Exercise Progression

Exercise Progression

- An art, not a science
- Multifactorial and individualized
- Should be based on goals of the patient
- Needs to start with tolerable and non threatening movement (SINSS)

Current Situation

- PT has historically failed to provide sufficient stimuli to achieve desired outcomes in individuals returning to activity, especially sports
- Grindhem (2016)
  - Quadriceps strength deficit prior to return to level 1 sport was a significant predictor of knee re injury, with a 3% reduced reinjury rate for every 1% increase in strength symmetry.
- Gokeler (2017)
  - “Too often, the end phase of rehabilitation is not extensive or specific enough, thereby exposing patients to specific training loads and characteristics that they cannot handle from a physical, physiological, neurocognitive and psychological perspective.”

Activity Demands During Multi-Directional Team Sports: A Systematic Review

Taylor 2017

- Soccer
- 90-minute match
- Athletes change activity between 500 and 3000x over the course of competition (every 2-4 seconds)
- Should be able to perform (controlled setting)
  - 10,000m of total distance
  - 30 sprint repetitions
  - 100 high intensity running reps
  - 300m of lateral movement

General Concepts

- Use pain as your guide

- Does contraction type matter?
  - Isometric – concentric – eccentric
    - Sometimes eccentrics first. Why?
    - Sometimes isometrics first. Why?

  - Contraction type may help pain modulation

Contraction Type and Shoulder Pain

- Concentrics directly related to the area of pathology usually mimic the aggravating factor or movement
  - Should likely be avoided early in the rehabilitation process

- Eccentrics have failed to show superiority compared to other methods of loading for rotator cuff and upper limb tendinopathy (Ortega-Castillo 2015, Spargoli 2019)
  - Optimal dosage, frequency of treatment, and load progression needs to be further researched

- As outlined in this review, there is little evidence for isolating the eccentric component of a loading-based regime (Couppe' 2015)

- The basic mechanisms that are likely to influence tendon adaptations appear to be related mainly to tendon load/strain magnitude and duration, and there is no theoretical basis for greater tendon loads in eccentric exercises at a given force (body weight or external load) (Couppe' 2015)

- There is a significant lack of evidence that confirms eccentric training having clear positive results in elbow and shoulder tendon injuries (Abat 2017)

Contraction Type and Knee Pain

- Eccentric-Concentric squat-based physical therapy has good evidence for use as an initial conservative treatment of patellar pain (Everhart 2017)

- When comparing isolated actions, eccentric training shows better results than the application of concentric work. These benefits have been shown in patellar pain (Everhart 2017)

- Strengthening the hip and core resulted in earlier resolution of pain compared to knee alone (Ferber2018)

Isometrics

- Likely to reduce patella tendon pain immediately for at least 45 min postintervention
  - The reduction in pain was paralleled by a reduction in cortical inhibition, providing insight into potential mechanisms (Rio 2015)

- Eccentric-concentric training combined with isometric contractions produced the largest effect in the reduction of pain and improvement of function at the end of the treatment and at any of the follow-up time points (Stasinopolos 2017)

Exercise-Induced Hypoalgesia

- A single bout of exercise influences the experience of pain

- In healthy young adults, acute aerobic and isometric exercise temporarily reduces pain sensitivity, a phenomenon termed exercise-induced hypoalgesia (EIH)

Final Thought on Contraction Type

- Probably the best thing to do is experiment with load (regardless of contraction type) and find the ‘entry point’ to achieve a positive response from an individual

- Some patients need a “softly” approach, others you can escalate load sharply, others need lots of reassurance/education (SINSS)

- Be prepared to play and try things, which means likely “flaring up” some people, and being “magicians” with others

A theoretical model to describe progressions and regressions for exercise rehabilitation

(Baker, Marshak, Rice, & Zimmerman, 2001)

