LAND VS. WATER STRENGTH TRAINING

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OBJECTIVES

• Understand the importance of general muscle strength for all populations
• Review research showing the importance of strength improvement in individuals
• Identify progressions emphasizing the importance of incorporating all planes of movement for the development of basic strength
• Understand various static postures and the influence on upper extremity movements and the disassociation of upper and lower extremity movement combined with coordination and its role in balance
• Incorporate balance, coordination, cardio and agility for upper and lower extremity exercises
• Apply the guidelines for quantifying work load and progressive overload in aquatic Resistance Training
Resistance training with land exercise has been shown to improve maximal muscle force, but improvement does not always result in improvements in function – research completed in Finland & Spain.

The aquatic environment provides instability by using the effects of turbulence which can promote greater improvements in body balance reactions.

Using ACSM weight training guidelines using free weights or weight machines on land, Colado found that land weight training had a 50% drop out rate while the aquatic group maintained the program.
RESEARCH ON AQUATIC STRENGTH TRAINING

• Measures such as weight and body mass index (BMI) have been regarded as a practical and sensitive evaluation for the prediction of health risks and outcome

• Muscle mass should be looked at as a new vital sign as it is a predictor of poor morbidity and mortality (Prado)

• “Use it or lose it” (Brody) The role of sarcopenia and dynapenia – loss of muscle mass and muscle strength contributes to the loss of independence

• Skeletal muscle is a primary driver of the relationship between body composition and clinical outcomes as it is involved in mobility, strength, and balance
COMPARISON OF BUOYANT & DRAG EQUIPMENT

• Buoyant equipment works the same muscle both concentrically when pushing down, and eccentrically when controlling the buoyant equipment to the surface of the water

• Drag equipment works the muscle pair both concentrically
  • Elbow extension with drag equipment works the triceps concentrically
  • Elbow flexion works the biceps concentrically

• Challenge – convince participants to try drag/resistive equipment and understand the importance of working muscle pairs
DRAG AND RESISTIVE EQUIPMENT OPTIONS

• Aqualogix bells & fins - different resistance levels accommodate individual needs as well as different workout formats
  • The different resistance levels can be used for specific training formats
  • The larger the blade, the more resistance
  • Choose the size that meets individual goals and abilities

• Aquastrength bells & fins
  • Two-dimensional resistance

• Hydrotone bells – 1 level, 1 color
  • Two-dimensional resistance

• NZ Cords – varied colors for different resistance
  • Made for the water
BENEFITS OF RESISTIVE EQUIPMENT

- Fluid omni-directional drag resistance is the ability to work a muscle group equally and smoothly in any direction
  - Strength & Conditioning are achieved through speed, force/power, intensity & isolated movement through full range of motion
  - Omni-directional movement combined with speed or power determines intensity of the exercise
  - Provides uniform resistance
  - Muscle balance is achieved so opposing muscle groups achieve symmetry of strength development

- Versatile and Efficient – safe for all to use
  - Different resistance levels accommodate different strength levels and workout formats to meet the needs of participants
  - Exercise in the water provides control because movements are slower while providing maximum strength and conditioning
FUNCTIONAL BALANCE & CORE STABILITY

• In the pool we can treat for center of gravity control enabling balance stability
  • Small weight shifts provide initial challenge
  • Movements should involve at least 2 planes of motion

• Strength training is the primary piece of the puzzle and the remedy for instability

• The main function of spinal orientation is to balance external loads applied to the trunk so that residual forces transferred to the lumbar spine can be handled by the stabilizing local muscles
  • The Local stabilizing muscles are the deep “core” muscles that take on the job of stiffening the lumbar spine while still allowing ROM
  • The Global muscles provide motion and control movement
STABILIZATION BEFORE MOBILIZATION

- Musculoskeletal system gives us the power to create, hold and adjust alignment
- All movement initiates in the core
- Core strength is a component of core stability and the foundation of balance and movement
- A strong core provides the strength to maintain the stable alignment to achieve the desired benefits of each exercise

- Strength loss correlates with muscle mass loss and bone density

- Water can be used to improve balance, muscle strength and endurance
CORE STRENGTH

