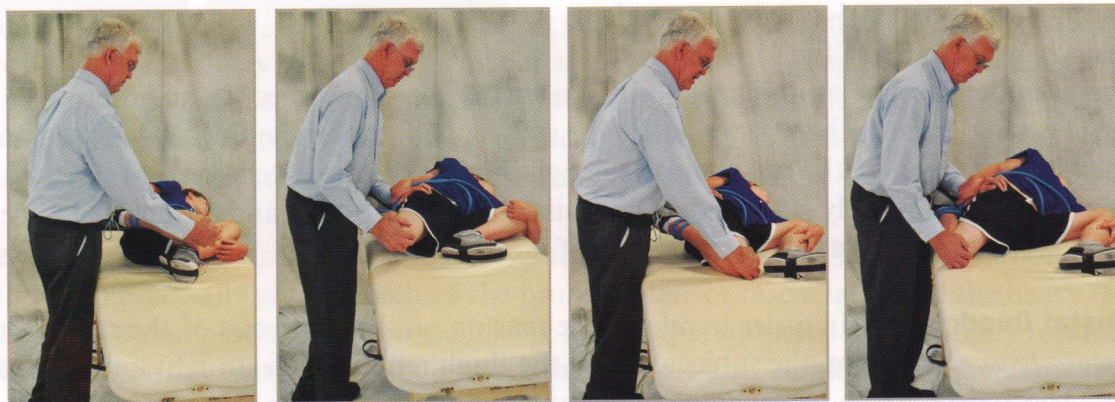
Stage 2: Distal Quadriceps: In order to release the tension on the distal end of the rectus femoris muscle (*knee extensor*), position the subject so that the thigh remains in a straight line with the upper body. The assistant stands below the bent knee and helps maintain this angle, as the subject actively flexes the knee, by contracting the hamstrings and moving the lower leg towards the buttocks. Assist at the end-feel for 1½-2 seconds, release and repeat the movement. Following this action, hyperadduct the exercising thigh downward across the midline 15-20 degrees to isolate the distal region of the vastus lateralis muscle. Employ the same above-described technique making sure that the heel moves toward the center of the thigh to prevent knee irritation, especially from stress on the medial collateral ligament. The vastus lateralis along with the rectus femoris and tensor fascia latae muscles are often a major source of lateral knee-thigh problems. **Repetitions:** 1-3 sets of 5-8.



continued next page

QUADRICEPS SIDE LYING *continued*

Stage 3: Proximal Quadriceps: The assistant stands behind the subject, place the proximal hand across the back of the top hip to help prevent the backward tilt of the pelvis. Place the opposite hand in front of the top thigh. The subject can clasp the ankle with the top hand or using a rope and may need to open the angle for those that are extremely tight in the upper thigh. Contract the buttock and proximal posterior thigh muscles and extend the thigh backward. Instruct the subject to contract the abdominal muscles to prevent arching of the back (*hyperextension*). Position the lower leg near the chest by having the subject clasp the thigh or having the bottom hand under the foot. This along with the contracted abdominal muscles will prevent the arching of the back (*compensation for the tight quadriceps*). Following the above described proximal quadriceps stretch (*rectus femoris*), isolate the proximal vastus lateralis muscle more thoroughly by lowering the exercising leg down and across the body midline an additional 15-20 degrees. Instruct the subject about using the top hand or a rope and extend the thigh backward in the hyperadducted position by contracting the buttock and upper posterior thigh to the end-feel for 1½-2 seconds. Inhale to the starting position and exhale through the stretch effort. **Repetitions:** 1-3 sets of 5-8.



Stage 3

RECTUS FEMORIS: PRONE

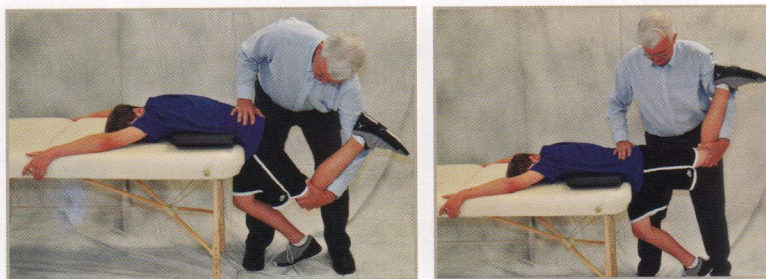
Muscles Stretched: Psoas major, iliacus, rectus femoris, vastus medialis, vastus intermedius and vastus lateralis.

Muscles Contracted: Gluteus maximus, semitendinosus, semimembranosus and biceps femoris.

Step 1: Hip Hyperextension:

Exercising from a prone position the subject should lean over a table, placing the resting leg near weight free and as far forward as possible along- side the table. Rest the upper body and pelvis firmly on the table. Step 1 shows the psoas being stretched which enables the quadriceps to be maximally stretched.

Repetitions: 1-2 sets of 5-8.

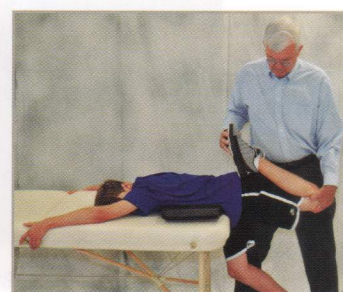
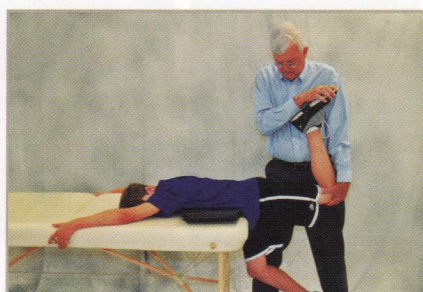


1.

RECTUS FEMORIS: PRONE *continued*

Step 2: Instruct the subject to bend the knee, moving the lower leg toward the buttocks to help release the distal rectus femoris muscle, which assists in knee extension. The distal end is often the tightest portion of the muscle. Release the lower leg to the 90-degree starting position and repeat the effort.

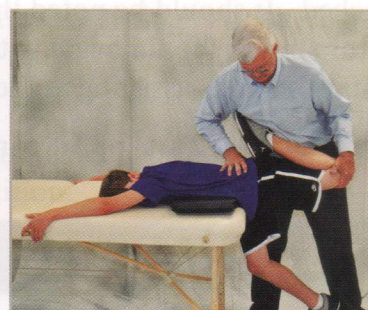
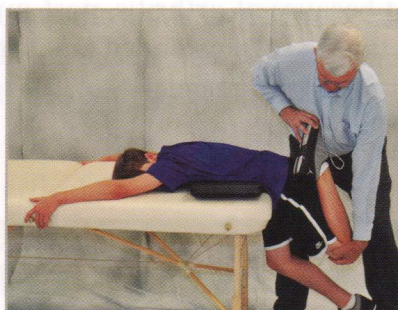
Isolating the vastus lateralis muscle is accomplished by adducting the exercising thigh across the midline an additional 15-20 degrees and repeat the same knee flexion process.



2.

Repetitions: 1-2 sets of 5-8.

Step 3: Bent Knee Hip Extension: Providing maximal isolation of the proximal (*near*) end of the rectus femoris is accomplished by bending the exercising leg as far as possible while adducting the leg to the centered position toward the opposite thigh. Clasp the ankle with your near side hand, placing your elbow across the pelvis. A seat belt may be used to help stabilize the pelvis. Instruct the subject to initiate the movement by contracting the gluteus maximus and hamstrings to move the thigh backwards. Assist the stretch with controlled guidance and gentle aid at the end-feel for 1½-2 seconds and repeat the same movement. For isolation of the proximal vastus lateralis muscle, adduct the exercising leg across the midline an additional 15 degrees and extend the flexed thigh.



3.

Repetitions: 1-2 sets of 5-8.

EXTERNAL HIP ROTATORS: SUPINE

Muscles Stretched: Six deep external rotators including the quadratus femoris, inferior gemellus, obturator internus, superior gemellus, obturator externus, piriformis and the lateral gluteus maximus muscle fibers.

Muscles Contracted: Gluteus medius, gluteus minimus and tensor fascia latae, pectinius, gracilis, adductor magnus, adductor longus, and adductor brevis.

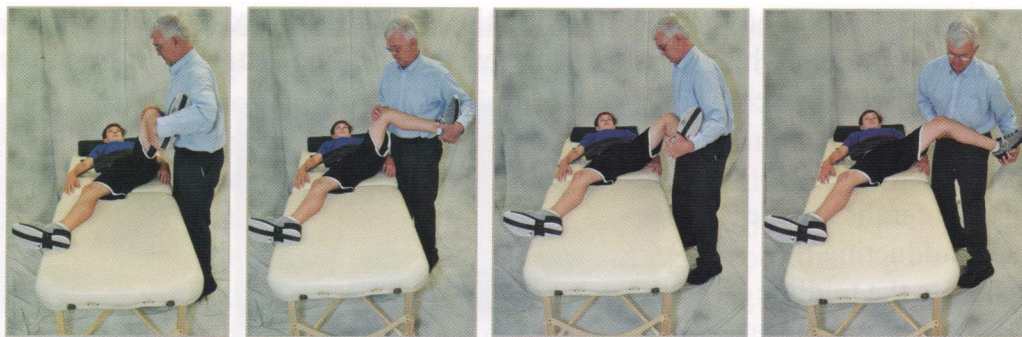
Introduction: This exercise is beneficial for movement, flexibility, rehabilitation and restoration of range of motion.

Method: Instruct the subject to place the rope around the mid-foot and clasp with the same side hand. The assistant may place the subject's opposite side hand above the knee to stabilize the femur. Instruct the subject to rotate the hip by moving the lower leg away from the midline. Gently assist at the end-feel and if possible have the subject provide continuous muscle contractions and include the assistant and rope for the best stretching result.

Compensation Check: Compensation may be prevented by placing a pad

continued next page

EXTERNAL HIP ROTATORS: SUPINE *continued*



and seatbelt above the pelvis. Spread the free leg (abduct) wide and rotate the hip outward. The pad and outward hip rotation help prevent hiking of the same side hip.

Specific Stretching: The thigh is positioned close to the midline, flexed 90 degrees at the knee. Exercising from this basic position, each of the external rotators will be stretched by moving the thigh (*femur*) away from the midline an additional 10 degrees. The muscles listed from distal (*lower*) to proximal (*upper*) in the exacting order are the quadratus femoris, obturator externus, gemellus inferior, obturator internus, gemellus superior, obturator externus, and piriformis. Each additional 10 degrees of movement specifically isolates the next muscle, which is located above the muscle previously stretched. It should be noted that because of arthritis, post-injury or post-surgery the supine external rotator stretch should begin with the leg fully extended and turning the entire leg inward with the assistant's hands assisting at the end of movement.

Repetitions: 1-2 sets of 5-8 for each angle.

EXTERNAL HIP ROTATORS: PRONE

Muscles Stretched: Quadratus femoris, obturator externus, gemellus inferior, obturator internus, gemellus superior, piriformis and gluteus maximus external fibers.

Muscles Contracted: Gluteus medius, gluteus minimus, tensor fascia latae, adductor longus, adductor magnus, adductor brevis, pectineus and gracilis muscles.

Introduction: This method is the most specific and allows the least compensation to successfully stretch the deep external rotators of the hip. However, this technique is unable to thoroughly stretch the piriformis muscle. See the piriformis stretch for specific instructions. These stretches are intended for the isolation of each individual external hip rotator muscle. When the external rotators of the hip



EXTERNAL HIP ROTATORS: PRONE *continued*

are tight, restricted external rotator muscles limit lateral quickness and the ability to change direction. Inflexible hip external rotators contribute to hip and knee problems, faulty gait and back conditions.

Method: The pelvis must be well stabilized with one or two seatbelts to help prevent compensatory pelvis and lower back movement. Place the subject in a prone position with the knee flexed at a 90 plus degree angle. The subject contracts the internal hip rotators moving the thigh laterally away from the midline. The subject moves the lower leg away from the midline to stretch the deep external rotators. The assistant will help stretch at the end-feel for 1½-2 seconds and return to the starting position after each repetition.

Specific Stretches: External hip muscle stretching begins with the farthest positioned external rotator. Start with the thigh adducted near the remaining leg. The lower leg moves away from the vertical neutral position. From this basic position the quadratus femoris is isolated, abducting the thigh an additional 10 degrees will isolate the gemellus inferior. An additional 10 degrees of abduction will involve the obturator internus; abducting an additional 10 degrees will exercise the gemellus superior, 10 additional degrees abduction isolates the uppermost piriformis. To achieve these stretches the assistant will place the far-side hand along the inside of the ankle while the near side hand clasps the femur and assists the subject during internal rotation of the femur. The near side hand, carefully assisting the femur, will do most of the work to help prevent strain of the medial collateral ligament of the knee. The far side hand that is clasping the ankle is used very gently in assisting. An alternate method is to use both hands and the outside shoulder positioned against the lower leg to assist in stretching the deep external rotators and the lateral gluteus maximus.

Caution: Use precaution so that the knee is not strained or the hip overstretched by using too much assisted pressure. Return to the starting vertical position after each repetition.

Repetitions: 1-2 sets of 5-8.

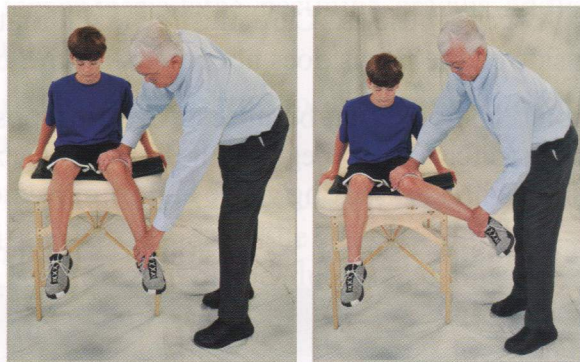
EXTERNAL HIP ROTATOR STRETCH: SITTING

Muscles Stretched: Quadratus femoris, obturator externus, gemellus inferior, obturator internus, gemellus superior, piriformis and gluteus maximus external fibers.

Muscles Contracted: Gluteus medius, gluteus minimus, tensor fascia latae, adductor longus, adductor magus, adductor brevis, pectinius and gracilis muscles.

Introduction: Stretching these muscles results in increased lateral movement and quickness. This is slightly more difficult to isolate without compensation than from the prone or supine positions. The piriformis is stretched in greater exactness in a supine position. (*See Piriformis Stretch*)

Method: Ask the subject to sit with the knees hanging over the end of a table or desk and place a firmly rolled towel or pad under the knees. Instruct the subject to maintain the same side buttock on the surface



continued next page

EXTERNAL HIP ROTATOR STRETCH: SITTING *continued*

throughout the movement. The subject will move the leg away from the midline with assistance at the end of the end-feel. Instruct the use of a rope for an active home program. Alternate legs after each set.

Specific Stretches: Move the thigh away (*abduct*) from the midline an additional 10 degrees for each external rotation movement. The order of stretching from the body midline is the quadratus femoris (*lower*), followed by the gemellus inferior, an additional 10 degrees involves the obturator internus, followed by the gemellus superior, the obturator externus and finally the piriformis muscle (*upper*).