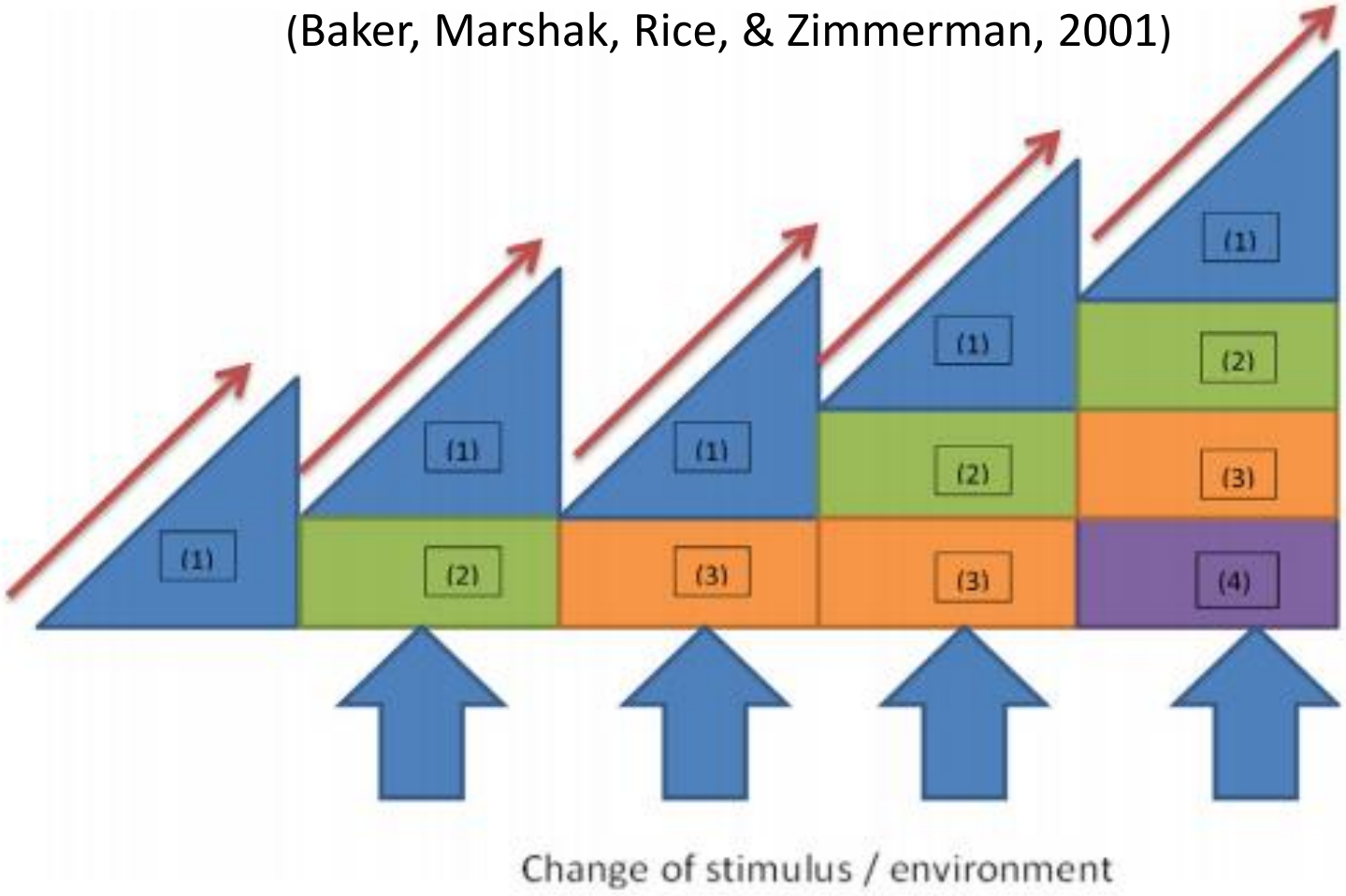


Fig. 1. A theoretical model for exercise progression as a continuum.

Block 1:

- Most controlled level of a given exercises
- The patient controls the exercise by regulating movement using intrinsic factors such as proprioceptive feedback via mechanoreceptors and adapting motor patterns
- The therapist's job at this stage is to ensure the patient has nothing else to concentrate on other than these intrinsic elements
- The exercise is controlled externally by the therapist by monitoring these motor patterns and providing the necessary feedback on technique and limiting as many variables as possible
- This is the one element of an exercise that will remain consistent throughout the progression or regression process

A theoretical model to describe progressions and regressions for exercise rehabilitation

