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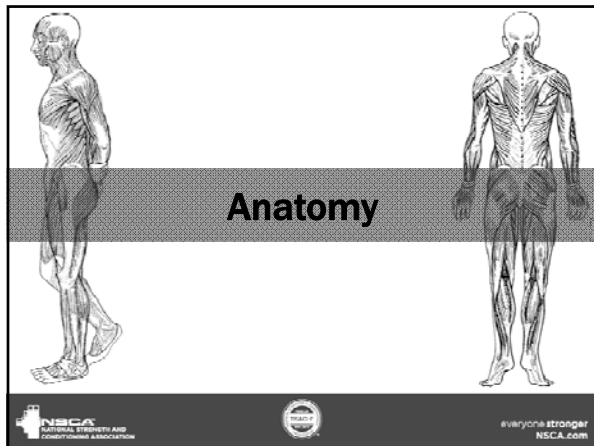
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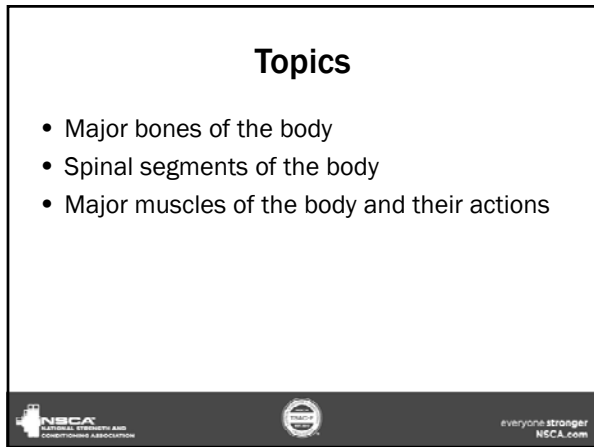


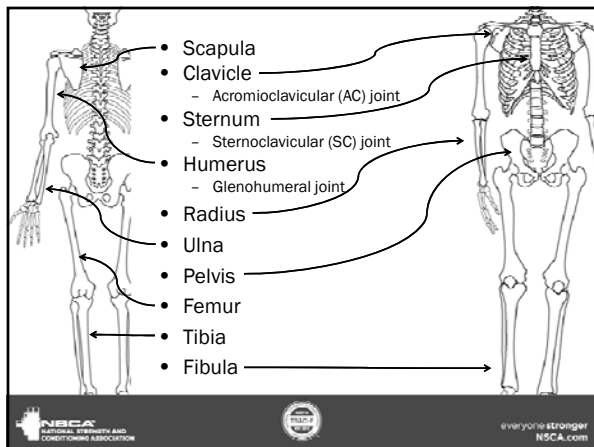
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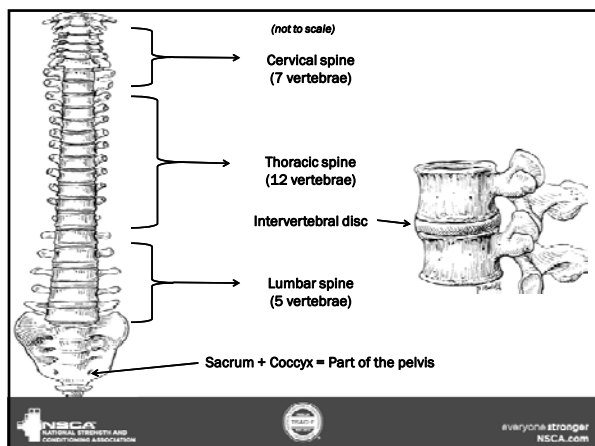
- Anatomy is not directly tested on the TSAC-F exam but is fundamental to understanding exercise selection, technique, variation, and population-specific injury concerns