Compensation Check: As the lower leg moves outward do not allow the same side of the pelvis to hike upward. **Repetitions:** 1-3 sets of 5-8.

INTERNAL HIP ROTATOR STRETCH: SUPINE

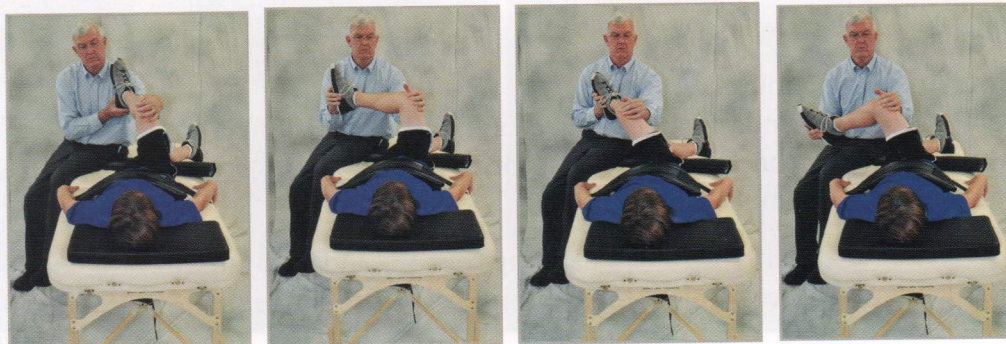
Muscles Stretched: Gluteus medius, gluteus minimus, psoas major, tensor fascia latae, pectiniis, adductor magnus, adductor longus, adductor brevis and gracilis.

Muscles Contracted: Quadratus femoris, obturator externus, gemellus inferior, obturator internus, gemellus superior, piriformis, and gluteus maximus (*lateral*).

Method: The subject will exercise in a supine position. The subject will flex the knee slightly greater than a 90 degree angle and bend the hip 90 degrees. Instruct the subject to move the non-exercising leg 30-45 degrees across the midline and maintain the leg in an internal rotated position to help stabilize the pelvis. The pelvis may be further maximally stabilized using a pad and seat belt. Initially the knee is positioned vertically. The assistant will place one hand around the lower thigh-knee and the opposite hand on the outside of the lower leg-foot. The assistant will provide help at the end feel for 1½-2 seconds. From this vertical position, ask the subject to contract the external hip muscles moving the exercising lower leg across the midline to lengthen the rotational tensor fascia latae and gluteus medius fibers. Adducting the femur 10 degrees across the midline will help stretch the gluteus minimus. Adducting the femur an additional 10 degrees (*20 degrees total*) will lengthen the rotary fibers of the psoas major. Adducting the femur maximally from the vertical position will help isolate and stretch the sacral-coccyx muscles. Care must be taken that the opposite side of the pelvis does not hike or that the near side of the pelvis does not rotate inward, both of these conditions jeopardize isolation.

It should be noted that because of arthritis, post-surgery or post-accident, the supine internal hip rotator stretch should begin with the leg fully extended and turning the entire leg outward with the assistant's hands assisting at the end of movement.

Repetitions: 1-3 sets of 5-8 repetitions. Total repetitions depend on the tissue elasticity at each angle.



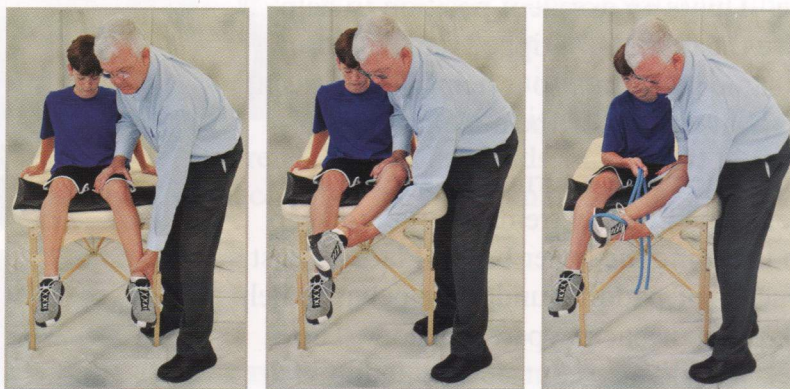
INTERNAL HIP ROTATOR STRETCH: SITTING

Muscles Stretched: Gluteus medius, gluteus minimus, tensor fascia latae, pectinius, gracilis, adductor longus, adductor magnus, and adductor brevis.

Muscles Contracted: Gluteus maximus (*lateral*), quadratus femoris, obturator externus, gemellus inferior, obturator internus, gemellus superior and piriformis.

Introduction: Medial rotation may be limited following an injury or from inactivity. Do not allow the opposite side of the pelvis to hike or specificity is comprised. Using a pad and seatbelt will further stabilize the pelvis.

Method: Place a pad or firmly rolled towel under the subject's knees and instruct the subject to keep the opposite side buttock on the table. Instruct the subject to move the lower leg across the midline. Assist the subject at the end-feel for 1½-2 seconds and repeat the effort. At the neutral position the gluteus medius is lengthened. Moving the thigh an additional 10 degrees across the



midline will isolate the gluteus minimus. Moving the leg 20-25 degrees across the midline will stretch the rotational psoas major fibers. Moving as far as possible will stretch the sacral-coccyx muscles. Alternate legs at the end of each set. A rope may be used by the subject to assist the stretch. The assistant will assist on the outside of the lower leg and the other hand to help stabilize the thigh.

Repetitions: 1-3 sets of 5-8 depending on specific tissue angle limitations.

INTERNAL HIP ROTATOR STRETCH: PRONE

Muscles Stretched: Gluteus medius, gluteus minimus, tensor fascia latae, pectinius, gracilis, adductor longus, adductor magnus, adductor brevis, and psoas major muscles.

Muscles Contracted: Gluteus maximus (*lateral*), quadratus femoris, obturator internus, gemellus inferior, obturator internus, gemellus superior and piriformis.

Method: This technique is the most exacting of the Hip Internal Rotator Stretches. Have the subject assume a prone position with the assistant standing or sitting by the side of the subject. Stabilize the pelvis with a pad and 1 or 2 seatbelts strapped to the center region of the gluteus maximus. Position the non-involved leg 20-30 degrees across the midline and rotated inward. The muscles being lengthened will depend on the angle of approach. Place one hand near the inside of the lower thigh-knee. The opposite hand is placed on the outside of the lower leg. Starting from the initial neutral position, rotate the hip outward and help the subject by placing assistive pressure on the lower outside leg. This movement stretches the gluteus medius and tensor fascia latae. Following the initial stretch, extend the hip 10 degrees and hyperadduct the thigh 10 degrees across the midline to isolate the gluteus minimus. Then isolate the psoas major rotary fibers by hyper-adducting the thigh 15 degrees and

continued next page

INTERNAL HIP ROTATOR STRETCH: PRONE *continued*

hyperextending the thigh 15 degrees. Exhale and assist the effort from the end-feel for 1½-2 seconds, inhale and repeat the effort. Finally, isolate the sacral coccyx muscles by hyperextending the hip 20 degrees and move 20 degrees across the midline. Block the thigh with a bolster to help maintain the correct angle. This is an excellent position to help release the fascia of a tipped female uterus. This same position also is helpful in releasing the fascial tension of the male prostate.

Notes: The prone internal hip stretch must be performed with extreme caution to keep from irritating the lower back. Place at least 3-4 inches of padding under the pelvis to help prevent major back hyperextension. The subject should also contract the abdominal muscles while exercising to help prevent lower back muscle stress. Following this stretch, loosen the lower back applying the double leg pelvic tilt stabilized with a supportive strap and 2 seatbelts. Conditions such as herniated disk, fused back or other serious surgical conditions, substitute the Internal Hip Rotator Stretch Supine.

Repetitions: 1-3 sets of 5 more repetitions for the tissues that are very tight.



MEDIAL HIP-THIGH MUSCLES STRETCH

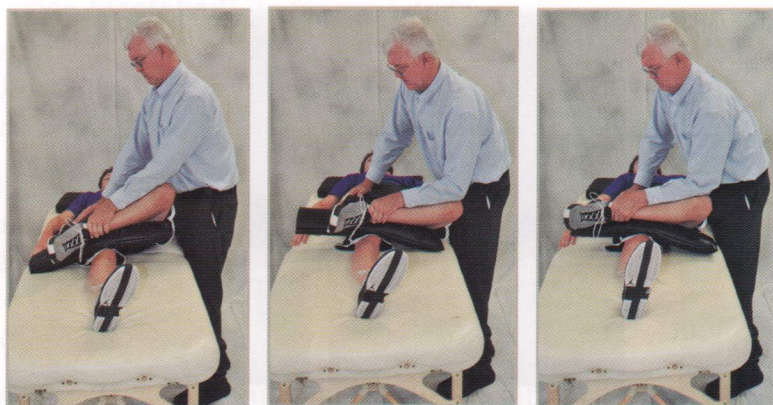
Muscles Stretched: Gluteus minimus, gluteus medius, pectinius, psoas major, gracilis, adductor magnus, adductor longus, adductor brevis, and gluteus maximus (*external*).

Muscles Contracted: Gluteus maximus, quadratus femoris, obturator internus, gemellus inferior, obturator internus, gemellus superior and piriformis.

Introduction: This is an important stretch in the evaluation of lower back involvement and is an excellent exercise in releasing pressure on the hips, sacrum and lumbar spine.

Method: Exercise the subject in a supine position. Ask the subject to bend one knee 90-plus degrees. Place the flexed leg on the top of the extended thigh, resting proximal to the knee cap (*patella*). Place a thick piece of foam or thick towel just above the patella to lessen pressure on the extended leg. Normally the lateral region of the flexed leg should be able to move to a near horizontal position, without moving the far side of the pelvis off the table. Stabilize the pelvis with a pad and a firmly fastened seatbelt. The far side of the pelvis is also held down with the assistant's hand. Instruct the subject to move the thigh (*knee*) downward toward the surface. When loosened, instruct the subject to move the thigh 10 degrees closer to the opposite thigh. The distal attachments of the adductors are lengthened in addition to the inner hip muscles, gluteus minimus and gluteus medius. Continue

MEDIAL HIP-THIGH MUSCLES STRETCH *continued*



or forearm to very carefully assist at the tissue end-feel. Stretch for 1½-2 seconds and release to the starting position and repeat the effort. The subject should contract the abdominals to help prevent arching of the back.

Repetitions: 1-3 sets of 5-8 repetitions.

BIG THREE

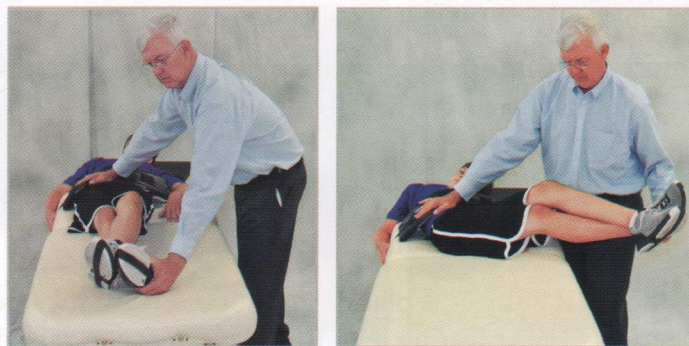
Muscles Stretched: Intercostal externus, intercostal internus, internal obliques, external obliques, serratus anterior, multifidus, quadratus lumborum, transversospinalis iliocostalis, tensor fascia latae, gluteus medius and gluteus minimus.

Muscles Contracted: Opposite side tensor fascia latae, quadratus lumborum, external oblique and internal oblique.

BIG THREE: HORIZONTAL

Method: The subject is placed in a supine position placing the pelvis on the far side of the table and the head on the near side of the table. This places the lateral thigh, lateral hip and lateral trunk and abdominal tissues to be stretched at the current maximum length.

The non-exercising leg is draped across the exercising leg to prevent the non-exercising leg from being an obstruction. The exercising leg is turned outward throughout the movement. Stabilize the pelvis near the far side of the table and the subject's upper body close to the near side of the table. Use a seatbelt placed on a foam pad or towel, positioned 1-2 inches above the anterior-superior iliac crest protuberances. Facing the subject, the outside hand will surround the exercising leg grasping the heel structure. The near side hand will help stabilize the far side of the pelvis, preventing the pelvis from rising off the surface. The subject will help stabilize the trunk hanging onto both sides of the table. The subject will contract the lateral trunk and hip muscles as the assistant helps move the leg horizontally, maintaining the leg in contact with the surface. Following the end-feel and 1½-2 seconds of stretch, move the legs to the starting position and repeat the stretch. This is an excellent stretch for scoliosis and various hip and back problems. **Repetitions:** 1-3 sets of 5-8.



continued next page

BIG THREE *continued*

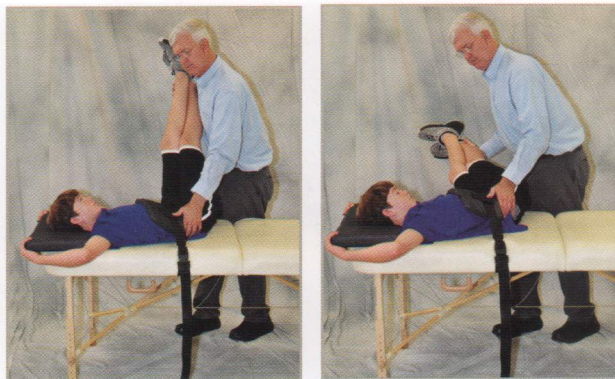
BIG THREE: VERTICAL AND ACROSS PELVIS

Method: This is an excellent stretch for people with lower back pain, especially if they are having pain across the entire lower back. The subject is placed in a supine position and the non-exercising leg is placed on top of the lower exercising leg.

The pelvis is on the far side of the surface. The head is on the near side of the surface. The exercising leg remains rotated outward throughout the effort. The abdominal muscles and hip adductor muscles are contracting while the lower

back is being stretched including the quadratus lumborum, latissimus dorsi, multifidus and lumbar rotators. The assistant will help maintain a fully extended, externally rotated leg and stabilize the far side of the pelvis using a seatbelt and pad and the free hand to help prevent pelvic rotation. The exercise is executed as the subject contracts the abdominal and adductor muscles while moving the legs across the near side hip and upper pelvis. Exercise, while exhaling, to the end-feel, stretch for 1½-2 seconds and return to the starting position.

Repetitions: 1-2 sets of 5-8.



BIG THREE: VERTICAL BACK MUSCLES

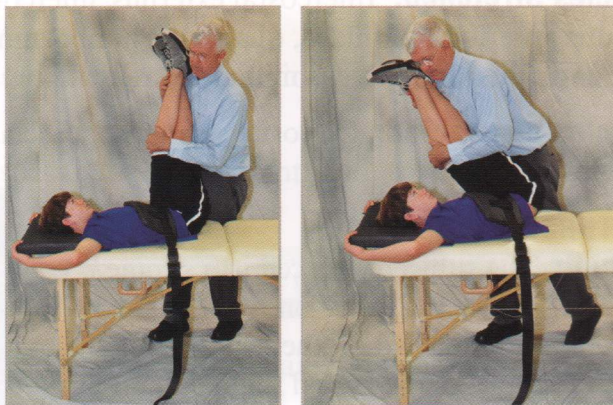
Muscles Stretched: Lower erector spinae, spinalis, iliocostalis, longissimus, multifidus, rotators, semispinalis, quadratus lumborum, interspinalis and posterior serratus.

