Hospital Authority Convention 2025
Oral Presentation F2.5

Targeted Physiotherapy Exercise Program incorporating *Real-time Ultrasound* for *Chronic Back Pain* Patients - Pilot Study -

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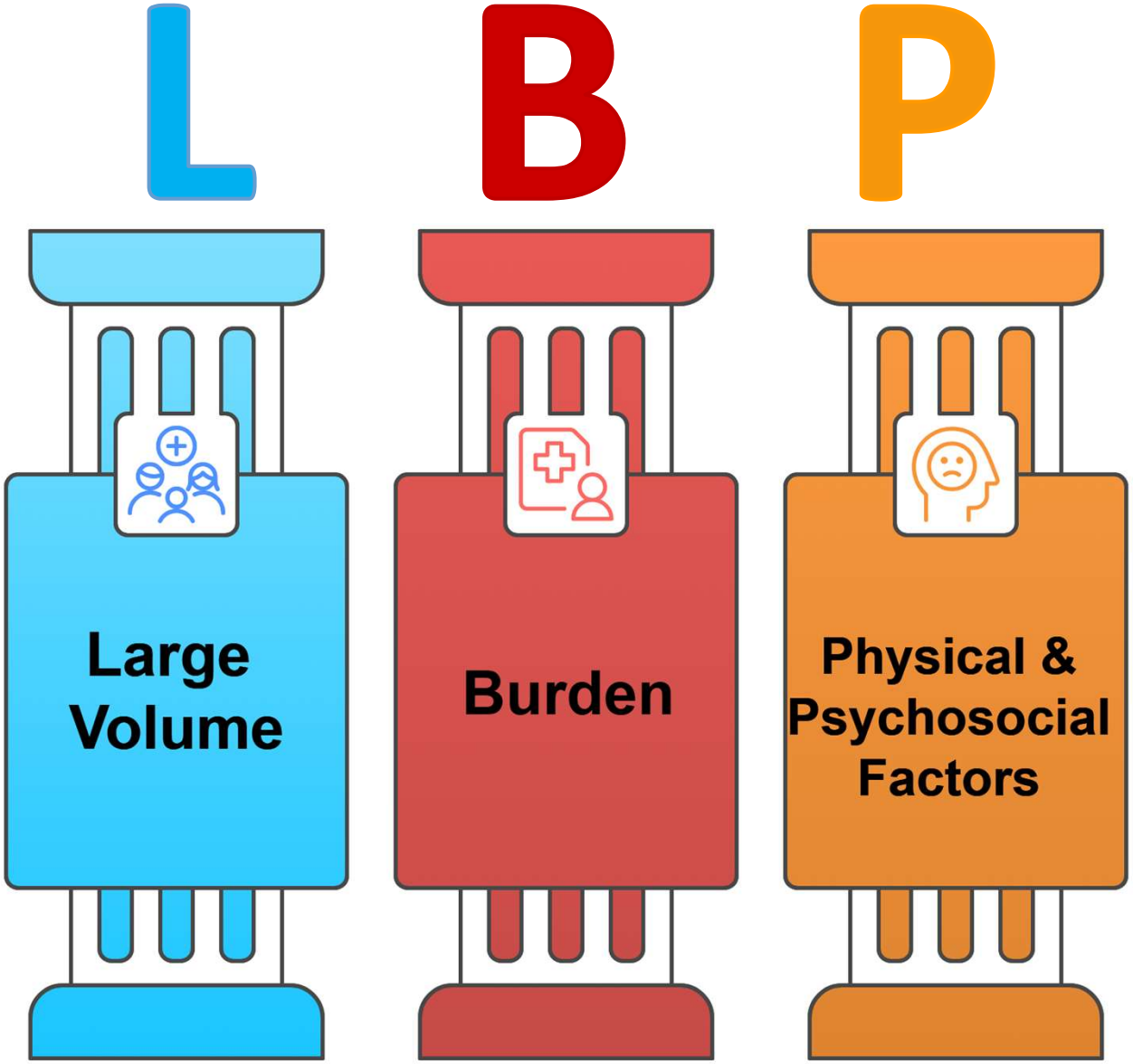
L B P