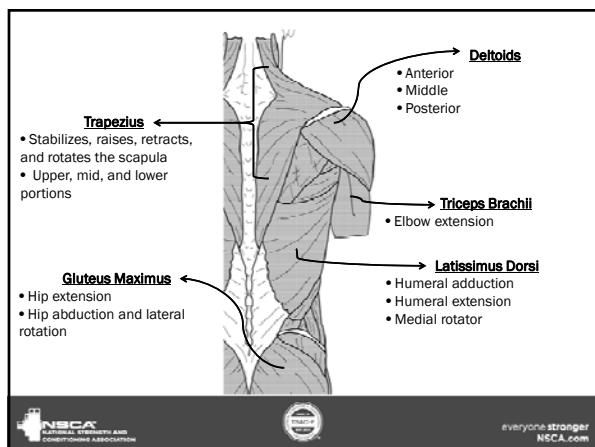


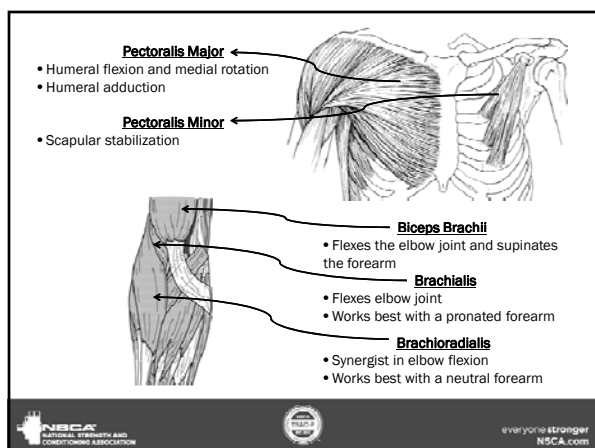


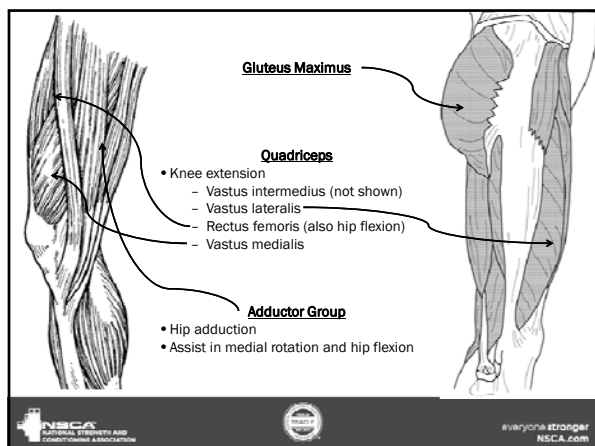


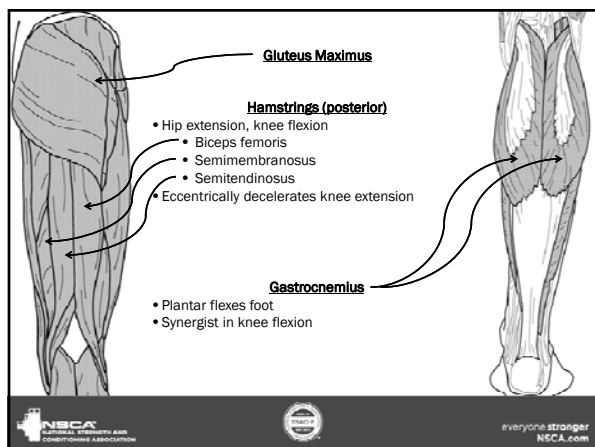










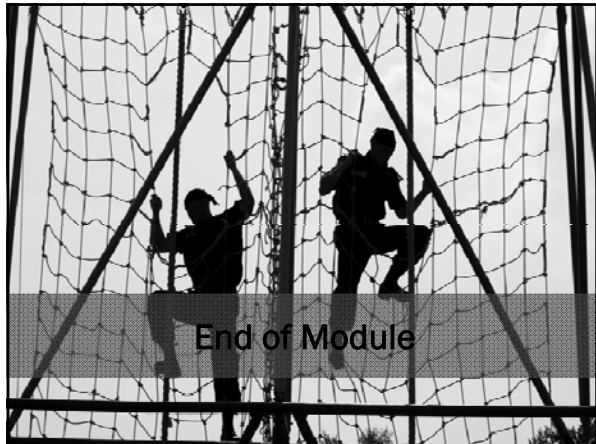


Anatomy and Muscle Actions

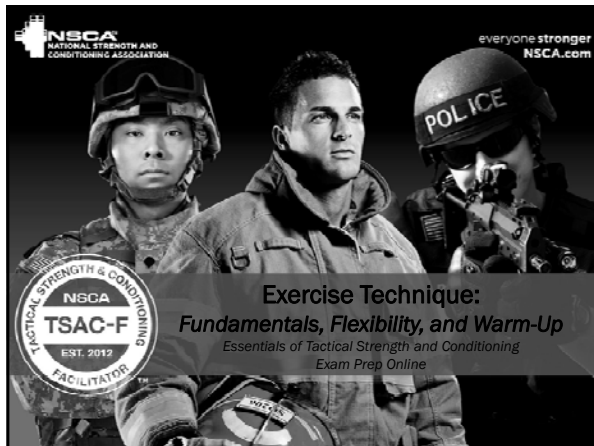
- An additional document is available on the main page in the Resources section
 - Muscle Anatomy and Action Reference Document