Muscles Contracted: Rectus abdominus, psoas major, iliacus, lower external oblique and lower internal oblique.

Note: This is an excellent stretch for the vertical and angular back and trunk muscles.

Method: The subject is placed in a supine (*on back*) position. The far side exercising leg is kept under the near side lower resting leg. Both legs are then raised to a vertical position. As the abdominal muscles contract raise the legs toward a vertical position. Maintain an external rotation of the exercising leg. The assistant will prevent the knee from bending and the far side of the pelvis stabilized with a seatbelt and pad and the assistants outside hand holding it down firmly. Proceeding from the vertical the legs move upward toward the opposite side of the head. (*Right side of spine directed toward the left side of the head. The left side of the spine is directed toward the right side of the head*). Stretch and move back to the vertical position and repeat the movement 5-8 times. The assistant moves to the opposite side of the table, crossing the near side leg over the far side leg. Perform the same stretch by stabilizing the pelvis with the far side hand and moving the vertical leg position toward the opposite side of the head.

Repetitions: 1-2 sets of 5-8.



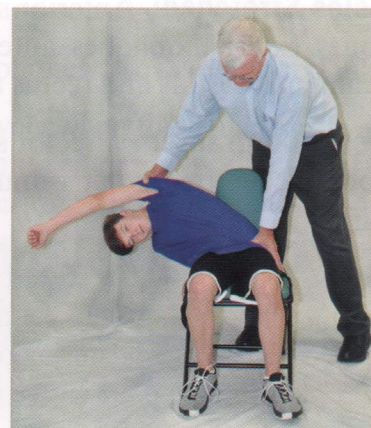
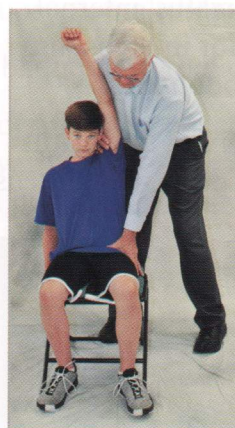
LATERAL TRUNK FLEXION

Muscles Stretched: Latissimus dorsi, quadratus lumborum, posterior serratus, oblique abdominals, anterior intercostals, exterior intercostals, infraspinatus, and teres minor.

Muscles Contracted: Opposite side lateral trunk and rib muscles including latissimus dorsi, quadratus lumborum, oblique abdominals, anterior intercostals, exterior intercostals, and erector spinae.

Method: The assistant will instruct the subject to sit and place the opposite side leg 12-18 inches laterally outside of the hip. The subject will contract the opposite side trunk and shoulder muscles with the exercising arm positioned vertically and leaning laterally as far as possible, keeping the exercising buttock positioned on the surface. The assistant will help stabilize the subject by pushing downward on the crest of the ilium (*top of pelvis*), assisting the movement with lateral pressure on the outer shoulder region at the end-feel and stretching for 1½-2 seconds. Exhale while repeating the exercise.

Repetitions: 1-2 sets of 5-8.



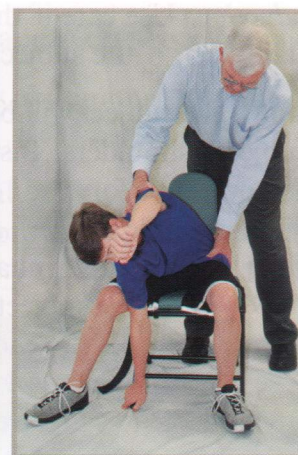
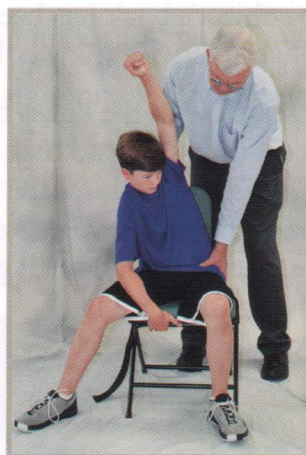
ANTERIOR OBLIQUE TRUNK FLEXION

Muscles Stretched: Latissimus dorsi, quadratus lumborum, erector spinae, serratus posterior, and multifidus.

Muscles Contracted: Rectus abdominus, external obliques, internal obliques, psoas major and iliacus muscles.

Method: The assistant will guide the subject as the upper body is rotated 45 degrees anterior. The subject will move the far side leg 18 inches laterally and 12 inches forward. The exercising arm is positioned vertically. The assistant will press down on the crest of the ilium (*pelvis*) to prevent the same side buttock from leaving the surface. The assistant will help direct the 45 degree oblique movement, using gentle angular pressure on the outside of the back shoulder, attempting to go past the end-feel for 1½-2 seconds. Return to the starting position and exhale, while repeating the stretching motion.

Repetitions: 1-2 sets of 5-8 repetitions.

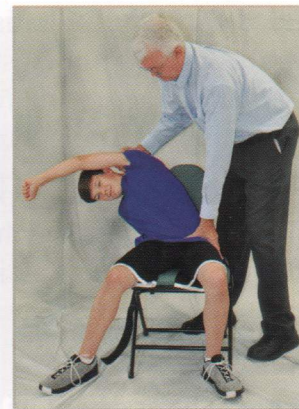
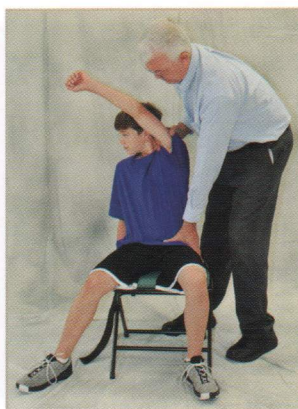


POSTERIOR OBLIQUE TRUNK FLEXION

Muscles Stretched: Anterior serratus, internal obliques, external obliques, anterior intercostals, external intercostals and rectus abdominus.

Muscles Contracted: Erector spinae, quadratus lumborum, multifidus, latissimus dorsi and gluteus maximus.

Method: Exercising in a seated position the assistant will guide the subject as the upper body is rotated 45 degrees posterior oblique. The subject will move the far leg 18 inches laterally and 6-12 inches backward. The far side arm is positioned vertically. The assistant will help stabilize the exercising side buttock by firmly pressing down on the iliac crest. A seatbelt may be used to help stabilize the pelvis as the subject moves the body at a 45 degree angle obliquely. The assistant will help direct the 45 degree posterior oblique movement pressing on the near side shoulder with gentle angular pressure and past the end-feel for 1½-2 seconds. Return to the starting position and exhale while repeating the stretching effort. **Repetitions:** 1-2 sets of 5-8.



BENT KNEE TRUNK FLEXION

Muscles Stretched: Erector spinae, quadratus lumborum, multifidus, and sacrospinalis muscles.

Muscles Contracted: Rectus abdominus, internal obliques, external obliques, psoas major and iliacus.

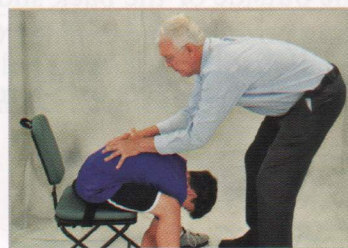
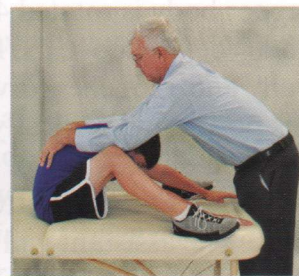
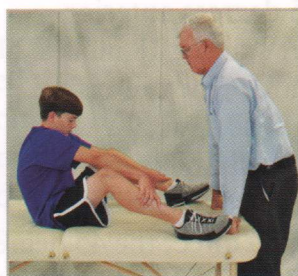
Introduction: Use care if the subject's back has been injured, surgically repaired, has a disc bulge or herniation, or if the subject has a very tight lower back.

Method: The subject will be seated with the knees bent 50-75 degrees positioning the thighs wider than the subject's shoulders. Instruct the subject to tuck the chin, exhale and firmly contract the abdominals as the body curls forward. The assistant places the hands on the lower back above the pelvis and provide gentle traction type (*down and forward at a 45 degree angle of pressure*), providing assistance at the end-feel for 1½-2 seconds. Inhale, release to the starting position and repeat the effort.

DO NOT allow the subject to bounce or make rapid movements at the end of the active stretch. The use of a chair or stool is an outstanding tool because it decreases involvement of tight hip muscles and allows isolation of the back muscles more carefully and completely.

Caution: It is potentially dangerous to the back to have the assistant use vertical, downward force to assist. Forward (*45 degree angle downward*); traction type assistance will best aid the fascia, connective tissue, and muscles stretching safely and thoroughly.

Repetitions: 1-2 sets of 5-8 repetitions.



LUMBAR-SACRAL SPINE STRETCH

Muscles Stretched: Erector spinae, quadratus lumborum, multifidus and sacral-coccyx muscles.

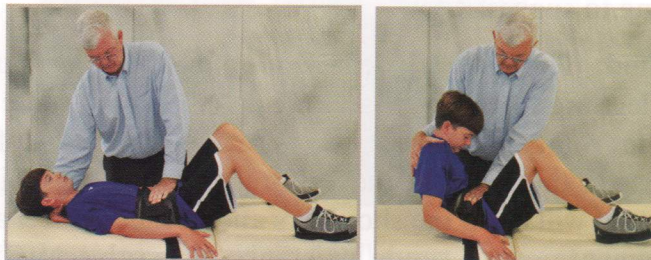
Muscles Contracted: Rectus abdominus, internal obliques, external obliques, psoas major and iliacus.

Introduction: The lumbosacral spine can be stretched safely and effectively when the pelvic girdle is stabilized by tilting the top of the pelvic girdle backward. This movement is maximally effective if a seatbelt and shock absorbing pad are firmly fastened just above the anterior pelvis.

Note: This stretch may be used in a very gentle manner for postoperative backs, backs with disc involvement, stenosis, extremely tight backs, and numerous other lower back disorders.

Method: Instruct the subject to bend the knees 60-90 degrees maximally. Attempt to relax the hip flexors and contract the lower abdominals to help stabilize the pelvis. Gently tuck the chin, exhale and flex the cervical, thoracic, and lumbar spine forward. The assistant will help maintain posterior pelvic tilt with one hand and help stretch the back muscles with gentle pressure of the hand on the back. The subject may also provide active assistance with the hands by clasping the table or placing the hands under the posterior thighs at the end-feel for 1½-2 seconds. Exhale and release to the starting horizontal position and repeat the effort.

Repetitions: 2-4 sets of 5 repetitions according to the subject's limitations.



LUMBAR-SACRAL SPINE STRETCH

Muscles Stretched: Distal erector spinae, quadratus lumborum, multifidus and sacral-coccyx muscles.

Muscles Contracted: Cervical flexors, upper rectus abdominus, lower rectus abdominus, internal obliques and external obliques.

Introduction: This stretch usually follows *Bent Knee Trunk Flexion* and is an alternative to the *Lumbar-Sacral Spine Stretch* which utilizes a seatbelt and pad. This is not advisable for recent disc involvement or recent surgical cases.

Method: Stretching the lumbar spine and sacral-coccyx safely and effectively ask the subject to stabilize the pelvis by contracting the lower abdominals and tilting the pelvis backward. Additionally stabilize the pelvis by standing in front of the subject, placing a seat belt just above the pelvis to help maintain the posterior pelvic tilt. Instruct the subject to flex the knees 12-18 inches and keep the thighs wider than the shoulders and contract the abdominals, hip flexors, internal and external oblique muscles, while the subject moves the body forward. The assistant will gently do traction down and forward at a 45 degree angle at the end-feel for 1½-2 seconds. Inhale and release to the starting position and repeat the effort.



Repetitions: 1-2 sets of 5-8 depending on amount of inflexibility.

SEATED TRUNK ROTATION

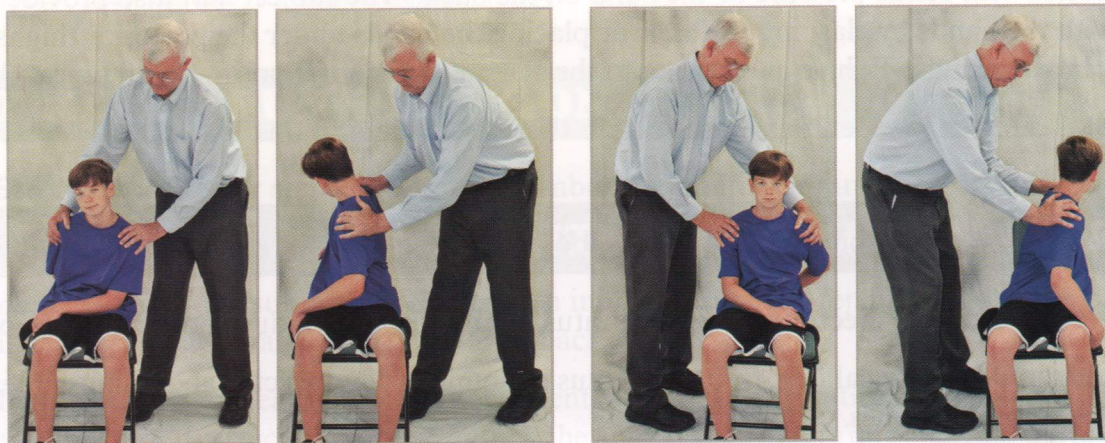
Muscles Stretched: Rotatores, thoracic rotators, lumbar rotators and opposite side internal obliques, external obliques, anterior serratus, internal intercostals and external intercostals.

Muscles Contracted: Rectus abdominus, same side internal obliques, external obliques, transverse abdominus, serratus anterior, internal intercostals and exterior intercostals.

Notes: Trunk rotation is very important in sports such as golf, tennis, baseball, football, lacrosse and boxing to suggest a few.

Method: The subject is seated on a stool or chair, sitting on the back of the chair as far as possible. The legs are spread wide and the pelvis should rotate back keeping the near side pelvis stable to help prevent rotary compensation. A seatbelt is also helpful to stabilize the pelvis. The assistant may place one leg to the inside of the leg for greater pelvic stabilization. The subject will rotate the body and the assistant will clasp the shoulders and at the end-feel assists the trunk in rotation. At the end of each movement provide gentle assistance. The subject will return to the starting position facing forward and repeat the same effort. Following the effort on one side, perform the exercise on the opposite side.

Repetitions: 1-2 sets of 5-8 on each side.



