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SHSS5063

Hip Late and Pre d/c Rehabilitation

Trawsnewid Addysg; Trawsnewid Bywydau
Transforming Education; Transforming Lives



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Recap

- TASK – Goals and Treatments for Following
 - Tendinopathy (Adductor)
 - Labral Pathology – requiring arthroscopic surgery
 - Trochanteric/Gluteal/Pectineal Bursitis
 - Hip Pointer
 - Osteitis Pubis
 - Adductor/ Flexor Strain
 - Referred Pain – Gluteal region

Hip Rehab

- Recap – Early Stage (principles)
 - ROM
 - Strength
 - Endurance
 - Hypertrophy

Initial Rehab Framework

Flexibility and ROM

- Active
 - 15-30sec
 - 4-5 reps
- Passive
 - 15-30sec
 - 4-5 reps
- Prolonged
 - Up to 20mins
 - 3min if FWB

Proprioception

Maintain CV and Other Joints

M. Endurance and Strength

- Isometric
 - 20° Intervals in P+ free range
 - 5-6 sec hold (ease on & off)
 - 10 reps
 - 10 sec rest per rep
- Concentric & Eccentric
 - Strength Endurance
 - Up to 3 sets 25 reps
 - 30sec recovery per set
 - <67% 1RM
 - Strength
 - 2-6 sets
 - 6 reps
 - •85%
 - 1RM •2-5min recovery

Hip Rehab

- What is the difference between a early and i/m stage activity and a late/ pre discharge stage activity?
 - ROM
 - Strength
 - ABC
 - Function

Hip Rehab

- What is the same from as early and i/m stage of rehab ?
 - Pain/ Swelling
 - Tissue Mechanics/ Integrity
 - Confidence Levels
 - SNAP

Hip Rehab – The Problem

- Your female football athlete is now 10 weeks post hip labral surgery..... They have progressed to the level of
 - Single Leg activities
 - Started proprioceptive progression with minimal impact
 - Strength 90% of uninvolved
- What's changed in this athlete and what's your plan?

Hip Rehab – Resistance Training

- Step 1: needs analysis
- Step 2: exercise selection
- Step 3: training frequency
- Step 4: exercise order
- Step 5: training load and repetitions
- Step 6: volume
- Step 7: rest periods

Resistance Training – needs analysis

- Which muscle?
 - Body and limb movements
 - Muscular involvement
 - Common injury sites /existing injury
- What type of strength/ primary resistance training goal?
 - Strength
 - Power
 - Hypertrophy
 - Muscular endurance

Training status

- Beginner (untrained)
 - No training or just begun
 - Less than 2 months experience
 - Training 1-2 sessions per week
 - None to low training stress/ physical demand
 - None or minimal technical experience and skill
- Intermediate (moderately resistance trained)
 - Currently training
 - 2-6 months previous experience
 - 2-3 sessions per week
 - Moderate training stress
 - Basic technical experience and skill

Training status

- Advanced (well resistance trained)
 - Currently training
 - Over 1 years previous experience
 - 3-4 sessions per week
 - High training stress/stimulus
 - High technical experience or skill

Step 2: Exercise Selection

- Core and assistance exercises
 - Core exercises
 - recruit one or more LARGE muscle areas (i.e. Chest, shoulder, hip, back), involve two or more primary joints and receive priority when selecting exercises as they should be sport specific
 - Assistance exercises
 - Recruit smaller muscle areas (i.e. Upper back, abs, neck, forearm, calf), involve only one primary joint and are considered less important to improving sports performance: injury prevention type exercises

Step 3: Training Frequency

- Number of sessions completed in microcycle i.e. One week
 - Beginner: 2-3 sessions
 - Intermediate: 3-4 sessions
 - Advanced: 4-7 sessions (split routine)
- Other microcycle demands
- Organisational consideration
 - Alternate heavy and light days: aids recovery
 - Upper body muscles recover quicker from heavy loading than lower body muscles
 - Recover quicker from single joint than multi-joint exercises