Low Back Pain


L
B
P
Large Volume
Burden
Physical & Psychosocial Factors

Global Prevalence of Low Back Pain

46%

2017 → 2050

577 Millions

843 Millions

By 2050,

Prevalence of Back Pain = 843 millions

(Global Burden of Disease Low Back Pain Collaborators, 2023)

Local Prevalence of Chronic LBP (CLBP)

Chronic Pain

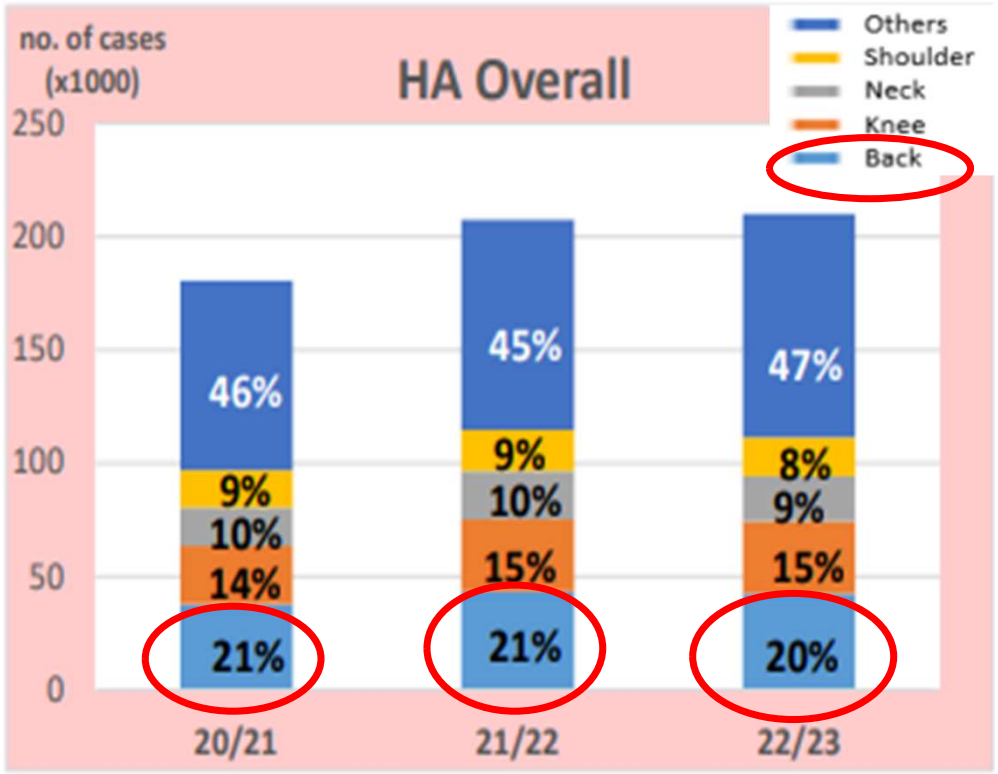
Aged > 60

Local Prevalence of CLBP

30%

(Schoeb V, et al 2022)

Significant Proportion in HA Physiotherapy Outpatient Service



~20-21%

Back Condition :