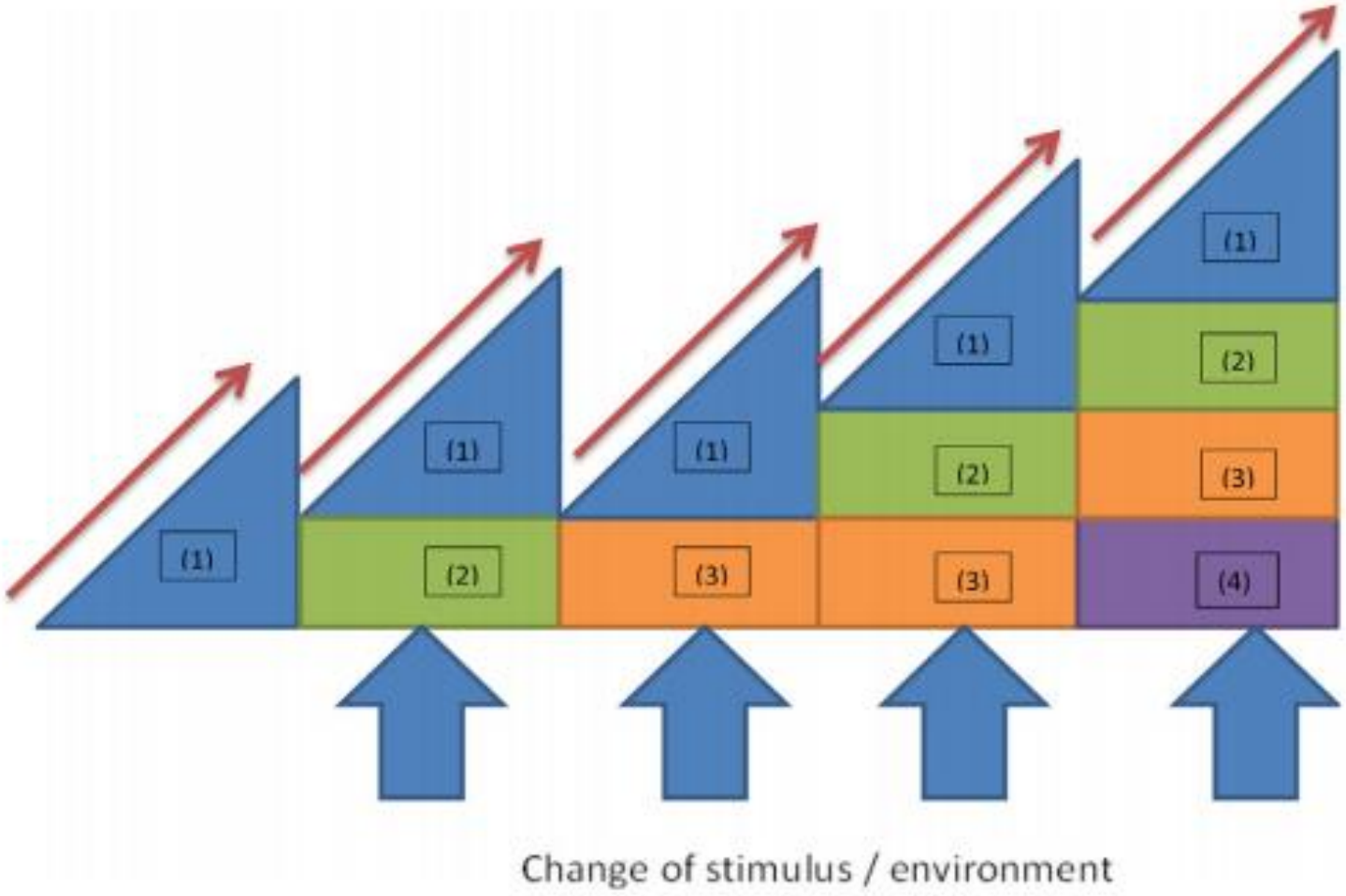
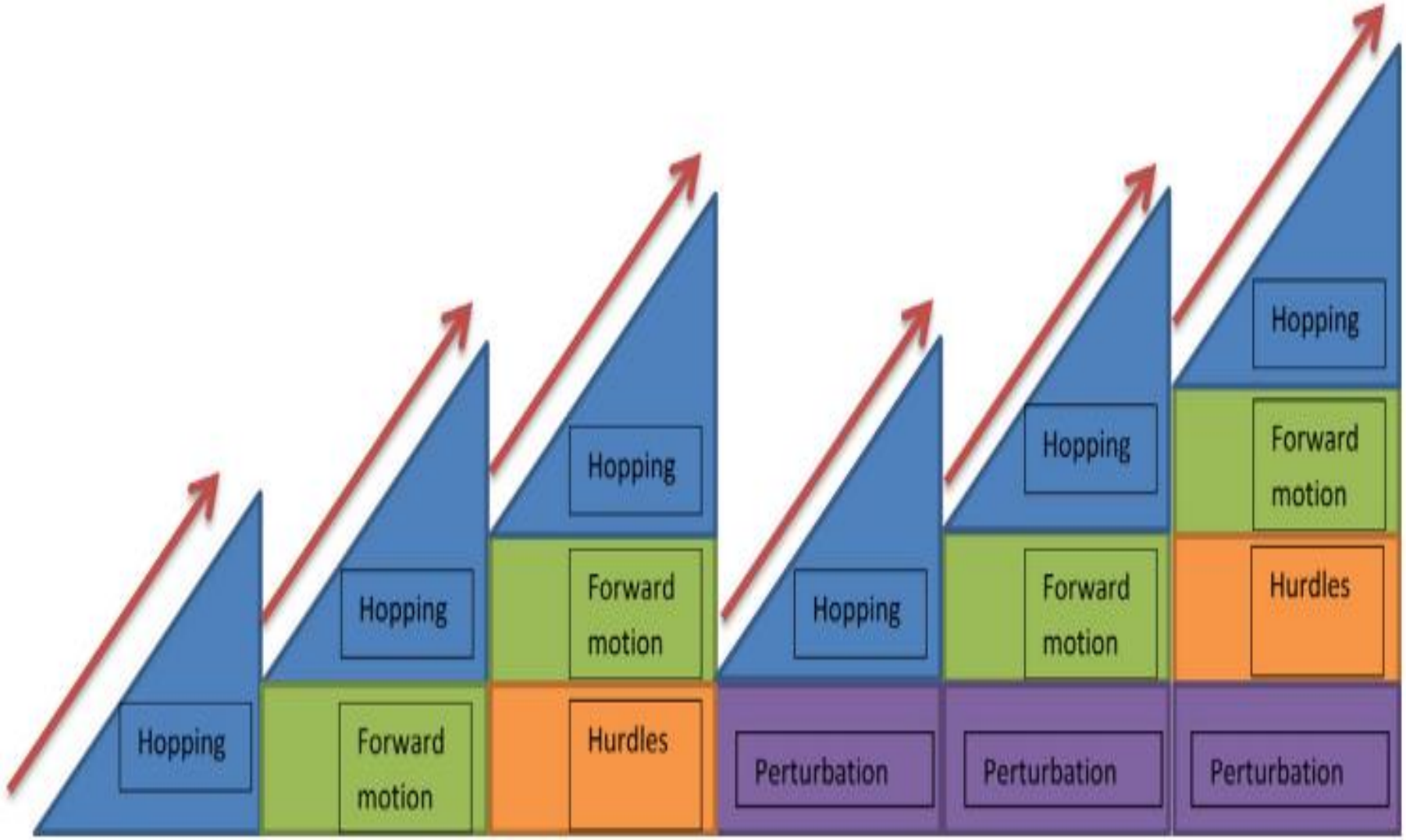


Fig. 1. A theoretical model for exercise progression as a continuum.

- The horizontal axis represents time and the vertical axis the level of difficulty of the exercise. The starting exercise (1) may be progressed by manipulating a number of variables, including
  - Duration
  - Speed
  - Distance
  - Repetitions

- The exact number of variables is dependent on the specific exercise and the goals of rehabilitation