Step 3: Training Frequency

- Number of sessions completed in microcycle i.e. One week
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Step 3: Training Frequency

- Periodisation considerations
 - Off season: 4-6 sessions per week
 - Pre-season: 3-4
 - In-season: 1-3
 - Post season: 0-3

Step 4: Exercise Order 1

- Sequence of exercises performed in one session
- Power, Other Core then Assistance
 - Aka multi-joint exercises then single joint exercises
 - Or large muscle areas the small muscle areas
 - Skill and concentration/technique exercises first as most affected by fatigue
 - Reverse exercise arrangement or 'pre-exhaustion'
 - Purposely fatigue muscle with single joint exercise THEN move on to multi-joint exercise

Step 4: Exercise Order 2

- Alternated Upper and Lower Body Exercises
 - Opportunity for athletes to recover more fully between exercises
 - Good for untrained individuals or if training time is limited
 - Minimal rest periods (20-30seconds) Circuit Training

Step 4: Exercise Order 3

- Alternated Push and Pull Exercises
 - Ensures same muscle group will not be used in 2 exercises in succession
 - Reduced fatigue
 - Increased ability to perform repetitions
 - Good for beginners
 - Used more commonly in upper body sessions

Step 4: Exercise Order 3

- Alternated Push and Pull Exercises
 - Ensures same muscle group will not be used in 2 exercises in succession
 - Reduced fatigue
 - Increased ability to perform repetitions
 - Good for beginners
 - Used more commonly in upper body sessions

Step 4: Exercise Order 4

- Supersets and Compound sets
 - Supersets:
 - Two sequentially performed exercises that stress two opposing muscles)or muscle areas (e.g. Agonist and antagonist
 - Compound:
 - Sequentially performing two different exercises for the same muscle group
 - Stress on the muscle is compounded
 - Not suitable for unconditioned athletes

Step 5: Training Load and Repetitions

- 1 Repetition Max

1 RM—Repetition Table	
Repetitions	% 1 RM
1	100
2	95
3	93
4	90
5	87
6	85
7	83
8	80
9	77
10	75
11	70
12	67
15	65

Step 5: Training Load and Repetitions

- Strength
 - $\geq 85\%$ 1RM (for large groups)
 - Not more at 80% 1RM for assistance exercises
 - ≤ 6 Reps
- Power
 - Single-effort event (e.g. Shot put, high-jump, weight lifting)
 - 80-90% 1RM for 1-2 Reps
 - Multiple-effort event (e.g. Basketball, volleyball)
 - 75-85% 1RM for 3-5 Reps

Step 5: Training Load and Repetitions

- Hypertrophy
 - 67-85% 1RM
 - 6-12 Reps
- Muscular Endurance
 - $\leq 67\%$ 1RM
 - ≥ 12 Rep

Step 5: Training Load and Repetitions

- Progressing Load
 - 2 for 2 rule
 - If athlete can perform 2 more reps on last set than is required, on 2 consecutive workouts, load can be increased
- Smaller, weaker, less trained athletes: (2.5%)
 - Upper body: 2.5-5 lb or 1-2kg increase
 - Lower body: 5-10 lb or 2-4kg increase
- Larger, stronger, more trained athletes (10%)
 - Upper body: 5-10lb + or 2-4kg + increase
 - Lower body: 10-15lb + or 4-7kg + increase

Step 6: Volume

- Volume: total amount lifted in a training session
 - Sets
 - Repetitions
- e.g. 2 sets of 10 reps of 50kg back squats
 - $2 \times 10 \times 50 = 1000\text{kg}$
- Single set V Multiple sets

Step 6: Volume

- Strength
 - ≤ 6 reps
 - 2-6 sets
- Power
 - Single-effort: 1-2 reps of 3-5 Sets
 - Multiple-effort: 3-5 reps of 3-5 Sets
- Hypertrophy
 - 6-12 reps
 - 3-6 Sets
- Muscular Endurance
 - ≥ 12 reps
 - 2-3 Sets