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Content Weighting



Exercise Technique Topic Areas	RE	AP	AN	Total
Warm-Up	0	2	0	2
Flexibility Technique	1	2	0	3
Total	1	4	0	5









Topics


- Handgrips and widths
- Safe body positions while lifting
- Appropriate breathing techniques
- Spotting fundamentals



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Handgrips and Widths

Supinated	Pronated	Neutral	Hook
			

Other: closed, opened, and alternated



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Body Position

- Stable body position
 - Always maintain proper body alignment (athletic stance)

Benches and chairs

1. Back of head
2. Shoulders/upper back
3. Buttocks
4. Right foot
5. Left foot

Prone machines

1. Chin/cheek
2. Chest and stomach
3. Hips and front of thighs
4. Right hand
5. Left hand



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Breathing

- Exhale through the sticking point
- Valsalva maneuver
- Weight belts



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Spotting Fundamentals

- Body position and number of spotters
 - Stand close and use proper lifting posture
- Spotting location
 - Dumbbell exercises
 - Over-the-face exercises
 - Structural exercises
 - Power exercises
- Communication





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Topics


- Purpose of a warm-up
- Descriptions of types of flexibility
- Methods of stretching
- Steps to warming up






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Benefits of Warm-up

- Decreases likelihood of injury
- Increases range of motion
- Prepares body for movement
- Reinforces proper technique
- Addresses mobility and stability patterns
- Increases proprioception for task-specific skills



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Physiological Benefits of a Warm-up

- ↑ blood flow, O₂ delivery, muscle temperature, and core temperature
- ↑ muscle contraction (agonist) and muscle relaxation (antagonist)
- ↑ rate of force development and reaction time
- ↑ strength and power
- ↑ metabolic rate
- ↓ viscous resistance in muscles



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Flexibility Defined

- Static flexibility
 - Range of motion (ROM) around a joint during *passive* movement
 - Hyperlaxity (ROM that exceeds “normal”)
- Dynamic flexibility (mobility)
 - Available ROM during *active* movements



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Factors Affecting Flexibility

- Joint structure
- Muscle and connective tissue
- Age
- Gender
- Temperature
- Activity level



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Types of Stretching

- Static
 - Passive stretch held for ~30 s
- Ballistic
 - A bouncing-type movement
 - Stimulates stretch reflex; increases injury risk potential



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Types of Stretching

- Dynamic
 - Emphasizes functional movements
- Proprioceptive Neuromuscular Facilitation (PNF)
 - Muscle actions used to facilitate passive stretching
 - Stimulates Golgi tendon organ (GTO)



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Warm-up Progression

1. Gradually increase intensity (without causing fatigue)
2. Light activity to increase core temperature
3. Activation
4. Mobility
5. Dynamic flexibility
6. Technique / workout specific warm-up
7. Nervous system activation



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Warm-up Order

- General Warm-up
- Specific Warm-up
 - Dynamic stretching
 - Movements that enhance mobility specific to the upcoming workout or the tactical athlete's needs
 - Neuromuscular activation (Fire-up)
 - Activity specific
- Static stretching and PNF
 - Separate session for 5-10 min *post-activity*



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General Warm-up

- 5-10 minutes slow activities
 - Jogging
 - Skipping
- Purpose
 - ↑ heart rate
 - ↑ blood flow
 - ↑ respiration
 - ↓ viscosity of joint fluids



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Dynamic Mobility

- 8-12 minutes (examples)
 - Arm swings
 - Inch-worm
 - Lunge walk
 - Lunge with twist
 - Walking knee lift
 - Lunge with elbow to instep