Additional Concepts



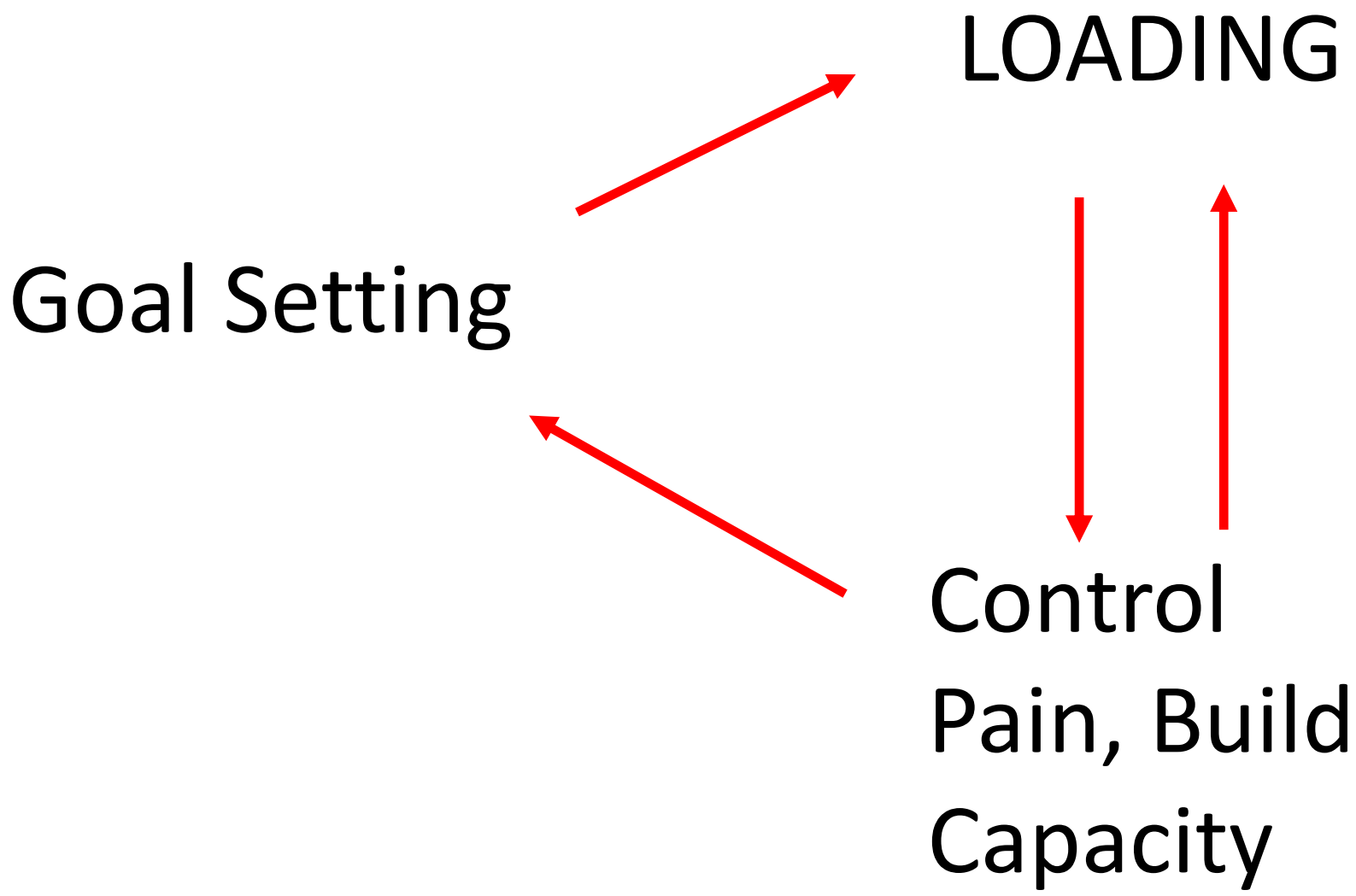
What If It Goes Wrong ?

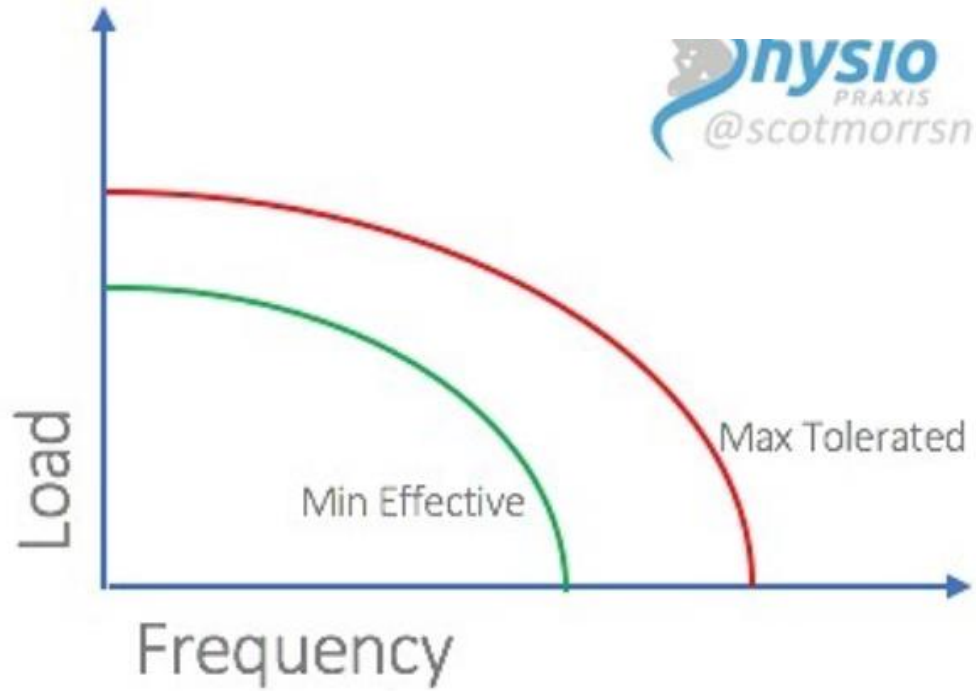
- Simply back off

- Usually/always includes decreasing load/volume/intensity
  - Alternating body parts/single joint exercises
  - Reducing ‘degrees of freedom’ of the exercise
  - Keeping movements closer to the body
  - Time based programs
  - Longer rest times