Step 7: Rest Periods

- Inter-set period
- Strength
 - 2-5 mins
- Power
 - Single-effort event: 2-5 mins
 - Multiple-effort event: 2-5 mins
- Hypertrophy
 - 30-90 sec
- Muscular Endurance
 - <30 sec

Step 7: Rest Periods

- Inter-set period
- Strength
 - 2-5 mins
- Power
 - Single-effort event: 2-5 mins
 - Multiple-effort event: 2-5 mins
- Hypertrophy
 - 30-90 sec
- Muscular Endurance
 - <30 sec

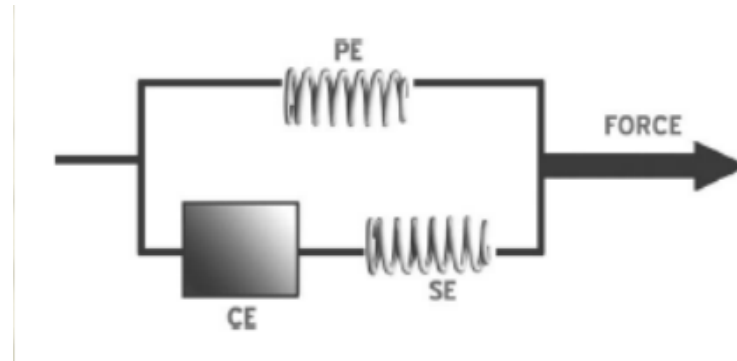
Why Plyometrics?

- This could be described as load acceptance rather than force generation
- Advantage of greater specificity with regards timing and mechanics (off-set by reduced flexibility in both)
- Provide a valuable link between training and performance (more than just a SSC)
- Evidence of improvements from training:
 - Running economy improved with plyos (Turner 2003, Saunders 2006)
 - Effective in improving jump height (Marcovic 2007)
 - Improvements in sprint ability and agility (Marcovic 2010)

Why Plyometrics?

- Three Main Theories Behind the SSC Gains:
 - Storage of elastic energy
 - Neurophysiological model
 - Working range

Storage of Elastic Energy



- Primarily in tendons (SEC) – (Kubo, 1999). Typically the muscle will remain isometric whilst the tendon lengthens e.g. Gastroc and achillies tendon(Wilson, 2010)

Storage of Elastic Energy

- Also some contribution from cross bridges (Lindstedt, 2002) but timing varies according to fibre type.
- Type II fibre cross bridges are formed and broken rapidly. Therefore the elastic properties of these connections can only be taken advantage of during “fast” SSCs.
- Type I fibre cross bridges take place more slowly and therefore can be utilised during longer SSCs.
- How should this impact our training?
- Fast and Slow SSC?