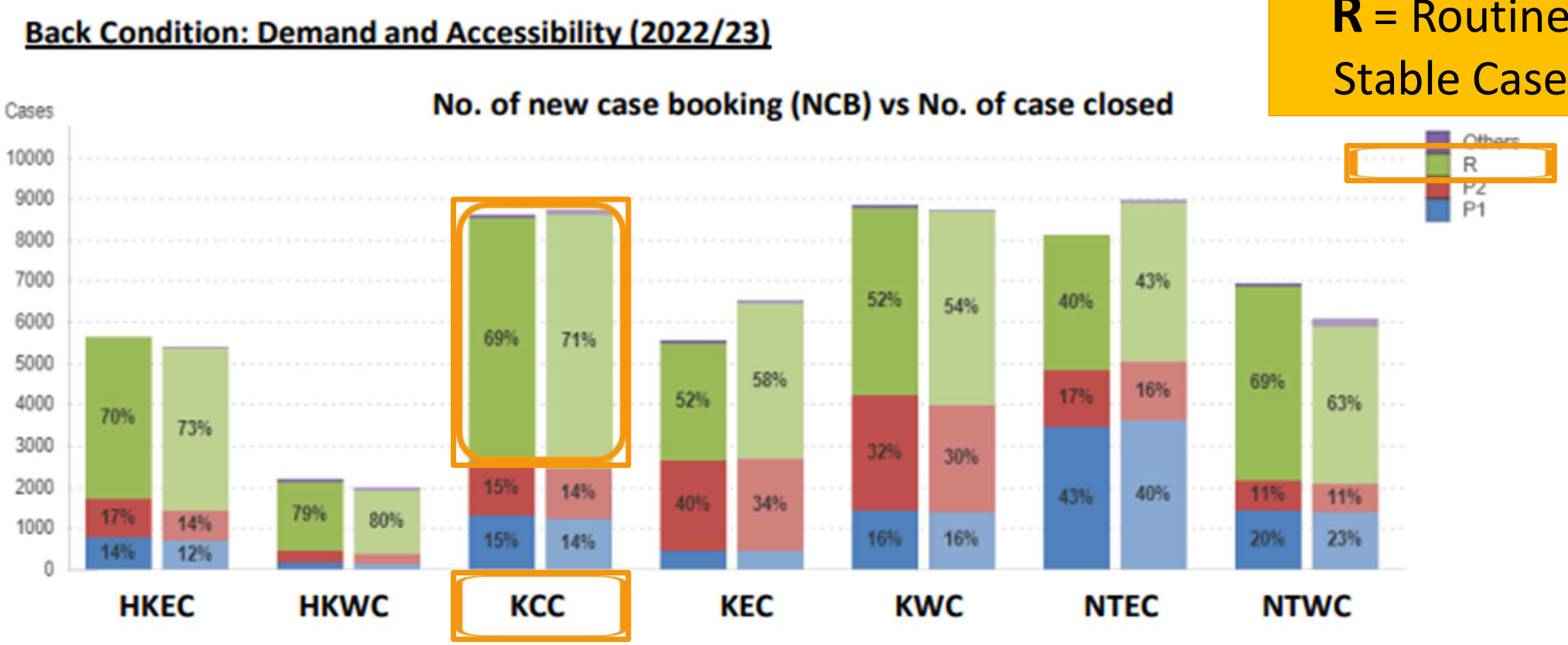
Biggest proportion

among all conditions

(HA Physiotherapy Outpatient Report, 2022-23)