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Neuromuscular Activation

- Examples

- Butt kicks
- Back pedal
- Lateral skips
- Bounding

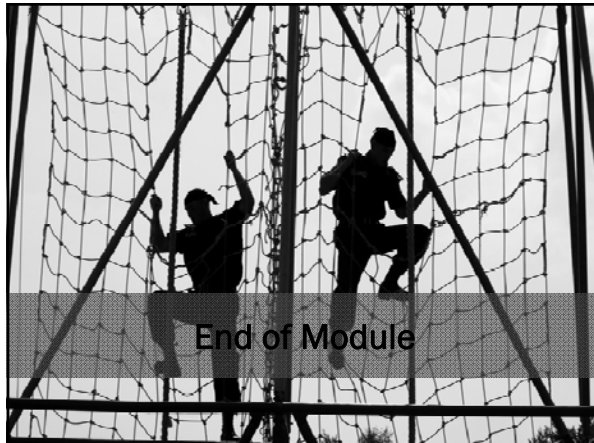


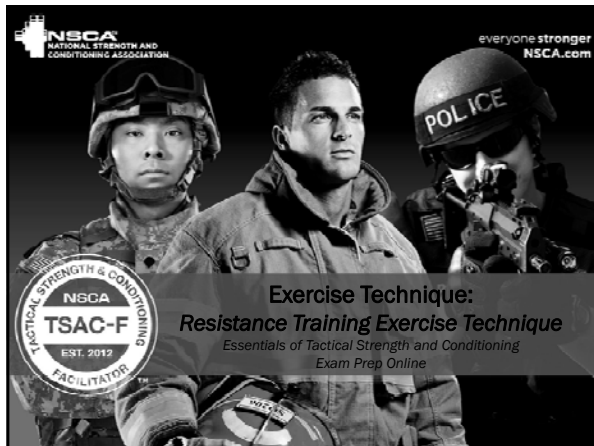
- Purpose:

- Reduce incidence of injury related to inability to maintain proper alignment of pelvis and femur
- Reinforce proper muscle sequencing



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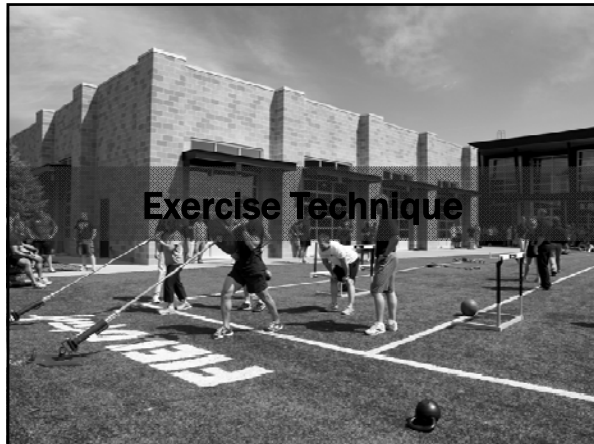
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Exercise Technique Topic Areas	RE	AP	AN	Total
Resistance Training Exercise Technique	1	4	0	5





Topics

- Basic exercise technique for traditional free-weight exercises
- Muscles involved during traditional free weight exercises
- Use of machines for weight training



Application of Biomechanics

- Torque
 - During rotation, the farther away a load is from a joint, the greater the force that will be required
- Inertial force
 - A body at rest tends to stay at rest



Breaking Down a Movement

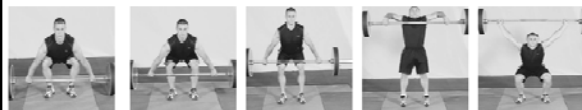
- Understand basic anatomy
- Movement analysis
 - Joint movement
- Physiological analysis



Olympic Lifts: Clean and Snatch



Start First pull Transition Second pull Catch



Analysis of Olympic Lifts

- Key points
 - Starting position
 - Neutral spine
 - Head in line with the spine or slightly extended
 - Feet flat on the floor
 - Shoulders over the bar
 - First pull
 - Torso-to-floor angle remains constant
 - Elbows remain fully extended
 - Bar remains close to the body



Analysis of Olympic Lifts

- Transition and second pull
 - Quickly thrust hips forward to allow slight flexion at the knee and a weight shift in the feet
 - Quickly and fully extend the body by bringing the bar to about chest height
- Catch
 - Quickly rotate the elbows/hands under the bar
 - Catch the bar across the deltoids, or overhead in a squat position
- The bar should travel in a relatively straight line during up and down phases



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Alternatives to the Olympic Lifts

- Which of the following **most** closely mimics the power clean?
 - Vertical jump
 - Tire flip
 - Upright row