THORACIC-LUMBAR ROTATION "SEATED"

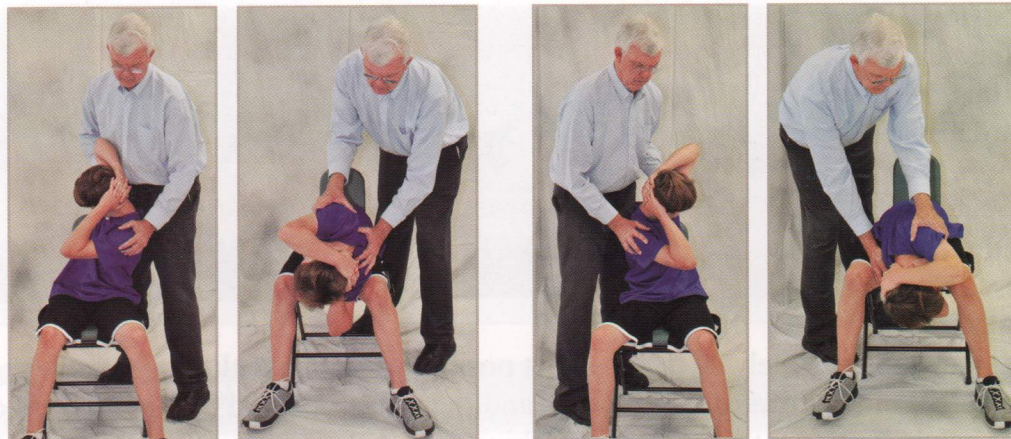
Muscles Stretched: Rotatores, erector spinae, sacrospinalis muscles, opposite side external obliques, external obliques, serratus anterior, anterior intercostals, and external intercostals.

Muscles Contracted: Rotators, psoas major, iliacus, rectus abdominus, external obliques, internal obliques, transverse abdominus, anterior serratus, anterior intercostals and exterior intercostals.

Introduction: This stretch is especially important for people with scoliosis, back stiffness and for athletes of all sports.

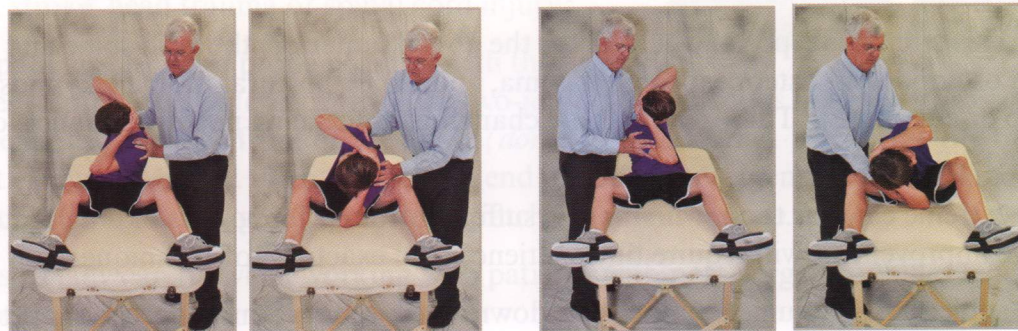
Method: Exercise from a seated position with the feet spread wider than the shoulders. The hands are clasped behind the head and the knees are flexed 45 degrees. The subject will help prevent the pelvis from rotating by pulling back the pelvis on the side from which trunk rotation is initiated, while the rotated trunk is being exercised. Instruct the subject to rotate the upper trunk near 90 degrees and move the lower elbow close to the opposite side of the chest, tuck the chin, exhale, contract the abdominals, obliques and hip flexors and flex the trunk forward (*shoulder toward surface*) as far as

THORACIC-LUMBAR ROTATION "SEATED" *continued*



possible without bouncing. The assistant helps keep the trunk rotated and will assist gently at the end of forward movement. Release and return to the starting position and repeat to the same side. Bend the body and rotate in the opposite direction. The assistant may stabilize the subject's same side leg with the assistant's inside leg as the subject rotates the trunk. This helps keep the hips less involved. Some subject's may require an extra set to one side as many people are less flexible on one side. This is often true when working with scoliosis.

Repetitions: 1-2 sets of 5-8.



SACROILIAC STRETCH

Muscles Stretched: Iliocostalis, and longissimus thoracic.

Muscles Contracted: External oblique, internal oblique, intercostalis internus and intercostalis externus.

Note: This work is intended to lengthen the muscles and fascia in the lower lumbar and sacroiliac regions and is intended to help solve sacroiliac joint problems. This region is usually very tight but responds rapidly to this exercise.

Method: The subject is placed in a side-lying position using a pillow to comfortably support the head and neck. The subject's top leg moves forward from the vertical position slightly beyond the far side of the table. The top shoulder is moved backward 30-45 degrees. The assistant stabilizes the shoulder using the far side hand preventing the shoulder from moving forward. The near side hand is placed on the upper, posterior pelvic girdle. The far side hand prevents the upper body from moving forward.

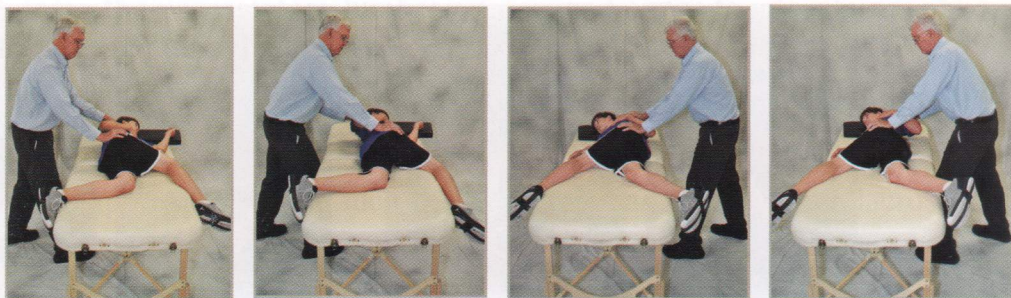
continued next page

SACROILIAC STRETCH *continued*

The near side hand will assist the forward movement of the upper pelvic girdle as the subject contracts the front hip, oblique abdominals and rectus abdominal muscles.

The assistant will

position his/her feet approximately 24 inches apart positioning most of the weight on the back foot. The assistant's weight moves toward the front leg and the near side hand pushes forward on the top of the posterior pelvis. Give gentle assistive stretching for 1½-2 seconds, at the end-feel. Release and exhale while repeating the effort. **Repetition:** 2-4 sets of 5-8.



THORACIC EXTENSION

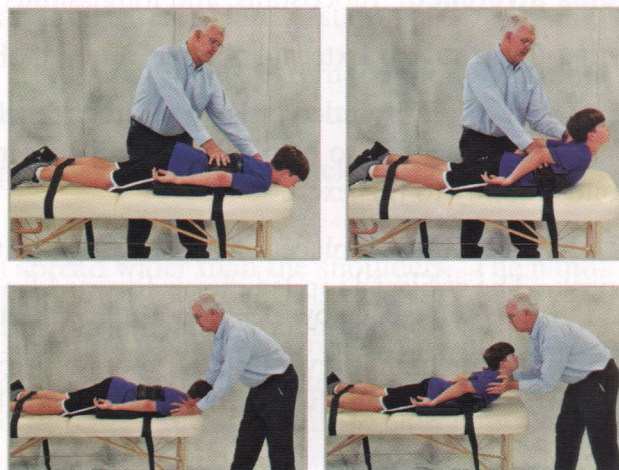
Muscles Stretched: Intercostals, upper rectus abdominus, upper internal obliques, upper external obliques and anterior portion thoracic spine.

Muscles Contracted: Erector spinae muscles quadratus lumborum, and multifidus.

Introduction: This stretch is especially helpful for the dorsal (anterior) thoracic spine and for those suffering from osteoporosis, osteopenia, emphysema, and major postural thoracic kyphosis (forward thoracic hump or curvature). This exercise is life changing, influencing posture, balance, osteoporosis and decreasing pain.

Caution: Use extreme care for those who may be suffering from osteoporosis or a herniated disk. Thoracic range improvement will require time, patience, and exactness of technique.

Method: The subject shall assume a prone (face down) exercise position. The assistant stabilizes the lower region of the thoracic spine and minimizes lumbar extension by placing a pad and seatbelt(s) across the T8-T9 region or by applying firm forward, downward pressure (45 degree angle) to the T8-T9 area. It is necessary to prevent as much lumbar extension as possible. A strap should also be applied across the ankles and a bolster under the ankles for greater isolation. Once stabilized, ask the subject to roll the shoulders back and raise the upper trunk up off the surface as far as is comfortably possible. Assist with your hands under the shoulders. Be careful not to aggravate the shoulder(s) with flexed distal fingers. This exercise ideally has a second assistant. If another assistant is available have both assistants place a 45 degree downward and forward stabilizing pressure using their hands and a seatbelt across T8-T9 while attempting to prevent lumbar substitution.



ANKLE-FOOT FLEXIBILITY: ASSISTED

Full range of motion of the ankle, subtalar, and metatarsal-phalangeal joints may help prevent joint sprains and muscle strains, relieve the effects of foot postural problems, rehabilitate the post-surgical, and alleviate many lower leg aging factors. Improved flexibility also helps reduce the amount of time spent in rehabilitation and increases sports potential. Assistance for stretching the ankle-foot areas may be necessary for those who are paralyzed, have neurological involvement, recovering from surgery, recovering from injury, or who have other limitations that prevent effective active involvement in the stretching process.

(See *Ankle-Foot Protocol* listed in *Appendix*)

SOLEUS STRETCH: PRONE

Muscle Stretched: Soleus.

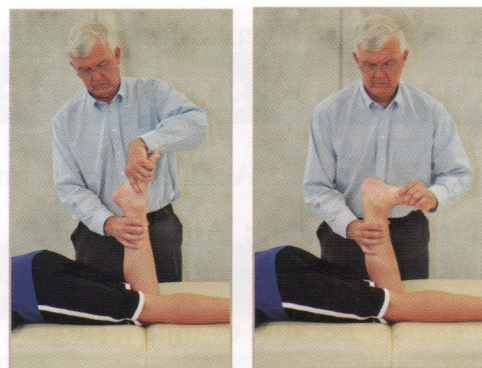
Muscles Contracted: Anterior tibialis, extensor digitorum longus, extensor digitorum brevis, extensor hallucis brevis, and extensor hallucis longus.

Introduction: Although a shortened Soleus muscle or Achilles tendon is an infrequent problem, it sometimes occurs following injury or problems such as fracture, sprain, casting, nerve damage, stroke, head trauma or spinal cord injury.

Method: The patient assumes a prone position with the knee bent 90-degrees to prevent interference from the two-joint gastrocnemius muscle. If possible, have the patient pull the foot toward the front of the ankle (*dorsal flex the ankle*), by contracting the anterior ankle and foot extensors. Assist the patient at the end of active movement, or if unable to contract the dorsal flexors the therapist may gently passively stretch the soleus muscle.

Caution: Be especially careful when working with patients with post-surgery Achilles tendon problems, have circulation issues, or who are paralyzed.

Repetitions: 2-3 sets of 5-8.



SOLEUS STRETCH: SUPINE

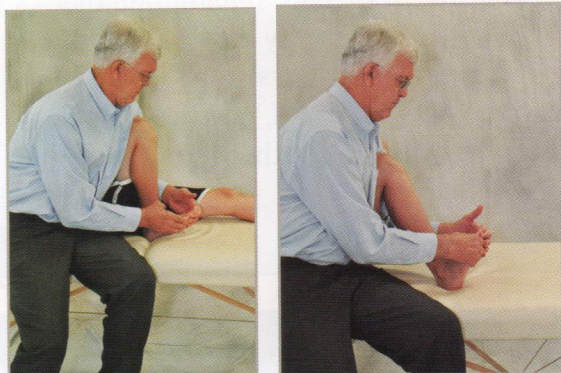
Muscle Stretched: Soleus - Turning foot inward 20-degrees to stretch the outer fibers, turn out 20-degrees to stretch the inner fibers.

Muscles Contracted: Anterior tibialis, extensor digitorum longus, extensor digitorum brevis, extensor hallucis longus and extensor hallucis brevis.

Method: The patient shall assume a supine position. Flexing the knee 90-degrees isolates the soleus and prevents interference by the two joint gastrocnemius muscles. Ask the subject to dorsal flex (*lift*) the ankle with the anterior ankle and foot extensor muscles. Assist the patient at the end of dorsal flexion, or if necessary the therapist may passively stretch the soleus if the patient cannot dorsal flex the ankle. For the assisted stretch, brace your anterior shoulder or chest against the subject's knee

continued next page

SOLEUS STRETCH: SUPINE *continued*



and interlock your fingers around the ball of the foot. Assist at the end of active movement or provide careful passive movement if the subject is paralyzed. This is probably the most effective soleus stretch. This is also very helpful to increase lower leg circulation as the soleus is the key muscle of circulation in the entire leg. The Chinese call the soleus the “second heart”.

Caution: Be especially careful when working with patients with post-surgery Achilles tendon problems, who are paralyzed, or have circulation issues.

Repetitions: 1 -2 sets of 5-8.

ACHILLES STRETCH: PRONE

Tissues Stretched: Achilles tendon, and soleus.

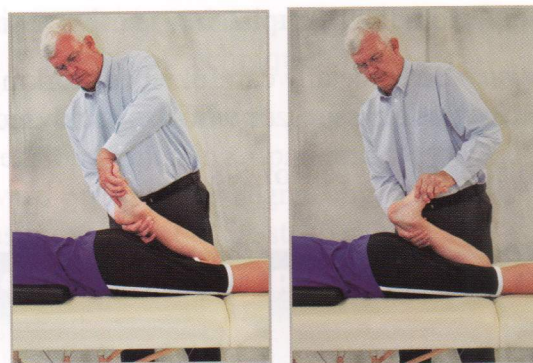
Muscles Contracted: Anterior tibialis, extensor digitorum longus, extensor digitorum brevis, extensor hallucis longus, and extensor hallucis brevis.

Introduction: Because of injury, surgery, muscle disease, temporary or permanent paralysis, the Achilles tendon may become shortened.

Method: The subject shall assume a prone position with the knee flexed comfortably, as far as possible, to prevent the “Triceps Surae” muscles (*soleus, plantaris, and gastrocnemius*) from limiting joint involvement as the achilles tendon is stretched. Ask the subject to lift the toes and ankle backward (*dorsal flexion*) with the anterior tibialis and foot extensors. If the dorsal flexors are unable to move, gently stretch the Achilles tendon passively, release and repeat the effort.

Caution: Be especially careful when working with patients with post-surgery or post-injury, achilles tendon problems, or who may be paralyzed.

Repetitions: 2- 3 sets of 5-8.



ACHILLES STRETCH: SUPINE

Tissues Stretched: Achilles tendon.

Muscles Contracted: Anterior tibialis, extensor digitorum longus, extensor digitorum brevis, extensor hallucis longus, and extensor hallucis brevis.

Method: The subject assumes a supine position. Bend the knee as far as capable, which helps immobilize the ankle plantar flexor muscles and permits greater isolation of the Achilles tendon. Have the subject attempt ankle dorsal flexion (*foot toward shin*), by contracting the anterior ankle and foot

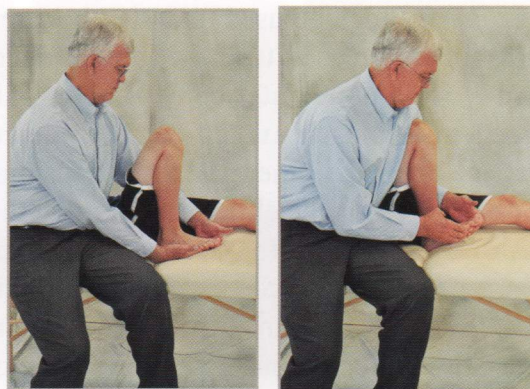
ACHILLES STRETCH: SUPINE *continued*

extensor muscles. If the subject is unable to move actively, then the assistant can passively perform the stretch very gently. In order to accomplish the Achilles Stretch the assistant should brace the anterior shoulder or chest against the subject's knee and interlock the fingers around the ball of the subject's foot. Assist the subject at the end of active movement. Perform careful passive movement if the subject is paralyzed. Release to the starting position and repeat the effort. This is undoubtedly the finest stretch of the Achilles tendon. Turn the foot 20 degrees inward for greater lateral fiber stretch of the achilles.