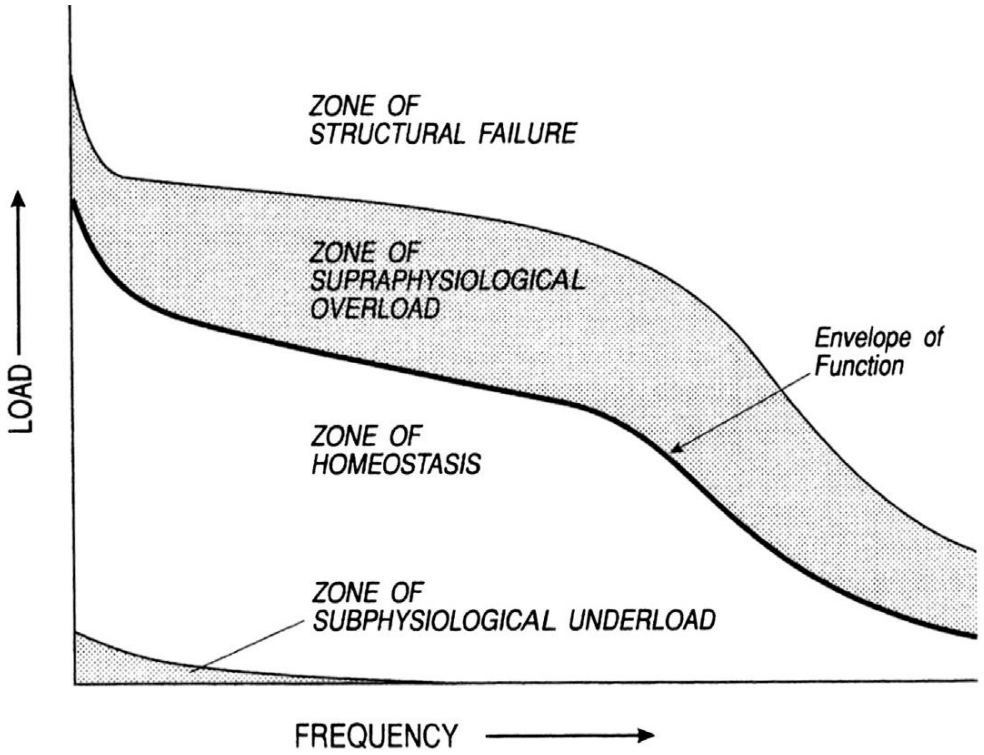

A New Way of Thinking

What Should Rehabilitation Look Like





"Capacity comes from consistency.
Stay between the lines."



Overload and the Envelope of Function

We need to be better at increasing the patients envelope of function.
This means increasing tissue capacity to cause adaptations.
This means loading with a goal.

Autoregulatory Rehabilitation

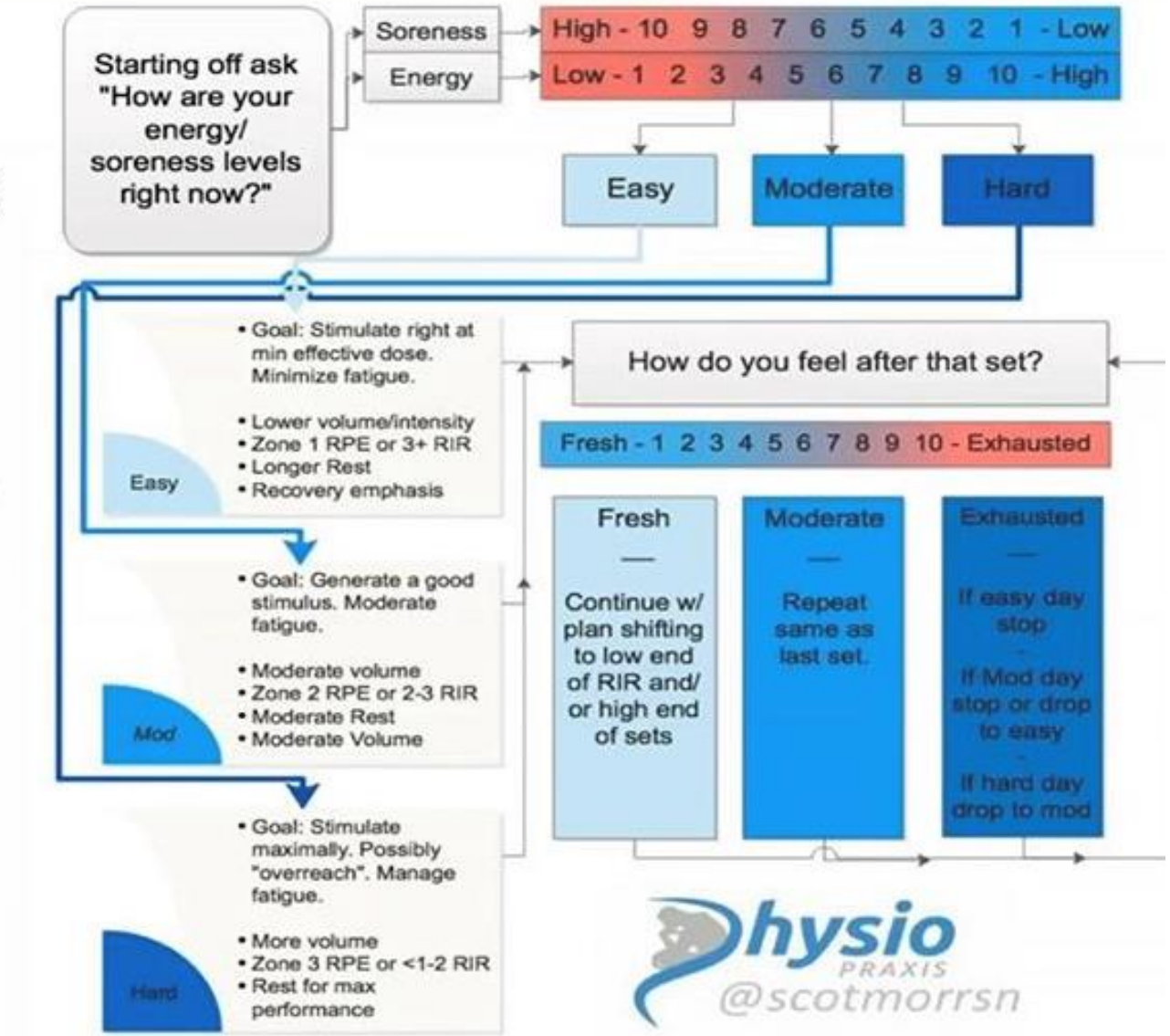
- A method of programming that is modifiable based on relevant feedback, day to day, and within sessions

- Ensure dosage is tailored to the individual at that moment in time via self adjusting via feedback loops

- Why?