In HA Physiotherapy Outpatient Service

R = Routine Stable Case



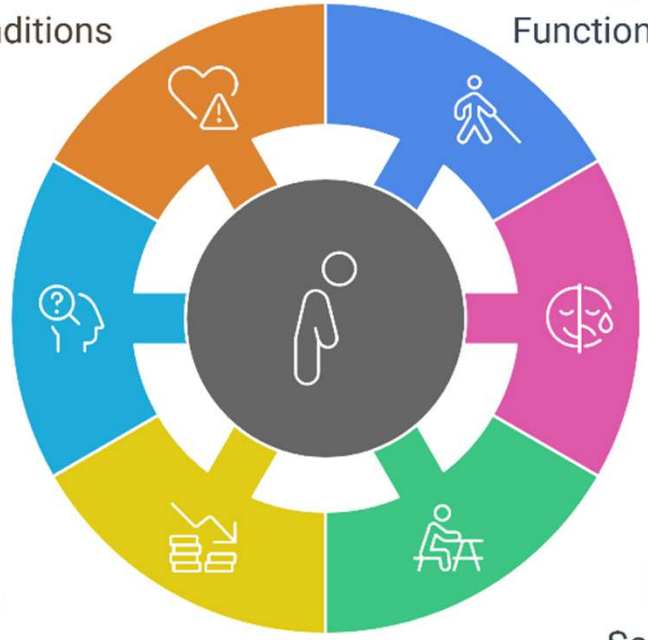
Chronic LBP Cases: **~70%**

(HA Physiotherapy Outpatient Report, 2022-23)

CLBP Leads to Wide Ranges of Impacts

Long-Term Health Risks
Increased risk of chronic health conditions

Physical Impacts
Functional limitations and disability



Cognitive Impacts
Cognitive difficulties & focus issues

Emotional Impacts
Emotional distress & mental health challenges

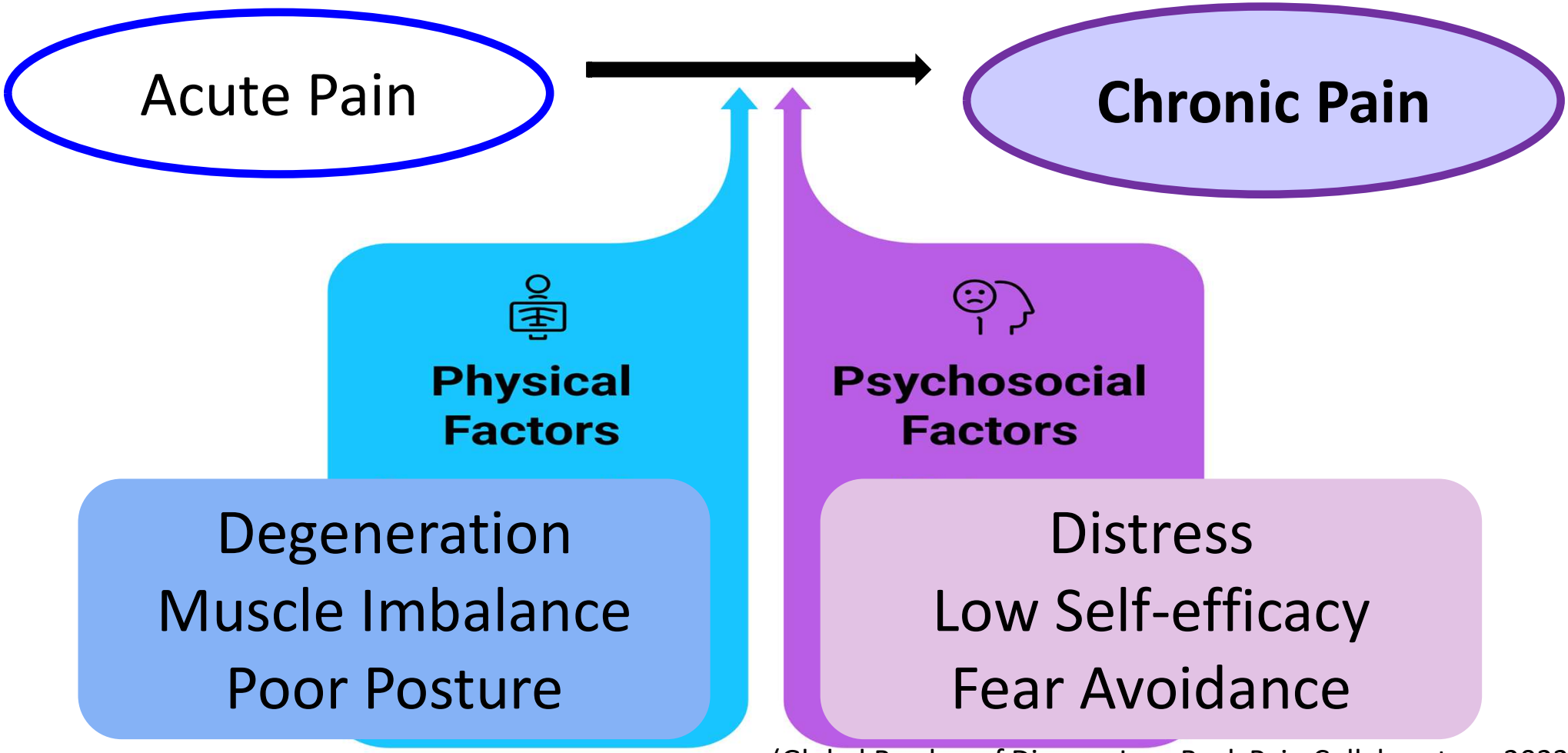
Economic Impacts
Financial burdens & work-related challenges