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Primary Muscle Involvement


Exercise	Concentric Action	Muscle Group	Primary Muscle Involvement
Front squat	Hip extension	Gluteals	Gluteus maximus
	Knee extension	Hamstrings	Hamstrings
Back squat	Hip extension	Quadriceps	Quadriceps
	Knee extension	Gluteals	Gluteus maximus
Deadlift	Hip extension	Hamstrings	Hamstrings
	Knee extension	Quadriceps	Quadriceps
Deadlift	Same as front and back squat		
Stiff-leg deadlift	Hip extension	Hamstrings and gluteals	Hamstrings and gluteus maximus
	Spinal extension	Spinal erectors	Erector spinae
Good morning	Same as stiff-leg deadlift		





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Back/Front Squat

- Key points
 - Maintain a neutral spine
 - Maintain elbow position
 - Descend until thighs reach parallel
 - *Front squat only*
 - Grip: clean or crossed-arm
- Common errors
 - Rounded or slightly arched back
 - Knee alignment
 - Passing forward of the toes
 - Varus/valgus
 - Heels rise up
 - Elbow position not maintained
- Spotting









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Deadlift/Stiff-Leg Deadlift

- The stiff-leg deadlift requires greater flexibility at the hip as compared to the deadlift
- Key points
 - Closed, pronated or alternated grip
 - Maintain a neutral spine
 - Bar positioned 1 in. from shins, over the balls of the feet at the start
 - Maintain slight knee flexion (stiff-leg deadlift)
 - Hips and knees extend at same time (deadlift)
- Common errors
 - Rounded or slightly arched back
 - Elbow position not maintained
 - Bar doesn't travel in a straight line
- Spotting









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Step-Up

- Key points
 - Lead leg and hip at 90° angle when stepping up; box height should be between 12-18 in.
 - Maintain a neutral spine
 - Step off with the trail leg first (allowing for eccentric contraction)
- Common errors
 - Heel hangs off the box
 - Leaning forward as the trailing leg is brought up
 - Pushing off with trailing leg
- Spotting



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Primary Muscle Involvement

Exercise	Concentric Action	Muscle Group	Primary Muscle
Barbell bench press	Shoulder, transverse (horizontal) adduction	Chest	Pectoralis major
		Shoulders	Anterior deltoid
	Scapular protraction (abd.), elbow extension	Scapulae, chest, upper arm (posterior)	Serratus anterior, pectoralis minor, triceps brachii
Bent-over row	Scapular retraction	Upper, middle back	Middle trapezius Rhomboids
		Back	Latissimus dorsi, teres major
	Shoulder extension	Shoulders	Posterior deltoid
	Elbow flexion	Upper arm (anterior)	Brachialis, biceps brachii, brachioradialis
Seated barbell shoulder press	Shoulder abduction	Shoulders	Anterior and medial deltoids
	Scapular protraction (abduction)	Upper shoulders and upper back	Trapezius
		Scapulae	Serratus anterior
	Elbow extension	Upper arm (posterior)	Triceps brachii



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Barbell Bench Press

- Key Points
 - Maintain the 5-point body contact position
 - Grasp the bar slightly wider than shoulder-width
 - Lightly touch the chest at approximately nipple level
- Common errors
 - Bouncing bar off the chest
 - Not maintaining the 5 contact points
 - Lifting the buttocks off the bench
 - Lifting the head off the bench
 - Arching the lumbar spine
- Spotting



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Bent-Over Row

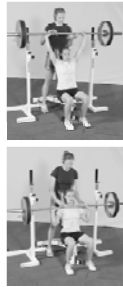
- Key points
 - Feet slightly wider than shoulder-width
 - Flex at the hip
 - Torso near parallel to the floor
 - Maintain a stationary, neutral spine
 - Knees are slightly flexed
 - Pull the bar towards the upper abdomen
- Common errors
 - Rounding the back
 - Swinging the body
 - Shrugging the shoulders
 - Heels raise up off the floor
- Spotting



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Seated Barbell Shoulder Press

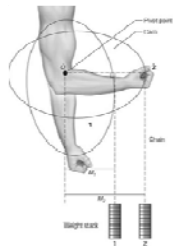
- Key points
 - Maintain the 5-point body contact position
 - Grasp the bar slightly wider than shoulder-width
 - Maintain a neutral spine
- Common errors
 - Hands, elbows, shoulders not in the same vertical plane
 - The buttocks comes off bench, low back arches, head deviates from neutral
- Spotting



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Weight Machine Training

- Variety of machines
 - Direction and pattern of resistance are modified through a variety of means:
 - Pulleys and cables
 - Cams
 - Gears
 - Changes the amount of muscular force applied at various points in a range of motion