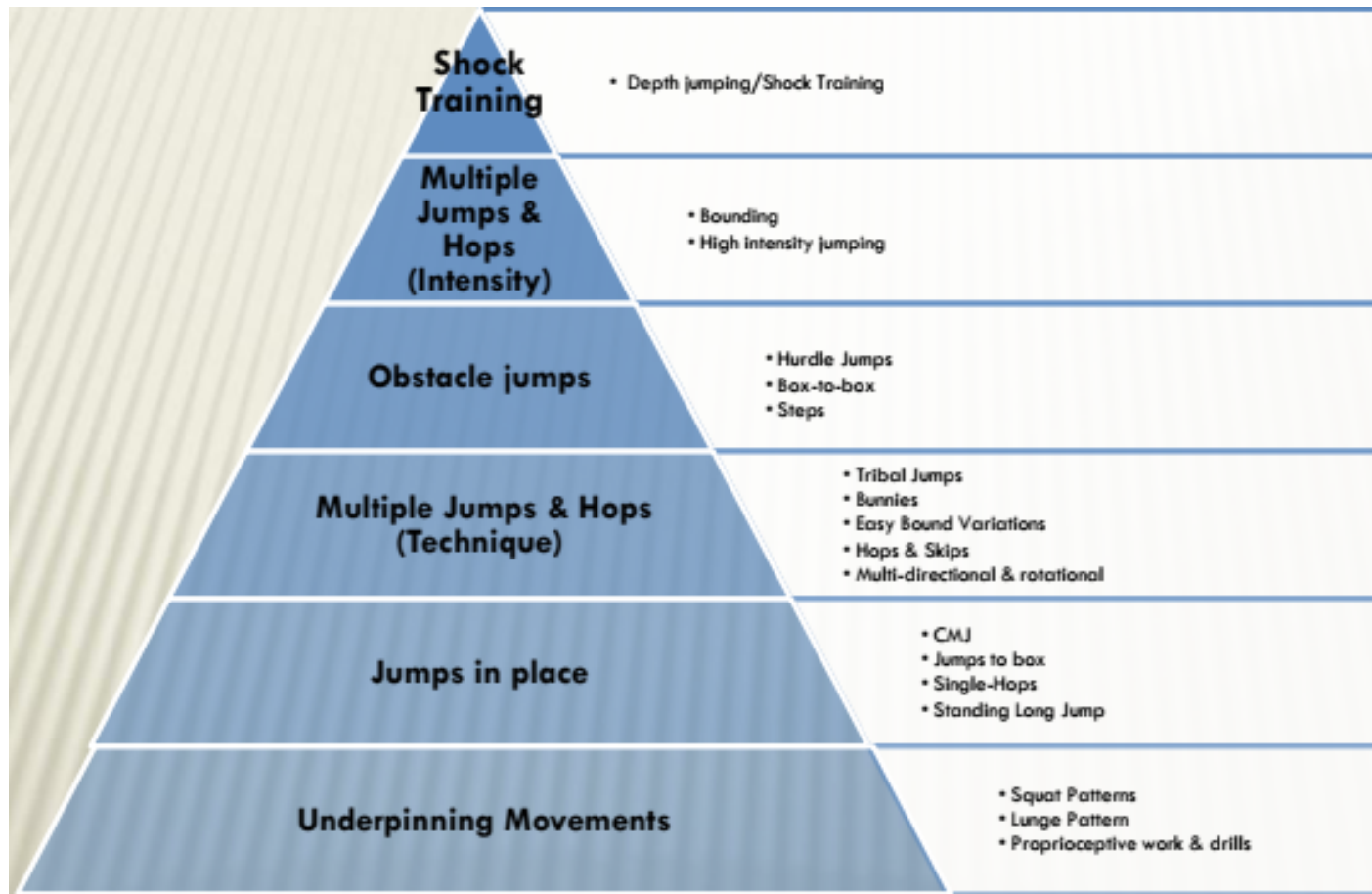
Neurophysiological Approach

- Essentially a trade-off between potentiation from the spindle fibres and the Golgi tendon organs.
- Spindle fibres lie parallel to muscle fibres and deform on stretch. This activates afferent nerve fibres.
 - Monosynaptic (M1) 30-40ms
 - Direct communication within the muscle
 - Functional stretch reflex (M2) 50-80ms
 - Higher centres of brain and spinal cord (Wilson 2010)
- GTOs inhibition typically reduces EMG 50-100ms before and during ground contact (Schmidtbleicher et al, 1995). This can be reduced with plyometric training (disinhibition).

Working Range

- Greater active state can be achieved during the ammortisation phase leading to higher muscle tension prior to the onset of movement
- It has been suggested that this is the sole reason for the difference between CMJ and SJ (Bobbert 1996)
- Peak force may take anywhere from 0.25-0.8s to generate, depending on RFD and level of strength
- Finally, the stretching of the fascicles following the eccentric phase places the quadriceps closer to their optimal length and thus there is a mechanical advantage.

Science of Jumping



Task

- Work through the exercises and decide when plyometric and late stage exercises would be relevant for the different hip pathologies mentioned at the start of the lecture?
- Check out (Kibler, 2006). Does this play any role in the rehabilitation of Hip pathologies?