Traditional approach lacks adjustments for each patient

Use feedback to choose the right bucket



Simple Solutions

- Prescribe ranges for load (70-80%) and rep range (5 x 4-8)
  - Take into good and bad days, reduce daily expectation and anxiety, hit goals

- Subjective feedback
  - RPE

- Instead of prescribing exact load and reps (3x10 @200lbs), prescribe load and exertion (3 sets at 200lbs @RPE 7-9) or reps and exertion level (3x5 @RPE 8, load until reached)

Exercise Progressions for the Painful Knee and Shoulder

Where Do You Start?

- You can’t go wrong if you focus on doing the simple great!

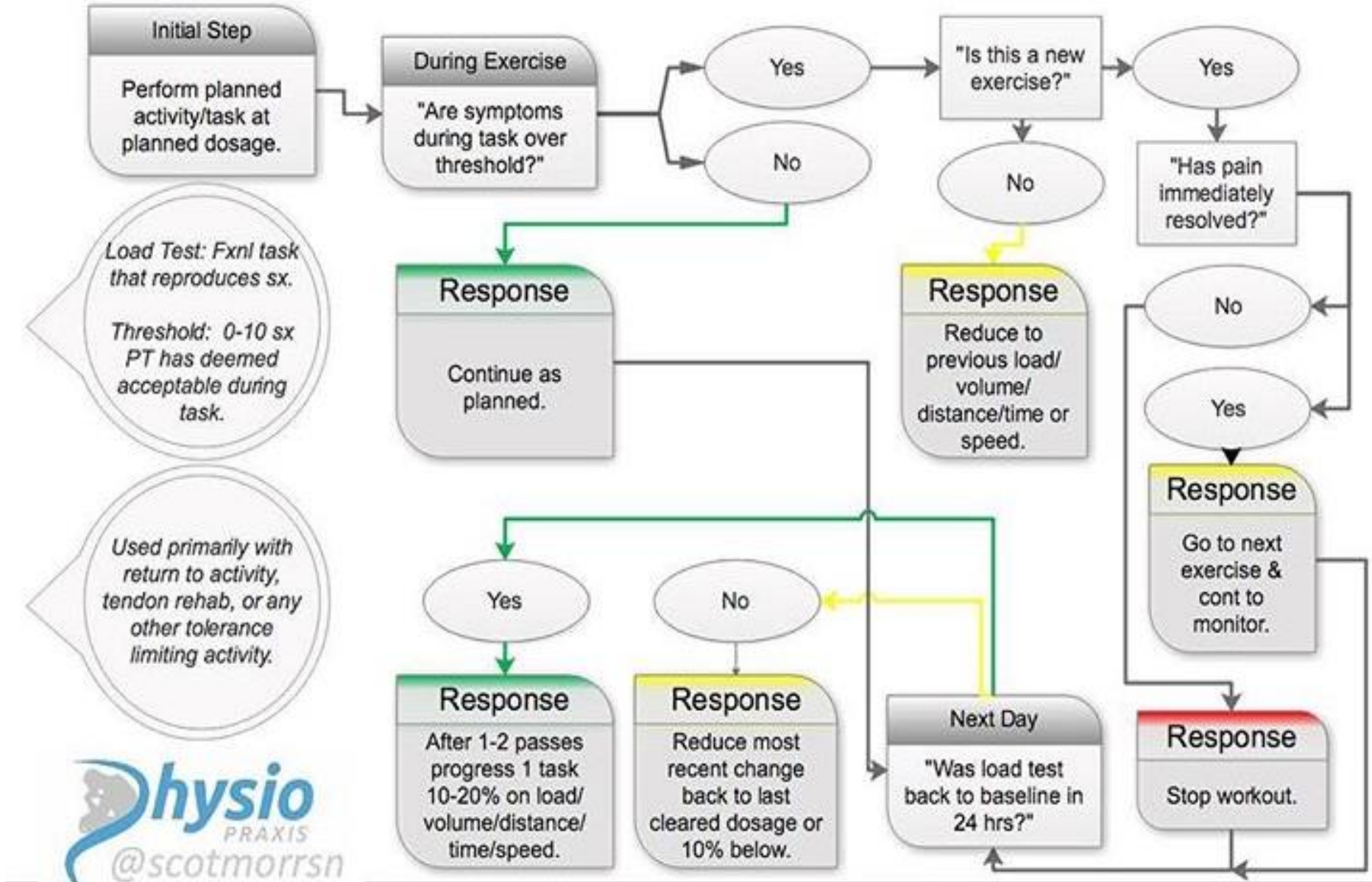
- Most effective exercises to patients should be easy to coach and use little or no equipment

- Exercises should be adaptable and easily progressed

Still About Optimal Loading

- The minimal effective dosage that maximizes tissues physiological adaptation that is within the envelope of function
- Increase tissue capacity so the person can perform functional movements at the volume and frequency required without exacerbating symptoms
- This will vary from individual to individual

Load Tolerance Feedback Loops



Isometrics

- Appear to play an important role in early stage management of pain
- Controlled application of force
- Position specific
- Dose dependent
- Generally safe:
  - Sub max effort: 50-80%
  - Duration: 10-30”
  - 3-5 reps
  - Full recovery: 1-3 x “On Time
  - High volume: daily

How To "Anchor" Isometrics

- Use a BP cuff for biofeedback
  - People are bad guessers
- Easiest and most cost effective
  - Multiple uses for entire body
- Allows for autoregulation of effort
  - Reinforce idea of "push" versus "hold"

Sample Progression Anterior Knee Pain

- Isometrics: supine and seated
  - 10” on/ 10” off time – 10-15 reps
  - Seated knee extension, Bridge, Hip Abd into wall
- DL → SL Squat Isometrics
  - 5 x 45” holds (ideally on incline board)
- DL → SL Squat Tempo Eccentrics
  - 5 → 15 reps
- Reverse Nordic Curls