Turning the foot 20 degrees outward will better isolate the medial achilles fibers.

Caution: Exercise extreme care with post achilles injury, post Achilles tendon surgery, aged patients, neurologically affected subjects, or if the patient is paralyzed due to spinal cord injuries, stroke (C.V.A.), etc.

Repetitions: 1-3 sets of 5-8.



GASTROCNEMIUS (CALF) STRETCH

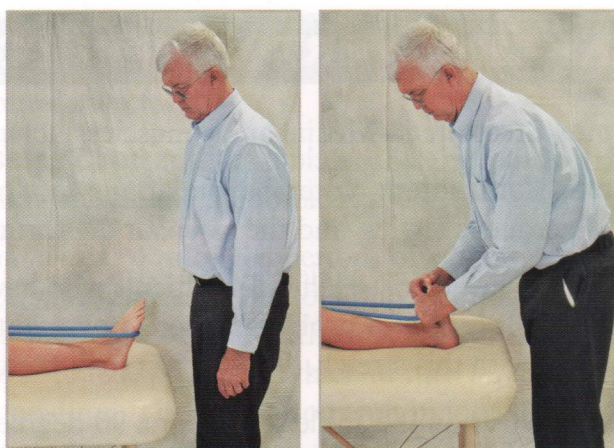
Muscles Stretched: Gastrocnemius, soleus.

Muscles Contracted: Anterior tibialis, extensor digitorum longus, extensor digitorum brevis, extensor hallucis longus, and extensor hallucis brevis.

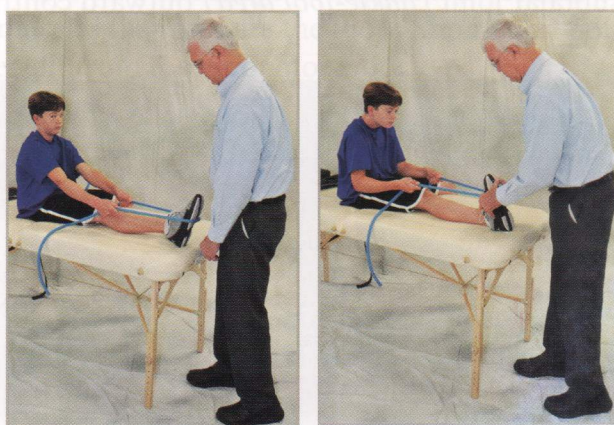
Introduction: This heel cord stretch lengthens the two-joint gastrocnemius muscle and reduces the risk of calf pulls, shin splints, Achilles tendon problems, and foot-ankle injuries.

Method 1: If the subject lays completely supine the distal gastrocnemius is best isolated. The subject will lay supine having the knee fully extended. The foot will pull backwards (*dorsal flex*) and the assistant will provide gentle stretch. The foot will also turn inward to isolate the distal lateral gastrocnemius fibers. The foot will turn outward to isolate the lower inner (*medial*) gastrocnemius fibers.

Method 2: The subject assumes a seated position and fully extends the knee. Ask the subject to dorsal flex the foot and ankle with the anterior tibialis and foot extensors muscles. Assist the subject in pulling back the foot beyond the active



1.



2.

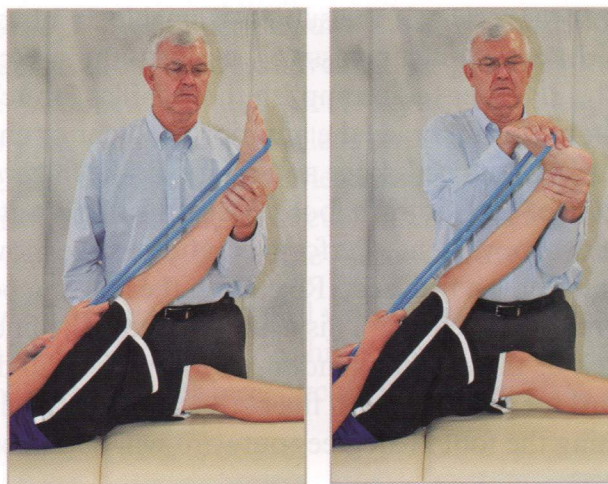
continued next page

SOLEUS STRETCH: SUPINE *continued*

range. A rope may be used to assist the stretch. As flexibility increases, turn the foot 20-degrees inward to isolate the outer belly of the proximal gastrocnemius muscle and 20-degrees outward to isolate the proximal inner gastrocnemius muscle. Release and repeat the effort. Encourage the subject to perform this stretch frequently when alone or with assistance. Alternate legs after each set. If the patient is leaning forward farther when sitting, it will increase the difficulty, but it will have a greater total stretch effectiveness.

Method 3: If the subject has been severely injured, has become paralyzed, has a neurological condition or has difficulty sitting, have the subject assume a supine position. Elevate the leg as high as comfortable and maintain the knee in an extended position. The assistant will help maintain an extended knee. Assist the subject in pulling back the foot beyond the active range. As range improved the exercise should include the foot turned in for lateral calf stretching and foot turning out for medial gastrocnemius stretching. Use of a rope or strap enables the subject to better assist the process.

Repetitions: 1-3 sets of 5-8.



3.

ANKLE INVERTOR STRETCH

Muscles Stretched: Medial ankle muscles, including the tibialis posterior and tibialis anterior.

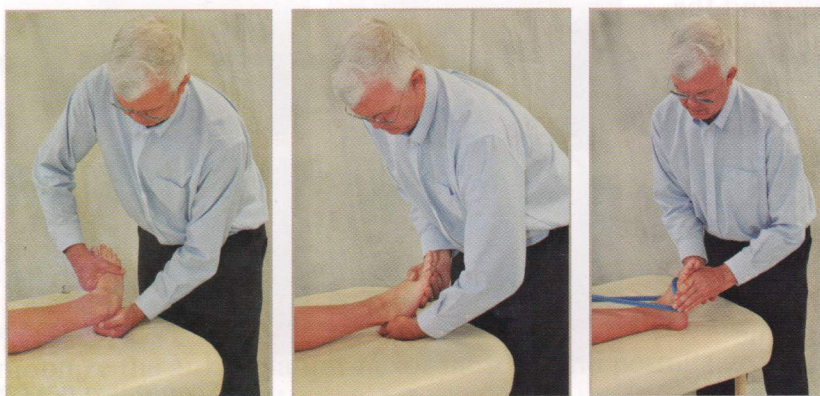
Muscles Contracted: Lateral subtalar and foot muscles, including the peroneus longus, peroneus brevis, peroneus tertius, and the extensor digitorum longus.

Notes: The invertor stretch is for patients who have had injuries, surgery or have various muscle afflictions. It is key for problems where movement is difficult, or currently impossible, and need assistance with this stretch. The subject may exercise from a seated, supine, or side lying posture.

Method: Position the ankle at as near a 90-degree angle as possible. Have the subject attempt to turn the subtalar joint (*ankle-foot area*) outward contracting the lateral subtalar and foot muscles. The

subject should attempt to turn the subtalar-foot outward as the assistant gently assists the motion with one hand around the heel and the other around the midfoot. In teaching the subject how to stretch themselves a double wrapped rope may be used to assist the stretch. Release and repeat the effort from the starting position.

Repetitions: 1 - 2 sets of 5-8.



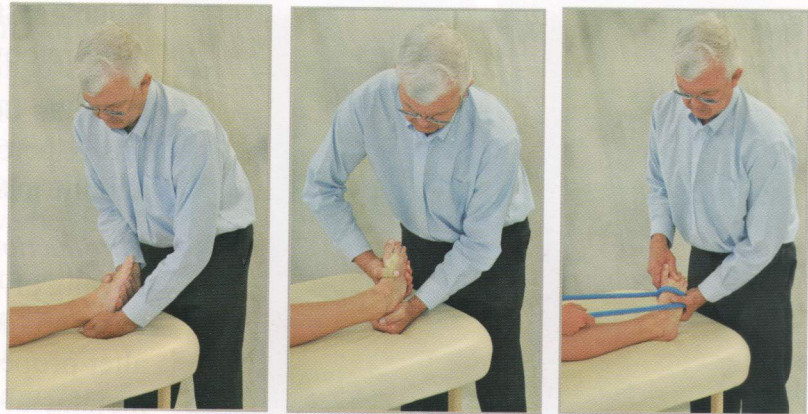
ANKLE EVERTOR STRETCH

Muscles Stretched: Lateral tissue of the subtalar and foot regions including the peroneus longus, peroneus brevis, peroneus tertius, and the extensor digitorum longus.

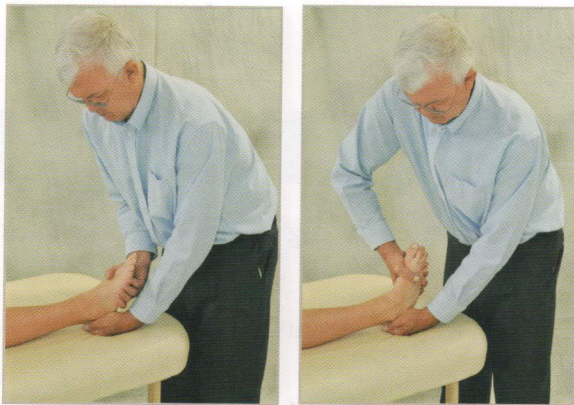
Muscles Contracted: Subtalar and foot invertor (*medial*) muscles, including the tibialis posterior and tibialis anterior.

Notes: Maintain the patient's ankle at as near a 90-degree angle as possible, attempting to turn the subtalar (*ankle-foot*) inward. The subject should attempt to turn the foot inward as far as possible, while the assistant gently assists the motion with one hand around the heel and the other around the midfoot. Assist at the end of active movement for 1 ½-2 seconds. A double wrapped rope may be used by the subject to actively assist the inversion movement. Release to the starting position and repeat the effort.

Repetitions: 1 - 2 sets of 5-8.



FOOT PRONATOR STRETCH



Muscles Stretched: Intrinsic dorsal muscles of the forefoot (*midtarsal, phalangeal region*) and peroneal muscles.

Muscles Contracted: Tibialis posterior and intrinsic plantar muscles of the forefoot.

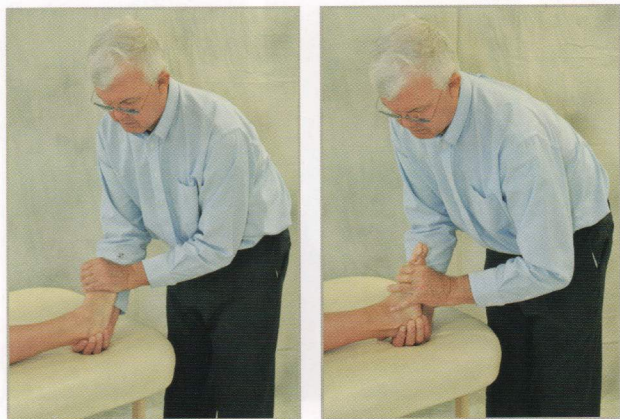
Introduction: Prolonged periods of pronation, post-surgery, or injuries to the toes and feet that require immobilization can cause the metatarsal-phalangeal regions to lose pliability, which in turn affects proper foot posture. This may also result in foot stress, stress

fractures, fallen arches, or inadequate circulation. Few feet have full range of supination because of shoes, foot-ankle weakness, or seldom stretching the muscles that pronate the foot. Supination potential is 80-90 degrees. Subjects with neuropathy will benefit from foot pronator work.

Method: Instruct the subject to perform in a mild plantar flexion position of the ankle-foot. Stabilize the heel with one hand to prevent movement and help isolate the foot during supination. Instruct the subject to attempt to move the foot inward as far as possible without allowing the heel to move. As the subject attempts to move the forefoot an assistant will provide gentle stretch of the midfoot for 1½-2 seconds past the end-feel. The stretching is first provided with the assistive hand close to the ankle joint, then moving to the mid portion of the foot, and finally to the distal foot. This is repeated a number of times to help re-establish normal supination. The assistant must prevent heel movement to effectively improve inward movement of the forefoot. Return to the neutral position and repeat the effort.

Repetitions: 2 or 3 sets of 5-8 depending on condition of the foot.

FOOT SUPINATOR STRETCH



Muscles Stretched: Intrinsic plantar muscles of the forefoot, and posterior tibialis muscles.

Muscles Contracted: Peroneus longus, peroneus brevis, peroneus tertius, extensor digitorum longus and intrinsic dorsal muscles of the forefoot.

Introduction: Prolonged periods of supination, bowing of the legs, surgery, or injuries to the toes and feet that require immobilization may alter proper foot posture. This can cause the metatarsal-phalangeal regions to lose pliability, which in turn alters proper foot posture, often

resulting in pain, foot stress, or inadequate circulation. Wearing shoes, foot weakness, and seldom stretching the muscles that supinate the foot may limit supination mobility. Normal range of foot pronation is 45 degrees.

Method: Instruct the subject in a relaxed dorsal flexed postural position of the foot. The assistant must stabilize the heel with one hand to prevent heel movement and isolate the foot during pronation. Have the subject attempt to move the foot outward as far as possible with the assistant gently aiding stretch of the midfoot with the free hand for 1½-2 seconds beyond the movement end feel. The stretching is first provided with the assistive hand close to the ankle joint, then moving to the mid-portion of the foot, and finally to the distal foot.

Repetitions: 2-3 sets of 5-8 depending on condition of the foot.

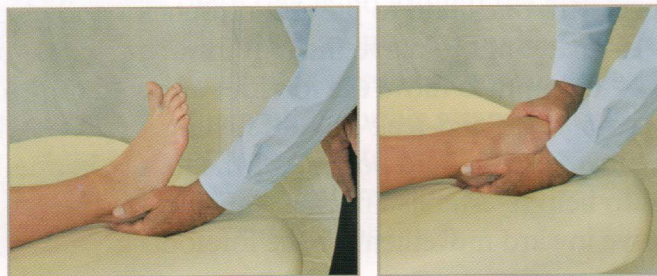
DORSAL ANKLE STRETCH

Muscles Stretched: Tibialis anterior, extensor digitorum longus, extensor digitorum brevis, extensor hallucis longus, and extensor hallucis brevis.

Muscles Contracted: Plantaris, soleus, gastrocnemius, flexor digitorum longus, flexor digitorum brevis, flexor hallucis longus, and flexor hallucis brevis.