Social Impacts
Social withdrawal and relationship strains

As **Single Leading Cause** of **Disability**

(Health Bureau HKSAR, 2022)

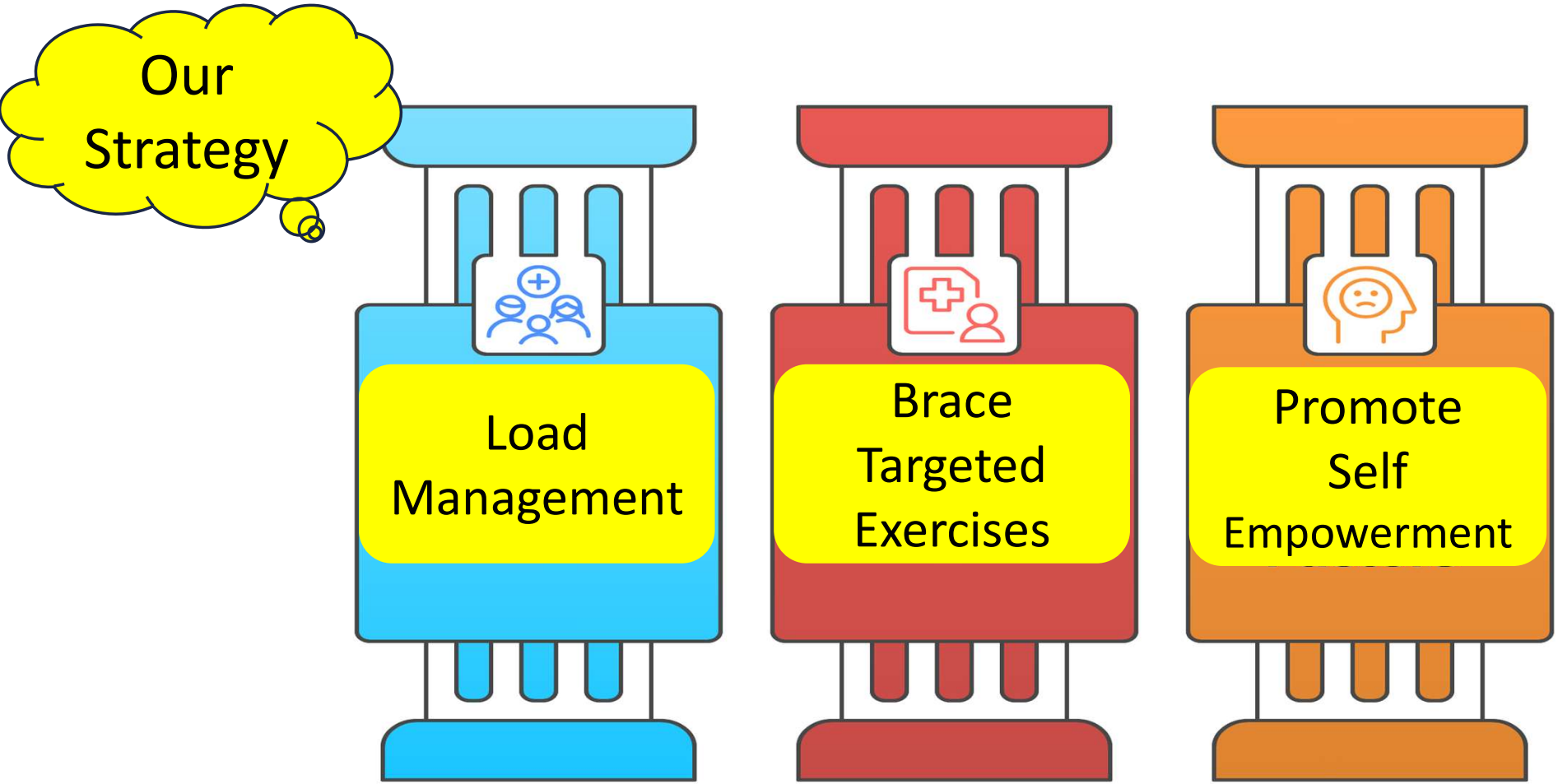
Complex Interplay of Risk Factors in CLBP