- Don’t forget about the hip, low back, and trunk stabilizers

DL / SL ISO Squat Hip Abduction

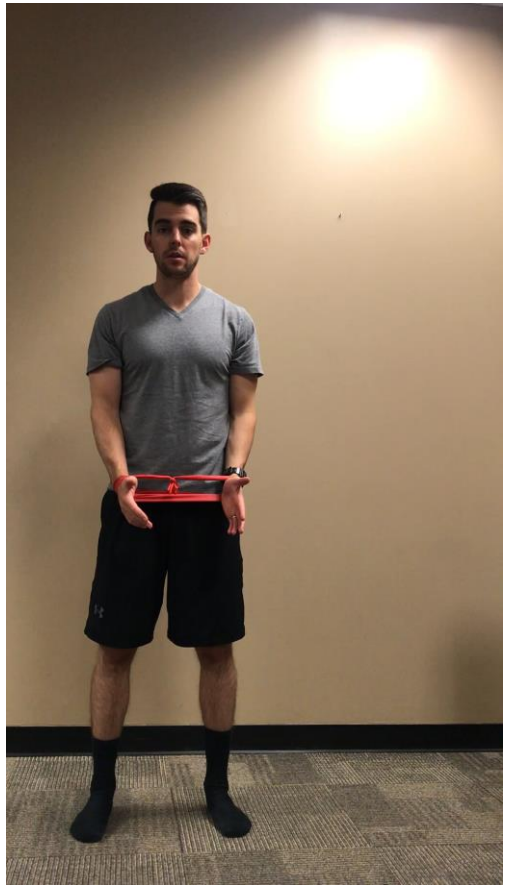
Progression of a Quadriceps Focused Program for PFPS / AKPS

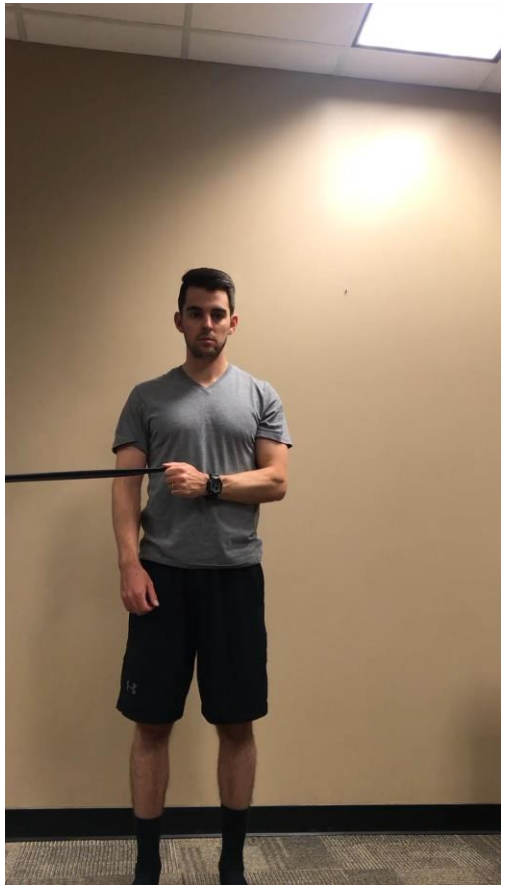
Quad set → Prone TKE → Prone TKE with liftoff → SAQ → LAQ → Seated Physioball TKE → Standing TKE → ¼ to ½ to ¾ Wall Sit → Small Knee Bends with UE support → Small Knee Bends without support → Squat variations Lunge variations → Step downs → Step ups → Single leg Squat → Reverse Nordic Curl → Plyometrics

Sample Progression for Rotator Cuff Related Shoulder Pain

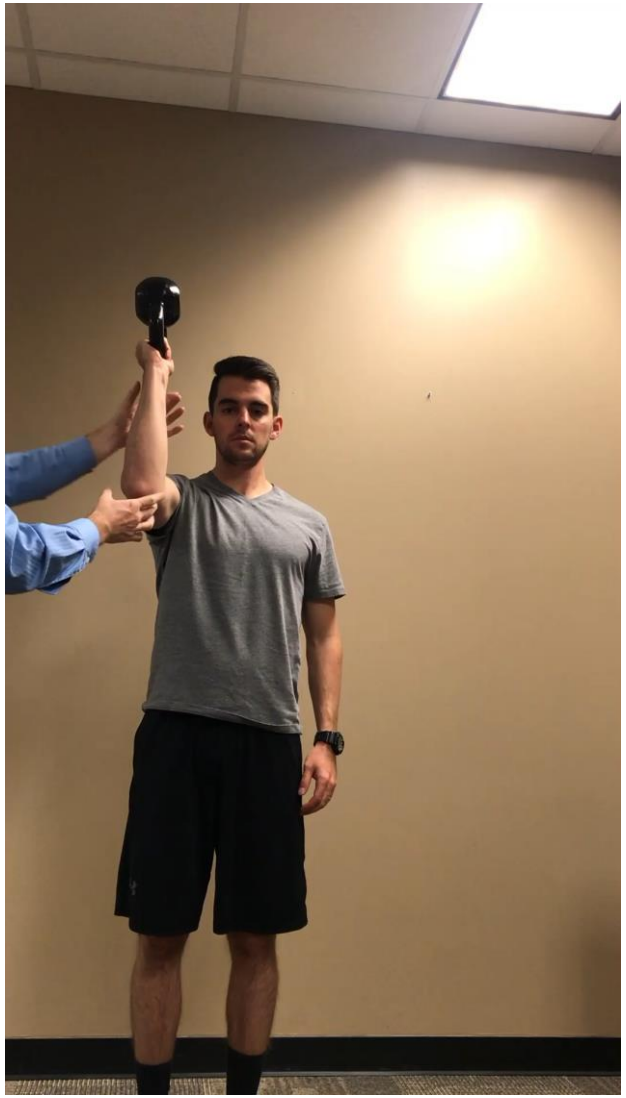
- RC Isometrics
  - Against a wall (use BP Cuff)
  - TB walkout
  - Multi-Angle Reactive Isometrics
  - Progress ROM, progress load tolerance
- Prone YTWI)
  - Table →Lifts (Physioball
- Presses
  - Overhead from supine → standing → long sitting → TGU
- Eccentrics
  - Seated arm wrestler