Introduction: Ankle plantar flexion (*pointing the foot downward away from the body*) may be limited because of injury, conditions causing weakness of the plantar flexors, or general lack of flexibility due to heredity, inactivity, soreness, or lower leg dorsal inflexibility. Repeated stressing of the ankle dorsal flexors may result in shin splints or tendonitis. Limited plantar flexion may be the result of a shortened tibialis anterior, shortened toe extensors, or tight fascia. Athletes are often limited in full plantar flexion and require assistance of this movement.

Method Stage 1: Have the subject plantar flex the ankle-foot downward (*toes pointing toward the surface*). Assist at the end of active movement for 1½-2 seconds beyond the end-feel. This is an effective stretch for the central shin region and anterior foot.



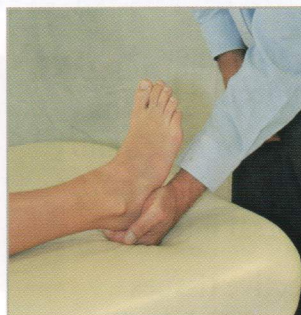
Stage 1

DORSAL ANKLE STRETCH *continued*

Stage 2: The most isolated stretch of the anterior tibialis will be accomplished by supinating the foot (*turning inward and downward*) as the ankle continues plantar flexing. The purpose is to stretch the tibialis anterior, lateral ankle and dorsal foot muscles. Assist at the end of active movement.

Stage 3: The subject shall turn the foot (*pronate*) and subtalar joint (*eversion*) outward and assist the patient at the end of downward movement (*plantar flexion*), while maintaining an outward turn of the foot. The main purpose is to stretch the medial dorsal foot and shin tissues, and proximal great (*big*) toe muscles. Assist at the end of active movement. Release and repeat the effort.

Repetitions: 1-2 sets of 5-8 of one or all stages as the foot-ankle condition dictates.

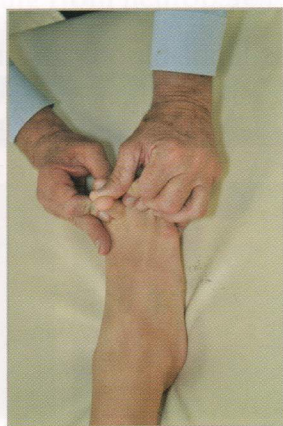
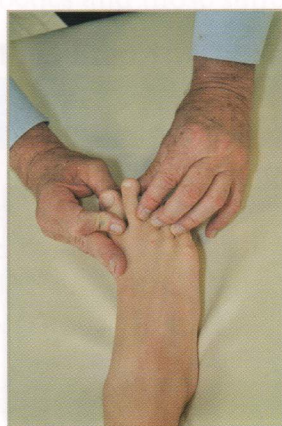


Stage 2



Stage 3

METATARSAL ARCH STRETCH: FOOT FLEXORS



Muscles Stretched: Flexor digitorum longus, flexor digitorum brevis, flexor hallucis longus, and flexor hallucis brevis.

Muscles Contracted: Foot extensors including the extensor digitorum longus, extensor digitorum brevis, extensor hallucis, extensor hallucis longus, and extensor hallucis brevis.

Introduction: This exercise is beneficial for those subjects with limited extension of the toes (*hammered toes*) and the metatarsal arch region, due to shortening of the calves and tightening of the plantar foot

(*bottom*) muscles, fascia, and connective tissue. Assistance is helpful to correct the tissue limitations.

Method: Ask the subject to attempt to extend the toes upward with active contraction of the foot (*toe*) extensors. Stretch one toe at a time, including the great (*big*) toe. Stabilize on the proximal side of the distal joint with the thumb and index finger to isolate the distal phalanx. Following the work with the distal digit, move to stabilize the proximal joint and assist the proximal joint of the toe. Employ the opposite thumb and index finger to provide assistance to the active movement of each joint. This is important work for diabetics and those suffering from neuropathy.

Caution: These muscles and tendons will probably be quite sensitive, please proceed very carefully. If the subject has a hammer toe(*s*) assist movement slowly and very gently to gradually release each joint's limitations and not over-stretch or tear shortened muscles, fascia or skin.

Repetitions: 2- 3 sets of 5-8 may be required. Usually more than one session will be necessary.

TOE (WEB) ADDUCTOR STRETCH

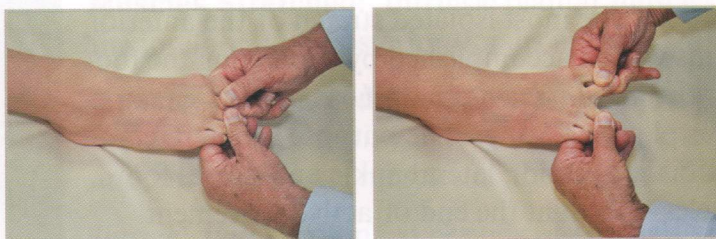
Muscles Stretched: Adductor hallucis, plantar interossei, and the connective tissue (*webs*) between the toes.

Muscles Contracted: Abductor hallucis, abductor digiti minimi, and dorsal interossei.

Note: The muscles and connective tissues between the toes often become very tight from shoes, inability to abduct the toes (*weakness*), fracture, surgery, or stubbing of the toe. This is an important stretch for diabetes and those suffering from neuropathy.

Method: The assistant will stabilize a toe next to the adjacent toe and connective tissue to be stretched with the thumb and index finger of one hand. The opposite thumb and index finger will support the adjoining toe. Instruct the subject to mentally and physically attempt to move the toe laterally. The assistant shall stabilize the adjoining toe and assist the toe that is attempting to move. Release to the starting position and repeat the effort. Perform 1-2 repetitions per web and progress to the next web and repeat the process a number of times. The big toes and little toes are usually more complicated. Please note the specificity in those stretches that follow. Toes may become crooked because of being pushed lateral by a neighboring toe and should be stabilized by one thumb and index finger. The laterally bowed toe is gently rotated and moved in the opposite direction by the remaining thumb and index finger a number of times.

Repetitions: 1-3 sets of 5-8 as condition of each toe dictates.



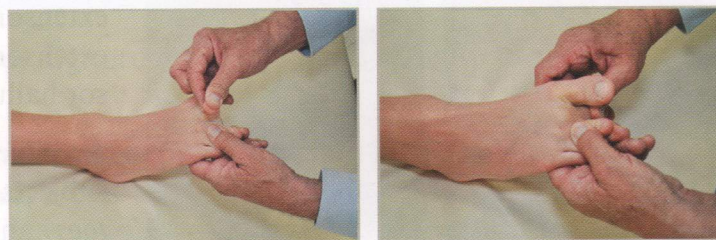
METATARSAL ARCH STRETCH: FOOT EXTENSORS

Muscles Stretched: The anterior metatarsal arch and toes, including the extensor digitorum longus, extensor digitorum brevis, extensor hallucis longus and extensor hallucis brevis.

Muscles Contracted: Gastrocnemius and soleus to plantar flex the ankle, flexor digitorum longus, flexor digitorum brevis, flexor hallucis longus, and flexor hallucis brevis, which will flex all the toes downward.

Introduction: This stretch is especially beneficial for people with limited flexion of the toes (*hammered toes*) and metatarsal arch region due to shortening of the dorsal (*top*) muscles and tissues (*high arches*). This is an excellent stretch for those suffering from nerve involvement such as Morton's Toe (*neuroma*). Most frequently the gastrocnemius (*calf*) is very tight and a major contributing factor to the condition. See *Gastrocnemius (Calf) Stretch*. This is also important work for diabetics and those suffering from neuropathy.

Method: Instruct the subject to plantar flex the ankle and curl the toes downward with an active contraction of the foot-ankle flexors. Provide gentle stretch with the fingers (*the thumb also works well*). Place one thumb under the metatarsal head. Use the remaining four fingers to clasp the top of the foot. Place the opposite side thumb or fingers on top of the toe to stretch the muscles and



METATARSAL ARCH STRETCH: FOOT EXTENSORS *continued*

connective tissues. Assist, one toe at a time. Release to the starting position and repeat the effort. In order to prevent irritation, perform one or two repetitions and move to another toe. Use this formula until the tissue gradually releases to prevent injury to the digit. If a toe is rotated inward or outward, de-rotate the toe while flexing the toe in the opposite direction that it is rotated.

Caution: These muscles and tendons will probably be quite sensitive, so proceed slowly and carefully to help prevent soreness or injury.

Repetitions: 2-5 sets of 2-5 repetitions may be necessary. Additional exercise sessions advisable.

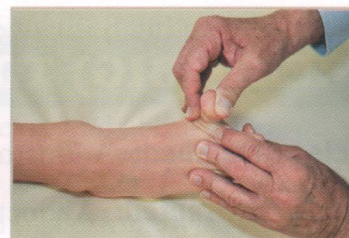
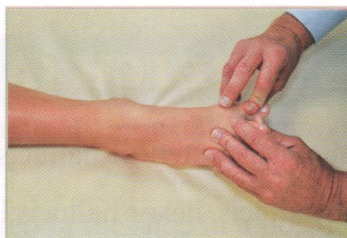
GREAT (BIG) TOE STRETCH (FLEXORS)

Muscles Stretched: Flexor hallucis brevis, flexor hallucis longus, and adductor hallucis.

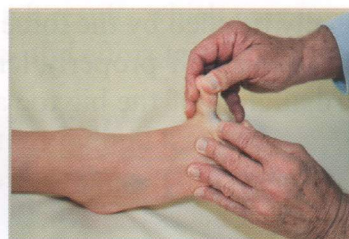
Muscles Contracted: Extensor hallucis brevis, extensor hallucis longus and abductor hallucis.

Introduction: This exercise is important when the arch is higher than normal, the big toe is hammered or angled inward (*hallux valgus*), or the foot has been affected by a neurological problem resulting in a foot drop. In addition, an inability to extend the great toe will greatly affect balance, coordination, speed, the ability to push off properly, and length of stride. Athletes who do extensive training and wear foot orthotics that provide firm support, but limit foot movement, will lose foot mobility unless they consistently perform foot flexibility and strength exercises. This is an important stretch for diabetics and those suffering from neuropathy, bunions, turf toe, or arthritis.

Method Step 1: The assistant should stabilize the area just above the proximal great toe joint with one thumb and index finger. Ask the subject to extend the big toe upward by contracting the dorsal muscles on top of the big toe. The assistant then gently assists with the free thumb and index finger. Stretch gently and release the pressure. Repeat the same process of the proximal great toe joint with the stabilizing thumb and index finger placed below the proximal big toe joint. Stretch for 1½-2 seconds at the end-feel and release. Repeat the effort 1-3 sets of 5 repetitions. Stretch carefully and beware of joint and muscle tissue sensitivity.



Step 2: This stretch and the great (*big*) toe adductor stretch are helpful to relieve inward angulation (*hallux valgus*), which is often accompanied by a bunion. This is usually caused by shoe friction (*pressure*) on the outer, proximal big toe surface. The assistant shall stabilize the great toe with one hand. The subject shall attempt to extend the big toe upward at a 45-degree angle obliquely (*up and out*) outward to stretch the tissues that are close to the adjoining 1st toe. The assistant will use their thumb and index finger of the free hand to assist the movement into the extension/abduction stretch. Assist the effort and release to the starting position. There is usually great limitation and sensitivity so please work extremely gentle, using great caution. This is also an important stretch for prolonged conditions such as diabetes, neuropathy, arthritis or turf toe. Repeat the effort 1-3 sets of 5 repetitions.



GREAT (BIG) TOE STRETCH (EXTENSORS)

Muscles Stretched: Extensor hallucis longus, extensor hallucis brevis, and adductor hallucis.

Muscles Contracted: Flexor hallucis longus, flexor hallucis brevis and abductor hallucis.

Introduction: Inflexible big toe extensors and tight Achilles tendon, soleus, or gastrocnemius muscles will lead to limited foot plantar flexion. A weak anterior tibialis muscle may also affect the problem because the tibialis anterior attaches under the great toe. This will affect speed, balance, ability to push off properly, length of stride, and coordination. Conditions such as inward angling of the big toe (*hallux valgus*), hammertoe, claw foot, metatarsalgia (*chronic pain in the joints connecting the ankle to the toes*). An abnormally high arch may result from tight calves, limited great toe flexion, and accompanying hammer toes.

Method: Instruct the subject to flex (bend) the big toe downward by contracting the muscles on the bottom (*plantar surface*) of the big toe. Stabilize proximally by placing pressure of one thumb and index finger at the head of the metatarsal (*base of the large toe*). Gently assist the movement with the opposite side thumb and index finger. The joint muscle, tendon, and connective tissue will probably be quite sensitive, please proceed carefully to prevent irritation. Assist the effort for 1½-2 seconds at the end-feel, release to the starting position and repeat the movement. Following this movement stabilize below the distal great toe joint and repeat the same movement.

Repetitions:

2 - 3 sets of 5.



GREAT (BIG) TOE STRETCH (ADDUCTORS)

Muscles Stretched: Adductor hallucis, extensor hallucis longus, and extensor hallucis brevis.

Muscles Contracted: Abductor hallucis, flexor hallucis longus, and flexor hallucis brevis.

Introduction: Quite often we see a condition in which the largest toe is angled inward (*hallux valgus*). This condition may be uncomfortable and eventually lead to the formation of a bunion. The shortened adductor hallucis and extensor hallucis muscles pull the big toe towards the second toe. If the abductor hallucis is too weak to keep the toe in the normal neutral position, it will angle inward, especially if aided by the force of the shoe or weak arch muscles. Hallux valgus affects speed, balance, ability to push off properly, length of stride and coordination. This stretch assists in alleviating the inward angling of the big toe and helps prevent friction, the major cause of a bunion. It also often positively affects a bunion that already exists by helping restore the posture of the big toe. A toe spacer between the great toe and 1st toe, strengthening the abductor hallucis, and a protective felt donut also reduces friction.

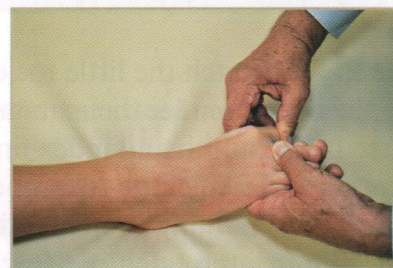
Method: Stage 1: The assistant will place mild stabilizing pressure against the outside of the big toe, just below the distal joint and have the subject attempt to spread the big toe away from the adjoining 1st toe. Stabilize the four toes with this inside hand. The subject may initially be incapable of performing this movement actively without assistance. Assist the subject's movement with the

GREAT (BIG) TOE STRETCH (ADDUCTORS) *continued*

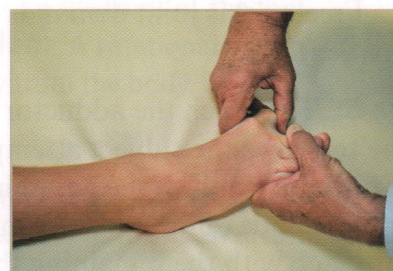
thumb and index finger of the outside hand. The joint, if mildly deformed, will need to be mobilized (*moved laterally*). Stabilize with one hand below the big toe proximal joint and gently move the big toe outward a number of repetitions with the opposite hand to increase limited joint movements.