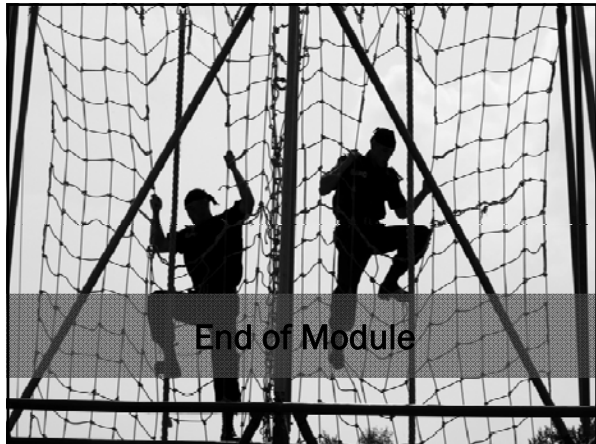
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Weight Machine Training

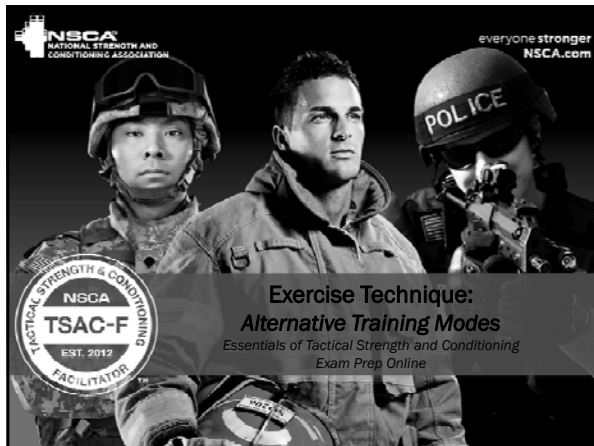
- Pros
 - Isolation of individual muscles
 - Design flexibility
 - Safety and ease of use
- Cons
 - Skill transfer
 - Open and closed chain exercise
 - Stabilization and postural muscles



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Exercise Technique Topic Areas	RE	AP	AN	Total
Alternative Training Modes	0	5	0	5







Alternative Training Modes

Topics

- Identification of alternative exercises for training tactical populations
- Key points to selection and use of alternative exercises



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Benefits of Alternative Modes

- Variety: grips, position, balance
- “On-the-go”
- Specificity
- Overall conditioning



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Alternative Training Equipment

- Functional equipment
 - Medicine balls
 - Bands
 - Suspension training equipment
 - Battling ropes
 - Kettlebells
 - Chains
 - Sledgehammers
 - Sleds



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Alternative Training Equipment

- In the field/on the job
 - Hoses
 - SCBAs/air tanks
 - Sandbags
 - Vests
 - Rucksacks
 - Flak jacket
 - Tires
 - Ammunition cans



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Alternative Exercise Examples

- Lower body
 - Rucksack front squats
 - Protective vest step-ups or lunges
 - Weighted vest stair climbs
 - Sled drag
 - Tire press



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Alternative Exercise Examples

- Upper body press
 - Standing band press
 - Rucksack press
- Upper body push
 - Medicine ball chest pass
 - Standing band chest press
 - Push-ups
 - Sandbag bench press



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Alternative Exercise Examples

- Upper body pull
 - Rope climbs
 - Suspension bodyweight rows
 - Ammo can bent-over row
 - Sled pulls



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Stability Ball Training

- Benefits are inconclusive
- Advantages
 - May increase core stability
 - Decreased injuries due to improved balance, joint stability, proprioception, and neuromuscular control
 - May increase the degree of training specificity



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Stability Ball Training

- Disadvantages
 - Increases in core stability do not transfer to improved performance
 - Training on unstable surfaces decreases overall force generation
 - Does not allow for the proper training intensity needed for strength gains



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Stability Ball Basics

- Selection and training
 - Size
 - Hips above knees, thighs just above parallel
 - Warm-up, correct form and technique
 - Neutral spine
 - Progression should be basic to complex
- Stability ball biomechanics
 - Lever length
 - Base of support



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Stability Ball Exercises

- Abdominal crunch
- Supine leg curl
- Supine hip lift
- Back hyperextension
- Elbow bridge
- Straight arm roll-out
- Stability ball push-up
- Pike roll-out
- Knee to chest (jackknife)



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