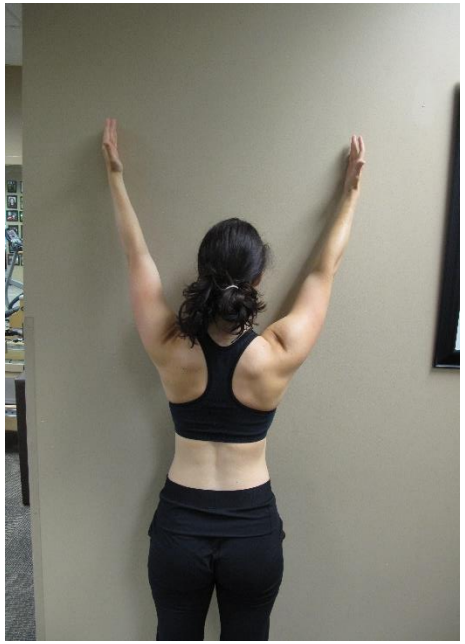
Multi Angle Isometrics

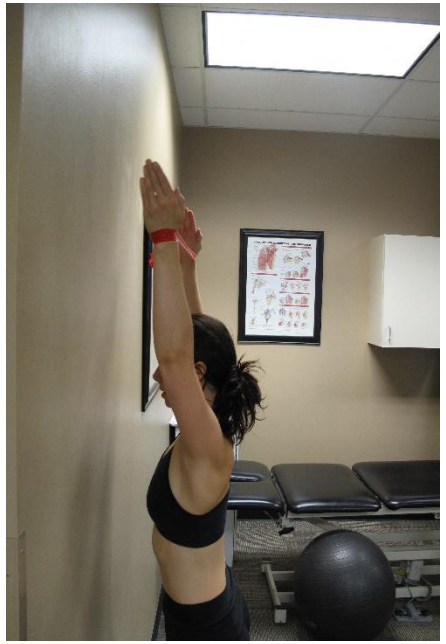


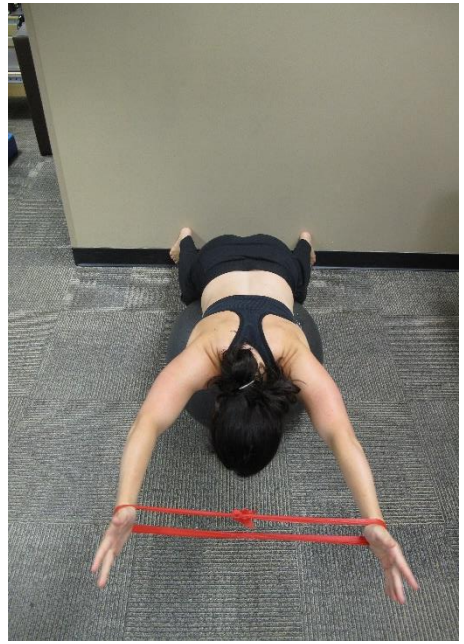


Isometric Press with Perturbations

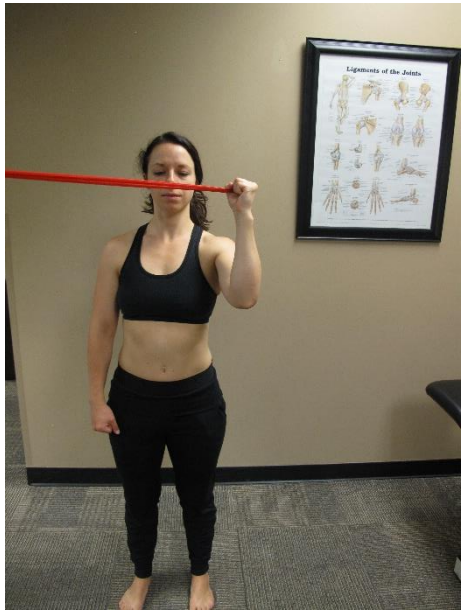


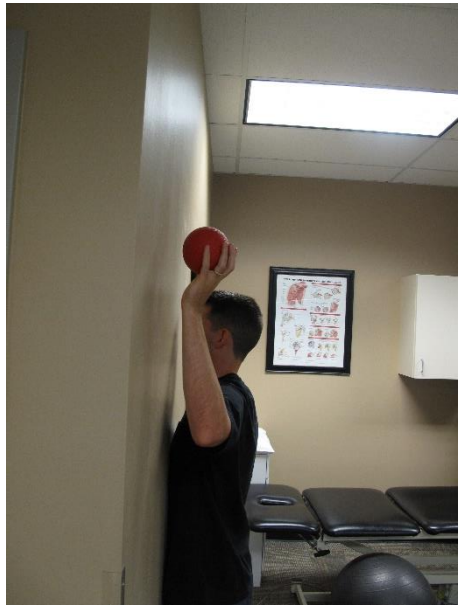






Miscellaneous Stabilization Exercises





Open Chain Progression

- Serratus punch
- Punch with rotation
- Punch with CW, CCW movements
- Punch with trunk rotation
- Partial Turkish Get Up (TGU)
- Floor press
- Floor press with rotation
- Press up in scapular plane (shoulder elevated)
- Press up in prop up position
- Full TGU
- OH walks/carries (vary hand position)
- OH press with windmill (trunk flex, side bend)

Closed Chain Progression

- Cat/camel – push away from top of movement
- Quadruped knee lifts
- Plank – neutral scapula
- Plank ups – retract/protract
- Plank– buzz saw
- Quadruped shoulder taps
- Up to down dog – inchworm
- Push away with foot and hand lifts
- TRX row
- Plank rotations
- Plank shoulder taps
- High plank T-turn

- Push up with plus
- Quadruped 3-way reach (→ resistance bands)
- Lateral bear crawls
- Forward/backward crawls (→ resistance bands)
- TRX one arm row with rotation
- Full plank lateral walks (→ resistance bands)
- Renegade DB row
- Renegade row with rotation
- Hand stands