• Functional balance training should include protocol exercises and should be executed in all planes of motion

• 6 Important Roles the Core Plays in Your Body
  • Decompression of the spine
  • Immediate improvements in balance
  • Increased joint mobility and functional movement gains
  • Increased ability to relax tonic muscles
  • Increased fluidity of movement
  • Increased performance gains
FUNCTIONAL CAPACITY

• Muscle strength, power and mass are associated with functional capacity – strength loss correlates with muscle mass loss

• Resistance training with land exercise has been shown to improve maximal muscle force in older adults, but improvement does not always result in improvements in function (Gait & Posture, 2016)

• In a land study, exercise interventions were more static and would not have challenged the neuromuscular activity (Literature Review, 2018)

• Aquatic exercise including resistant/drag equipment show similar effects in both muscle capacity and physical functioning to suggest a carryover effect for aquatic exercise (Colado, 2012)

• “Balance under static conditions accentuates the capacity to minimize line of gravity sway within a defined, unchanging base of support” (Winter, Patla, & Frank, 1990)
TYPES of FUNCTIONAL MOVEMENT

• 6 Fundamental types of exercise that should be at the core of any person’s exercise program
  • Squat Action: sitting, standing, lifting
  • Lunge Action: walking, running, kneeling, shoveling, lifting
  • Push Action: opening doors, grocery carts
  • Pull Action: opening doors, vacuuming, raking
  • Twist Action: rolling over, turning, looking over our shoulder – rotational movements
  • Gait: walking, running
  • Changing direction: agility
FUNCTIONAL TRAINING LINK

The tool that helps control intensity during strength training exercise

- Physiological
- Perceptual
- Performance
EVOLUTION OF RESISTANCE TRAINING IN THE AQUATIC ENVIRONMENT
SPAIN RESEARCH – led by Juan Colado

• Aquatic Resistance Training (RT) is a viable alternative for general and athletic populations

• RT in the water has not been widely used because there were no methods for controlling and progressing intensity
  • Formulated a method for creating progressive overload for resistance training in the water

• Recommendations/Guidelines for program design with devices that increase drag force (DIDF) include:
  • Use same design recommendation as for land for load, volume, and progression (Adapted from Colado/Triplett, 2009)
OMNI-RESISTANCE SCALE

- Quantifying aquatic resistance uses Perceived Exertion for the Omni-Resistance Scale (OMNI-RES)
- OMNI-RES scale recommends the speed of the exercise and/or repetitions with beats per minute to achieve maximum benefit of the exercise
- In the water, a double increase in speed results in a 4 times as great increase in resistive force of drag
- When you increase the pace, resistance increases quadratically (squared)
- When we speed up the movement, the execution becomes more difficult resulting in an upsurge of cardiovascular endurance and muscular strength

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<th>OMNI-RES</th>
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<tr>
<td>0</td>
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<tr>
<td>1 (10% RM)</td>
<td></td>
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<tr>
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<td>Easy</td>
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<td>3 (30% RM)</td>
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<td>4 (40% RM)</td>
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<td>5 (50% RM)</td>
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<tr>
<td>6 (60% RM)</td>
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<td>7 (70% RM)</td>
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<tr>
<td>8 (80% RM)</td>
<td>Hard</td>
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<tr>
<td>9 (90% RM)</td>
<td></td>
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<tr>
<td>10 (100% RM)</td>
<td>Extremely Hard</td>
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USING THE OMNI-RES SCALE

- To improve and progress muscle strength & endurance you must have combined control of
  - Intensity
  - Cadence/movement pace
  - Size of the equipment (surface area)
  - Length of the extremity (lever arm)
  - Hydrodynamic position of the moving segment and drag equipment used
  - Perception of effort at predetermined number of reps using Omni-Res

- Monitor pace with beats per minute or a device like a metronome
  - The resistance provided by the water is always the same
  - Use the same form and technique through full ROM

- Increase or decrease DIDF to the level necessary to maintain a prescribed pace of movement and reach the desired number of reps and level of effort
- Increase the pace of movement with the same size DIDF
RECOMMENDATIONS TO DETERMINE INTENSITY