(See previous Big Toe Extensor Stretch)

Stage 2: Following stretching of the extensors and adductors of the big toe, have the subject flex the big toe downward and the assistant will help to perform a combination stretch of downward and outward assistance for maximum stretch of the big toe extensors and adductors. Assist, movement for 1 ½ seconds, release after the effort and repeat the stretch. Stage 1 and Stage 2 of the Big Toe Adductor Stretch help correct the faulty inward posture of the toe (*hallux valgus*). A temporary large toe spacer and specific strength exercises are also necessary for proper great toe posture.



Stage 1



Stage 2

Repetitions: *Caution:* Be very gentle because sensitivity of the joint, muscles, connective tissue, scar tissue, or nerve ending will affect the stretch. Do not be discouraged about initial results because most joint and muscle distortion takes time and consistency, to correct this often serious distortion.

Repetitions: 2-3 sets of 5-8.

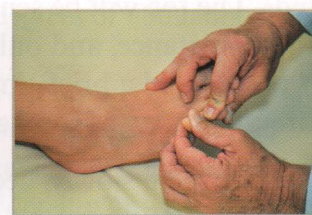
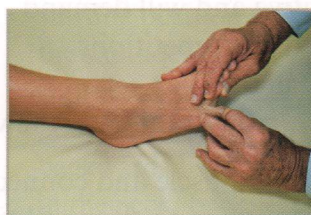
LITTLE TOE STRETCH

Muscles Stretched: Flexor digitorum longus, flexor digitorum brevis, abductor digiti minimi, plantar interossei, and flexor minimi.

Muscles Contracted: Extensor digitorum longus, extensor digitorum brevis, and abductor digiti minimi.

Introduction: Frequently the little toe is postured in the shoe in a position of flexion, hyperadduction, and inward or outward rotation. This 5th toe slides under the 4th toe rendering them both functionally limited, placing greater stress on the medial foot and arches. In some cases the little toe is abnormally spread (*abducted*) away from the 4th toe causing foot posture and balance problems. When working with the little toe, be very gentle because sensitivity of the joint, muscles, connective tissues, scar tissue or nerve endings will affect the stretch. Do not be discouraged about stretch results which may involve a number of sessions. Joint and tissue distortion require consistency, time, and effort to effect change.

Method Stage 1: The subject should attempt lifting the little toe upward, contracting the extensor digitorum longus. Isolate below the affected flexor area, placing the thumb and index finger proximal to the affected digit. Assist the subject's upward active effort with the remaining thumb and index finger. Be extra careful not to overstretch, as tissue is usually limited and could easily tear.

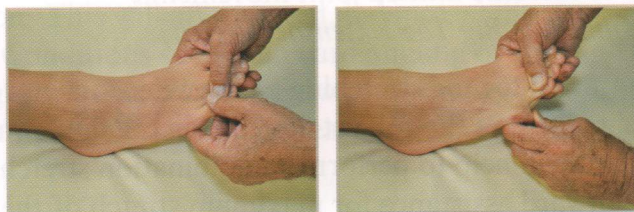


Stage 1

continued next page

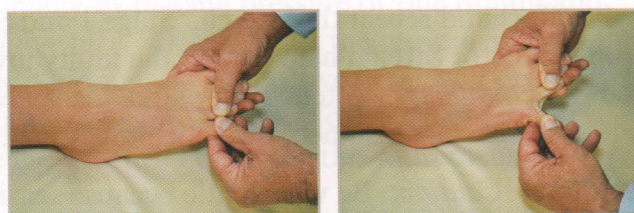
LITTLE TOE STRETCH *continued*

Stage 2: To stretch the little toe extensors, flex the little toe downward. The assistant will then place the thumb under the metatarsal head at the base of the little toe, and assist movement with the free hand thumb and index finger. In order that an immobile distal phalangeal joint may become free again, clasp the little toe just above the distal phalangeal joint to stabilize the upper little toe and use the remaining thumb and index finger to gently help free the calcified "frozen Joint", as the subject gently attempts to flex the distal phalangeal joint. Freeing this joint demands gentleness, time and patience.



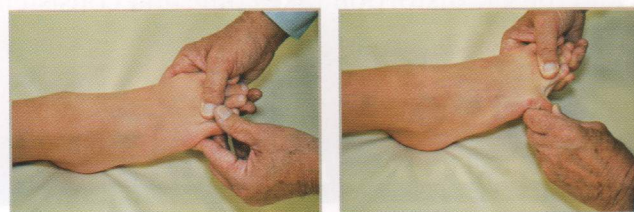
Stage 2

Stage 3: To stretch the adductor (*web*) portion on the toe, have the subject attempt to spread the toe while you stabilize the adjoining toe with one thumb and index finger. Assist in gently spreading the little toe with the remaining thumb and index finger. Be aware that the web in between the little toe is sensitive and could easily tear. Do 2-3 repetitions, rest for a few seconds and gently do an additional 2-3 repetitions, etc.



Stage 3

Stage 4: Following spreading of the web, stabilize the remaining toes and foot with one hand and have the subject attempt to flex the little toe downward and outward at a 45-degree angle. The assistant will aid with the thumb and index finger of the free hand. This de-rotation process will require a number of series and possibly more than one session, especially if seriously postured under the 4th toe.



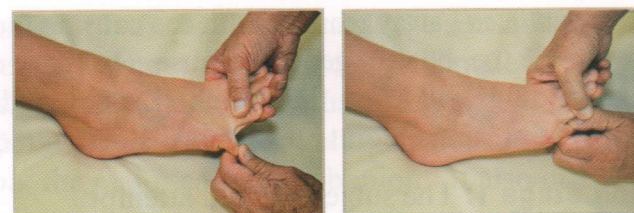
Stage 4

Stage 5: If the toe is also rotating inward or outward, mildly de-rotate the twisted toe in the opposite direction with the thumb and index finger assisting. Perform 2-5 sets of 5 as may be required.



Stage 5

Stage 6: If the little toe is splayed outward away from the 4th toe, stabilize the foot and other four toes and adduct the toe toward the 4th toe and de-rotate the joint in the opposite direction it is rotated. The toe will be sensitive and will demand sensitive assistance, and only a few repetitions (3-5) per set and a brief time in between sets.



Stage 6

Be careful to prevent soreness, pain or injury. A few sessions will probably be necessary.

Caution: Stretch slowly, because muscle and connective tissue will usually be quite short and sensitive. Repetitions: 2-3 sets of 5-8 according to the condition of the toe.

a

Abduction: Movement laterally away from the midline.

Active range of motion: Degrees of movement at a joint with movement caused by voluntary effort to move a body part being tested.

Adduction: Movement toward the body midline. Opposite of abduction.

Agonists: Muscles whose active contraction causes movement of a part of the body. The contraction of the agonist muscle, also called the prime mover, is associated with the relaxation of its opposing antagonist muscle.

Antagonists: Muscles whose action (*contraction*) opposes that of the agonist muscles.

Antagonist muscles relax to allow the agonists to effect movement.

Anterior: Front of the body or front of a body part.

Anterior pelvic tilt: Forward tilt of pelvis, which tends to increase the lumbar curve (*lordosis*).

c

Circumduction: A movement that includes flexion, abduction, extension, and adduction performed in circular sequence.

Concentric: (*contraction*): Movement during contraction as the muscles shorten.

Contracture: Sustained intrinsic activation that causes muscle shortening absent of motor unit action potentials.

d

Depression: Gliding motion in which the scapula moves downward. Opposite of elevation.

Dorsiflexion: To lift or flex the foot so that the ankle or toes are elevated upward.

e

Eccentric Contraction: Contraction during which the muscle actively lengthens.

Elevation: Gliding motion in which shoulder blade (*scapula*) moves upward. Opposite of shoulder girdle depression.

Extension: A motion in which two parts of the body on either side of a joint are moved farther away from each other.

Extensor: A muscle that extends or enlarges a joint angle.

Eversion: The motion of turning the foot outward. This combination movement involves the outward movement of the talus bone on the rear of the foot and outward movement of the metatarsal and phalangeal joints on the front of the foot.

External rotation: A rotational movement that is lateral or away from the body.

f

Fascia: A sheet or band of fibrous tissue such as lies deep to the skin or forms an investment or bandage for muscles and various organs of the body.

Flexion: The motion of bending or the state of being bent. Movement involving decreasing of the joint(*s*) angle.

Flexors: Any muscle that flexes or closes the angle of a joint in the human body.

Forefoot: The portion of the foot in front of the transverse tarsal (*ankle*) joint involving the metatarsal and phalangeal joints.

h

Hallux valgus: Condition in which the first (*great*) toe is positioned inward towards the other four toes.

Hammer toe: Chronic flexion of the interphalangeal joint of the big toe or of the proximal interphalangeal joints of the smaller toes.

Horizontal adduction-extension: A position in which the arms are shoulder high and the palms are together; the hands separate, moving apart horizontally towards the back of the body.

Horizontal flexion: The motion of bringing the arm closer to the front of the chest from a starting position at 90 degrees of abduction from the shoulder.

Hyperextension: The extension of a limb or body part beyond its normal range of motion or backwards beyond 0 degrees. Especially prevalent in the neck, back, shoulder, hip or wrist.

continued next page

i

Internal rotation: Horizontal movement of a limb toward the body midline. Medial or inward rotation.

Intrinsic muscle: A muscle that is contained entirely within the organ or part it acts upon.

Inversion: Supination or the inward movement of the entire foot.

k

Kyphosis: Increased flexion or forward bending of the thoracic spine.

l

Lateral: A location farther from the middle of the body or away from the side.

Lateral rotation: External rotation of an anterior surface of the body away from the mid-sagittal plane.

Lateral pelvic tilt: Position in which the pelvis is tilted toward the lower side. One anterior-superior spine is elevated higher than the other side.

Lordosis: An abnormal extension increase in the curvature of the lumbar or cervical spine.

Lumbar spine: Lower back; spinal area above pelvic girdle.

m

Medial rotation: Toward the midline.

Medial rotation: The motion in which the anterior surface of a body part is turned toward the mid-sagittal plane of the body; inward rotation.

p

Passive range of motion: Degrees of motion of an anatomical joint when movement is produced by an outside force without voluntary assistance.

Pelvic rotation: Movement of the pelvis in the transverse plane about the body's long axis.

Plantar flexion: Bending the ankle, foot, or the toes downward.

Posterior pelvic tilt: The cephalad (top) portion of the pelvis is shifted backward, resulting in a decreased curvature of the lumbar spine.

Pronation: The turning of a body part from the anatomical position (*face up*) 180 degrees to the opposite position.

r

Rotation: Circular movement of a structure around its axis.

s

Sciatica: Inflammation or impingement of the sciatic nerve that contributes to pain in the low back, and referred pain to the hip, thigh, or lower leg.

Scoliosis: Lateral deviation of the spinal column.

Spasm: Increased tonicity of a muscle as a result of an involuntary muscle action.

Supination: The inversion and adduction of a body part, for example, when the sole of the foot or palm of the hand faces upward.

v

Valgus: Condition in which a body part is bent outward or away from the midline of an extremity.

Varus: Deformity in which a portion of the body is bent inward or toward the body's midline.

BIBLIOGRAPHY

- Basmajian, John V. Therapeutic Exercise, 5th ed. Baltimore/London, Williams and Wilkins, 1990
- Beaulieu, John E. Stretching For All Sports, Pasadena, California, Athletic Press, 1980
- Brashear, H. Robert Jr., R. Beverly Raney Sr., Shands Handbook of Orthopedic Surgery, St. Louis, Missouri, C.V. Mosby Company, 1971
- Calais-Germain, Blandine. Anatomy Of Movement, Seattle, Washington, Eastland Press, 1993.
- Dail, Nancy W., Timothy A. Agnew, R.T. Floyd, Kinesiology For Manual Therapies, New York, New York, McGraw-Hill, 2011
- Dalton, Erik, PH.D., Advanced Myskeletal Techniques, Oklahoma City, Oklahoma, Freedom From Pain Institute, 2005
- Floyd, R.T., Clem W. Thompson, Manual of Structural Kinesiology, C.V. Mosby, St. Louis, Missouri, 1994
- Gardiner, M. Dena, The Principles of Exercise Therapy, 3rd Edition, London, England, G. Bell and Sons, LTD., 1975.
- Garrick, James G. MD., David R. Webb, MD., Sports Injuries: Diagnosis And Management, W.B. Saunders Company, Philadelphia. 1990
- Gorman, David., The Body Moveable, Ampersand Press, Guelph, Ontario. 1981
- Hammer, Warren I., Functional Soft-Tissue Examination and Treatment by Manual Methods, 3rd. Edition, Boston, Massachusetts, Jones and Bartlett Publishers, 2007
- Hoppenfeld, Stanley M.D., Physical Examination of the Spine and Extremities, New York, New York, Appleton-Century-Crofts, 1976
- Juhan, Deane, Job's Body, Barrytown, New York, Station Hill Press, 1987
- Kendall, Florence Peterson, P.T. and Elizabeth Kendall McCreary, Muscle Testing and Function, 3rd. Edition, Baltimore/London, Williams and Wilkins, 1983
- Klafs, Carl E., Daniel E. Arnheim, Modern Principles of Athletic Training, 8th Edition, C.V. Mosby, St. Louis, Missouri, 1992
- Luttgens, Kathryn., Helga Deutsch., Nancy Hamilton., Kinesiology Scientific Basis of Human Motion., 8th Edition, Brown & Benchmark, Madison, Wisconsin. 1992
- Magee, David J PH.D., Orthopedic Physical Assessment, 2nd. Edition, W.B. Saunders Company, Philadelphia, 1992
- Mattes, Aaron L, Active Isolated Stretching, Sarasota, Florida, Self Published, 1995
- Mattes, Aaron L., Active Isolated Stretching: The Mattes Method, Sarasota, Florida, Self Published, 2000

continued next page

BIBLIOGRAPHY *continued*

Neumann, Donald A, Kinesiology of the Musculoskeletal System, St. Louis, Missouri, C. V. Mosby, Inc. 2002

Norkin, Cynthia C., Pamela K. LeVangie, Joint Structure and Function, 2nd. Edition, Philadelphia, Pennsylvania, F.A. Davis Company, 1992

O'Donoghue, Don H. MD., Treatment of Injuries to Athletes, 4th Edition, Philadelphia, Pennsylvania, W.B. Saunders, 1984

Oschman, James L., Energy Medicine, The Scientific Basis, Philadelphia/London, Churchill Livingstone, 2000

Raney, R. Beverly Sr., H. Robert Brashear, Jr., Alfred R. Shands, Jr., M.D., Shand's Handbook of Orthopaedic Surgery, The C.V. Mosby Company, Saint Louis, 1971

Rasch, Philip J., Roger K. Burke, PH.D., Kinesiology and Applied Anatomy, 7th Edition, Philadelphia, Pennsylvania, Lea and Lebigier, 1989

Salter, Rober B., Textbook of Disorders and Injuries of the Musculoskeletal System, The Williams & Wilkins Company, Baltimore, 1970

Solveborn, Sven A, M.D., The Book About Stretching, Tokyo, Japan Publications, Inc. 1989

Steindler, Arthur M.D., Kinesiology of The Human Body Under Normal and Pathological Conditions, 5th Edition, Springfield, Illinois, Charles Thomas Publisher, 1977

Sweigerd, Lulu E., Human Movement Potential, ITS Ideokinetic Facilitation, New York, New York, Dodd, Mead and Company, Inc. 1974

Travell, Janet G. M.D., David G Simons M.D., Myofascial Pain and Dysfunction The Lower Extremities., Vol. 1, Baltimore, Maryland, Williams and Wilkins, 1983

Travell, Janet G M.D., David G. Simons M.D., Myofascial Pain and Dysfunction, Vol. 2, Baltimore, Maryland, Williams and Wilkins, 1992

ANKLE-FOOT FLEXIBILITY: ACTIVE

Stretching the ankle and foot muscles prior to activity or rehabilitation to improve performance or enhance healing. Suggest stretching in the order presented.

1. Dorsal Ankle Stretch
2. Soleus Stretch
3. Achilles Tendon Stretch
4. Gastrocnemius (Calf) Stretch
5. Outer Gastrocnemius Stretch
6. Inner Gastrocnemius Stretch
7. Evertor Stretch
8. Invertor Stretch
9. Foot Pronator Stretch
10. Foot Supinator Stretch
11. Metatarsal Arch Flexors
12. Metatarsal Arch Extensors
13. Toe Adductor (Web) Stretch
14. Great (Big) Toe Stretch (Flexors)
15. Great (Big) Toe Stretch (Extensors)
16. Great (Big) Toe Stretch (Adductors)
17. Little Toe Stretch

ELBOW, RADIAL-ULNAR, WRIST, FINGER, AND THUMB FLEXIBILITY: ACTIVE

1. Elbow Flexor Stretch
2. Triceps Stretch
3. Radial-Ulnar Pronation
4. Radial-Ulnar Supination
5. Wrist Extension: Prone
6. Wrist Extension: Supine
7. Wrist Flexion
8. Wrist-Finger Extensor Stretch
9. Wrist Radial Flexion (Abduction)
10. Wrist Ulnar Flexion (Adduction)
11. Finger Extensor Stretch
12. Finger Flexor Stretch
13. Finger Flexor – Joint Stretch
14. Finger – Wrist Flexor Stretch
15. Finger Adductor (Web) Stretch
16. Finger Abductor Stretch
17. Interphalangeal Joints

THUMB STRETCHING

1. Thumb Opposition Stretch
2. Thumb Adductor (Web) Stretch
3. Thumb Abductor Stretch
4. Thumb Extensor Stretch

HIP – BACK PROTOCOL: ACTIVE

Because lower back problems are among the most common complaints of subjects, I have developed the following protocol specifically to promote hip-back flexibility, which is vital to a strong, healthy, and flexible hip, back and pelvic girdle.

1. Psoas – Iliacus Stretch: Prone
2. Psoas – Iliacus – Sartorius: Kneeling
3. Quadriceps Stretch: Side Lying
4. Hip Adductor Stretch (Groin) – Supine
5. Single Leg Pelvic Tilt
6. Lateral Gluteus Maximus Stretch
7. Oblique Gluteus Maximus Stretch
8. Double Leg Pelvic Tilt
9. Oblique Double Leg Pelvic Tilt
10. Piriformis Femoral Attachment
11. Piriformis: Sacral
12. Gastrocnemius (Calf) Stretch
13. Outer Gastrocnemius Stretch
14. Inner Gastrocnemius Stretch
15. Bent Knee Hamstring Stretch
16. Bent Knee “Inner Hamstring Stretch”
17. Bent Knee “Outer Hamstring Stretch”
18. Straight Leg Hamstring Stretch – Neutral
19. Straight Leg “Inner Hamstring Stretch”
20. Straight Leg “Outer Hamstring Stretch”
21. Hip Abductor Stretch
22. External Hip Rotator Stretch: Supine
23. Internal Hip Rotator Stretch: Supine
24. Medial Hip-Thigh Muscles Stretch
25. Bent Knee Trunk Flexion
26. Seated Trunk Rotation
27. Thoracic-Lumbar Rotation – Seated
28. Lateral Trunk Flexion (Seated or Standing)
29. Lateral Trunk Flexion – Forward Oblique
30. Trunk Extension – Posterior Oblique

continued next page

KNEE STRETCHING PROTOCOL: ACTIVE

1. Gastrocnemius
2. Bent Knee Hamstrings
3. Bent Knee "Inner Hamstring Stretch"
4. Bent Knee "Outer Hamstring Stretch"
5. Straight Leg Hamstring Stretch – Neutral
6. Straight Leg "Inner Hamstring Stretch"
7. Straight Leg "Outer Hamstring Stretch"
8. Hip Adductors
9. Hip Abductors
10. Quadriceps

NECK FLEXIBILITY: ACTIVE

Active neck exercises. Great care should be taken as many subjects have neck problems. Perform exercises in order listed.

1. Anterior Semi-Circles
2. Cervical Flexion
3. Cervical Hyperextension
4. Cervical Oblique Hyperextension
5. Cervical Lateral Flexion: Right
6. Cervical Lateral Flexion:
Forward Oblique Right
7. Cervical Flexion Forward Oblique: Right
8. Cervical Rotation: Right
9. Cervical Lateral Flexion: Left
10. Cervical Lateral Flexion:
Forward Oblique Left
11. Cervical Flexion Forward Oblique: Left
12. Cervical Rotation: Left

NECK FLEXIBILITY: ACTIVE GRAVITY

1. Cervical Anterior Semi-Circles
2. Cervical Hyperextension
3. Cervical Hyperextension: Oblique
4. Cervical Lateral Flexion: Right
5. Cervical Rotation: Right
6. Cervical Lateral Flexion: Left
7. Cervical Rotation: Left
8. Cervical Flexion
9. Cervical Flexion Forward Oblique
10. Cervical Flexion: Oblique

SHOULDER FLEXIBILITY: ACTIVE

Active exercises for the shoulder joint and shoulder girdle. Optimum results if performed in order presented.

1. Shoulder Circumduction – Circles
2. Horizontal (Abduction) Extension 1
3. Shoulder: (Abduction) Extension II
4. Hyperextension Single Arms
5. Shoulder Hyperextension (Hands Clapsed)
6. Longhead Biceps Brachii: Single Arm
7. Shoulder Abduction: Posterior Oblique
8. Shoulder Adduction: Posterior Oblique
9. Shoulder Horizontal Abduction: Posterior
10. Shoulder External Rotation
11. Shoulder Internal Rotation
12. Shoulder Horizontal Flexion 1
13. Shoulder Horizontal Flexion II
14. Deltoid Stretch
15. Shoulder Triceps Stretch
16. Shoulder Forward Elevation
17. Shoulder Sideward Elevation
18. Posterior Hand Clasp (Apley Scratch Test)

ANKLE-FOOT FLEXIBILITY: ASSISTED

Stretching the ankle and foot muscles prior to activity or rehabilitation to improve performance or enhance healing. Suggest stretching in the order presented.

1. Soleus Stretch: Prone
2. Achilles Stretch
3. Gastrocnemius (Calf) Stretch: Supine
4. Gastrocnemius (Calf) Stretch: Seated
5. Ankle Invertor Stretch
6. Ankle Evertor Stretch
7. Foot Pronator Stretch
8. Foot Supinator Stretch
9. Dorsal Ankle Stretch
10. Metatarsal Arch Stretch: Foot Flexors
11. Toe (Web) Adductor Stretch
12. Metatarsal Arch Stretch: Foot Extensors
13. Great (Big) Toe Stretch (Flexors)
14. Great (Big) Toe Stretch (Extensors)
15. Great (Big) Toe Stretch (Adductors)
16. Little Toe Stretch

ELBOW, RADIOULNAR, WRIST, FINGER AND THUMB FLEXIBILITY: ASSISTED

1. Elbow Flexor Stretch
2. Triceps Stretch
3. Radial-Ulnar Pronation
4. Radial-Ulnar Supination
5. Wrist Extension: Prone
6. Wrist Extension: Supine
7. Wrist Flexion
8. Wrist Radial Flexion (Abduction)
9. Wrist Ulnar Flexion (Adduction)
10. Wrist-Finger Extensor Stretch
11. Finger Extensor Stretch
12. Finger Flexor Stretch
13. Finger Adduction (Web) Stretch

THUMB STRETCHING

14. Thumb Adductor (Web) Stretch
15. Thumb Abductor Stretch
16. Thumb Opposition Stretch
17. Thumb Extensor Stretch

HIP/KNEE/TRUNK FLEXIBILITY: ASSISTED

Because lower back problems are among the most common complaints of subjects, I have developed the following protocol specifically to promote hip-back flexibility, which is vital to a strong, healthy, and flexible hip, back and pelvic girdle.

1. Hip Flexors-Psoas-Iliacus-Sartorius
2. Hip Adductors (Groin) Stretch: Single
3. Single Leg Pelvic Tilt-Hip Flexion
4. Lateral Gluteal Stretch
5. Oblique Gluteus Maximus Stretch
6. Piriformis Stretch: Femoral Attachment
7. Piriformis Stretch: Sacral Attachment
8. Double Leg Pelvic Tilt
9. Oblique Double Leg Pelvic Tilt
10. Gastrocnemius (Calf) Stretch
11. Hamstring Stretch: Bent Knee
12. Bent Knee "Inner" Hamstrings
13. Bent Knee "Outer" Hamstrings
14. Hamstring Stretch: Straight Leg - Neutral
15. Straight Leg "Inner" Hamstring
16. Straight Leg "Outer" Hamstrings
17. Hip Abductor Stretch
18. Quadriceps Side Lying
19. External Hip Rotators: Supine
20. External Hip Rotators: Prone
21. Internal Hip Rotator Stretch: Supine
22. Medial Hip-Thigh Muscles Stretch
23. Big Three
24. Lateral Trunk Flexion
25. Anterior Oblique Trunk Flexion
26. Posterior Oblique Trunk Flexion
27. Bent Knee Trunk Flexion
28. Seated Trunk Rotation
29. Thoracic-Lumbar Rotation "Seated"
30. Sacroiliac Stretch
31. Thoracic Extension

continued next page

KNEE STRETCHING PROTOCOL: ASSISTED

1. Gastrocnemius
2. Bent Knee Hamstrings
3. Bent Knee "Inner Hamstrings Stretch"
4. Bent Knee "Outer Hamstring Stretch"
5. Straight Leg Hamstring Stretch – Neutral
6. Straight Leg "Outer Hamstring Stretch"
7. Straight Leg "Outer Hamstring Stretch"
8. Hip Adductors
9. Hip Abductors
10. Quadriceps

NECK FLEXIBILITY: ASSISTED SEATED

Great care should be taken as many subjects have neck problems. Perform exercises in order listed.

1. Anterior Semi-Circles
2. Cervical Flexion
3. Cervical Extension (Hyperextension)
4. Cervical Lateral Flexion
5. Cervical Rotation
6. Cervical Anterior Oblique
7. Cervical Posterior Oblique

NECK FLEXIBILITY: ASSISTED GRAVITY

1. Cervical Hyperextension
2. Cervical Hyperextension: Oblique
3. Cervical Lateral Flexion: Right
4. Cervical Rotation: Right
5. Cervical Lateral Flexion: Left
6. Cervical Rotation: Left
7. Cervical Flexion: Supine
8. Cervical Flexion: Oblique
9. "Aaron Mattes' Digastric Technique"

SHOULDER FLEXIBILITY: ASSISTED

Assisted stretching exercises for the shoulder joint and shoulder girdle. Optimum results if performed in order presented.

1. Shoulder Circumduction
2. Weighted Shoulder Warm-up
3. Horizontal (Abduction) Single Arm
4. Horizontal Abduction – Side Lying
5. Horizontal (Abduction) Extension I
6. Horizontal (Abduction) Extension II
7. Shoulder Hyperextension: Single Arms
8. Shoulder Hyperextension: Palm Outward
9. Shoulder Abduction: Posterior Oblique
10. Shoulder Adduction: Posterior Oblique
11. Horizontal Abduction: Posterior
12. Shoulder External Rotation
13. Shoulder External Rotation: Prone
14. Shoulder: Internal Rotation
15. Horizontal Flexion I
16. Horizontal Flexion II
17. Triceps Brachii Stretch: Assisted
18. Shoulder Forward Elevation (A)
19. Shoulder Forward Elevation: Side Lying (B)
20. Shoulder Forward Elevation: Prone
21. Shoulder Sideward Elevation (A)
22. Sideward Elevation: Palm Down (B)
23. Sideward Elevation: Palm Backward (C)
24. Lateral Trunk Flexion: Seated
25. Anterior Oblique Trunk Flexion
25. Posterior Oblique Trunk Flexion
25. Shoulder: Posterior Hand Clasp

ABOUT AUTHOR

Aaron L. Mattes - Kinesiologist

Aaron Mattes received his Bachelor of Science Degree from Wisconsin State University - Superior, 1970 majoring in Physical Education. Mattes received his Master of Science Degree from the University of Illinois, Urbana-Champaign, 1972, with special emphasis in Kinesiology and Kinesiotherapy. Mattes served as pitching coach for the University of Illinois baseball team. Mattes directed Kinesiotherapy Clinics at the University of Illinois (1972-1976) and the University of Toledo (1976-1979). Mattes experience encompasses over 200,000 hours in instruction, rehabilitation, athletic training, adapted physical education, sports medicine, training and preventive programs. He is a registered Kinesiotherapist #449 and a certified member of the American Kinesiotherapy Association. He is a licensed Massage Therapist #3864 and a member of the Florida State Massage Association and the American Massage Therapy Association. Mattes is a member of the Association of Medical Rehabilitation Administrators, and the National Rehabilitation Association #039204. Mattes lectures internationally at sports medicine clinics, medical seminars, massage therapy conventions, and continuing education to personal trainers, nurses, strength trainers, athletic trainers, physical therapists, massage therapists, coaches and athletes. Mattes serves as a consultant to sports clubs, high school, college and professional athletes and teams. He has rehabilitated thousands of subjects including famous politicians, entertainers, and hundreds of Olympic and professional athletes.

AUTHOR:

Flexibility for Conditioning And Rehabilitation: 1980
Flexibility: Active And Assisted Stretching: 1990
Active Isolated Stretching: 1995
Active Isolated Stretching: The Mattes' Method: 2000
Specific Stretching For Everyone: 2000
Active Isolated Strengthening: The Mattes' Method: 2006
Aaron Mattes' Active Isolated Stretching: 2012

Co-AUTHOR

Exercise for Pre-Conditioning, Re-Conditioning, and Re-Habilitation: Shelton, Greninger, Mattes 1972
Nutrition Therapy For Massage and Physical Therapy Patients: Knight and Mattes 1998

VIDEO'S/DVD'S:

Flexibility Active Isolated Stretching: 1990
Flexibility Active Isolated Stretching: Assisted: 1990
Active Isolated Stretching: 1998
Active Isolated Stretching: Assisted: 1998
Active Isolated Strengthening: The Mattes' Method: 2006

CHARTS:

Active Isolated Stretching: Upper Body: 1997
Active Isolated Stretching: Lower Body: 1997

ISBN# 0965639649



8 94327 00110 5