- Determine desired repetition range based on client goals and training history
- Determine desired level of exertion
  - Use the OMNI-RES scale
  - You can also use the OMNI-RES scale to vary intensity
- Choose the appropriate DIDF
  - Based on the client’s reps and exertion level
  - The cadence should be the maximal possible allowing the exerciser to complete targeted reps at the targeted ONI-RES level
PROGRESSIVE OVERLOAD

• More repetitions (increasing speed) through full range of motion within the same period of time

• More repetitions through full range of motion at the same rate of speed

• Systematically increase the frontal surface area, buoyancy, or resistance depending on the type of equipment being used

• Application:
  • Tempo: 44 to 64 BPM (metronome)
  • Music: 88 to 128 BPM used at half time
  • Manipulating intensity with size drag equipment
    • Speed of movement
    • Size of resistance
    • Lever length
GUIDELINES for PROGRAM DESIGN

• Use same design recommendations as for land for load, volume, and progression with devices that increase drag force (DIDF)

• The variables that help to control the focus of the exercises are:
  • Intensity – perceived exertion
  • Power – the rate of doing work
  • Speed – movement as part of the power calculation
  • Angles – working all the muscle fibers by changing the angle of movement, or adding rotation to change the effect
  • Range of Motion – selection of appropriate surface drag that allows performance through the full range of motion without sacrificing form.
MOVEMENT DESIGN VARIABLES

• Include all movement planes of the body when planning a program

• Recommendations to help quantify and progress workload:
  • Use a timing device to control speed (durations and repetitions)
  • Systematically vary the load of the equipment
  • Use perceived Exertion
AQUATIC STRENGTH TRAINING

• Target all the major muscle groups

• Modifications & Progressions
  • Wall for support to free standing
  • Hand positions
  • Lever length

• Base of Support
  • Stable stance (lunge or center)
  • Less stable stance (tandem or single leg support)
BASIC UPPER EXTREMITY EXERCISES

• Front pull downs – flexion/extension (Floating)
• Lateral pull downs – lateral adduction/abduction (Uplifting)
• Crossovers, Chest flies – horizontal adduction/abduction (Enclosing)
• Alternate pull behind, pull in front
• Paddle wheels – circles in front, both directions
• Karate punches – front, and diagonal
• Lateral arm circles – depth depends on shoulder health
• Biceps curls & Triceps push backs
• Accepting – both arms, then alternate arms
• Arms to center – small to big pumps
• Uppercuts – cross body – (modified D-1 and D-2 PNF patterns)
• Trunk twists
• Wrist flexion/extension
BASIC LOWER EXTREMITY EXERCISES

- Squats
- Butt kicks
- Toe and heel rocks
- Lunges to rear
- Lunges to front
- Side lunges
- Side lateral leg lifts
- Side lateral leg circles – both directions
- Straight leg lifts – one leg repetitions, then alternate
- Karate kicks - Front, side, back
- Box step
- Soccer kick – toe touch back to cross kick in front
- Curtsy – toe touch diagonally behind, & opposite arm across front
COMBINATION and AGILITY EXERCISES

Combination Exercises (fins on hands and ankles)
• Horizontal add/abd with backward lunge & forward kick
• UE adduction/flexion/extension/abduction
• Shifting w/arms – infinity 8 & increase to large figure 8
• Squat with lateral leg lift upon standing
• Curtsy – toe touch diagonally behind, & opposite arm across front
• Soccer kick and arms pull diagonally across body
• Oyster (tree) – swing leg back, leg forward (knee bent) & hold

Shallow Water Agility (fins on hands and ankles)
• Karaoke crossover steps
• Side steps – (Flowing)
• Dance steps – tango, electric slide
• Ladder drills

Stretching - Encircling, Nurturing, Surrounding, Twisting
• Use water currents to improve muscle co-activation in the core
• Use asymmetric and a variety of exercises that increase the instability in different planes (sagittal, frontal and horizontal)
• Apply superset strategies to create a more intense and longer duration stimulus for the muscle fibers
• Use jumping activities to stimulate and increase the power of the lower extremities
• Increase size of drag or resistive equipment
• Add flotation and drag equipment to increase muscular stimulus
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