(Global Burden of Disease Low Back Pain Collaborators, 2023)

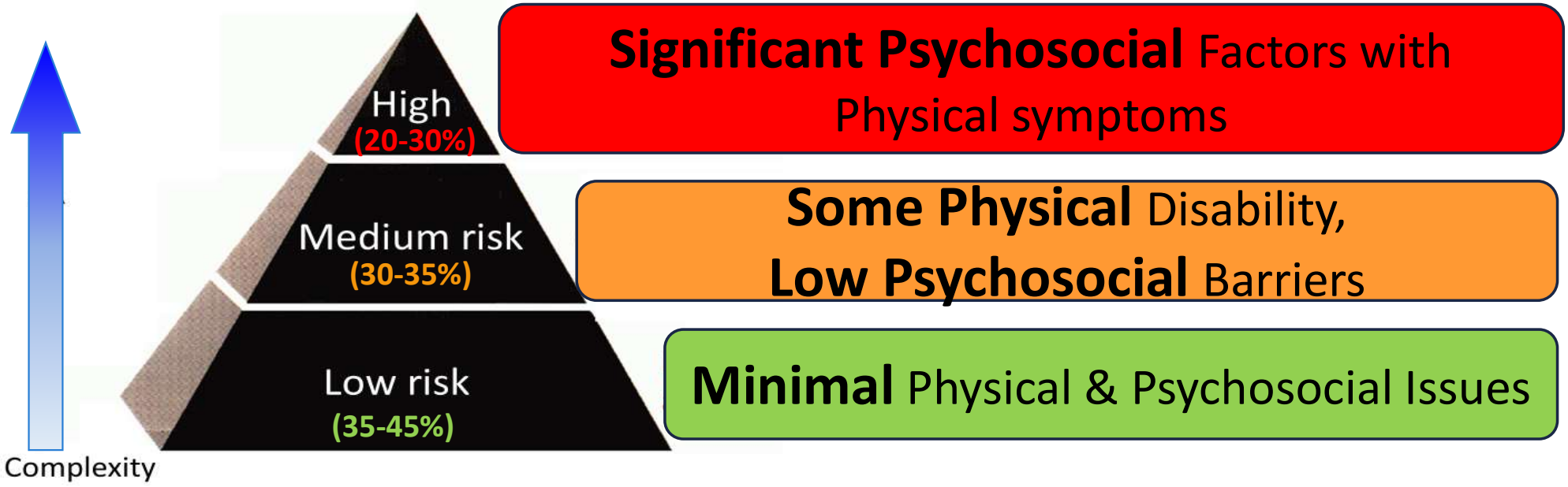
How to Manage Chronic LBP

Our Targeted Physiotherapy Exercise Program with Real Time UltraSound as Feedback



Stratified Care by SBST

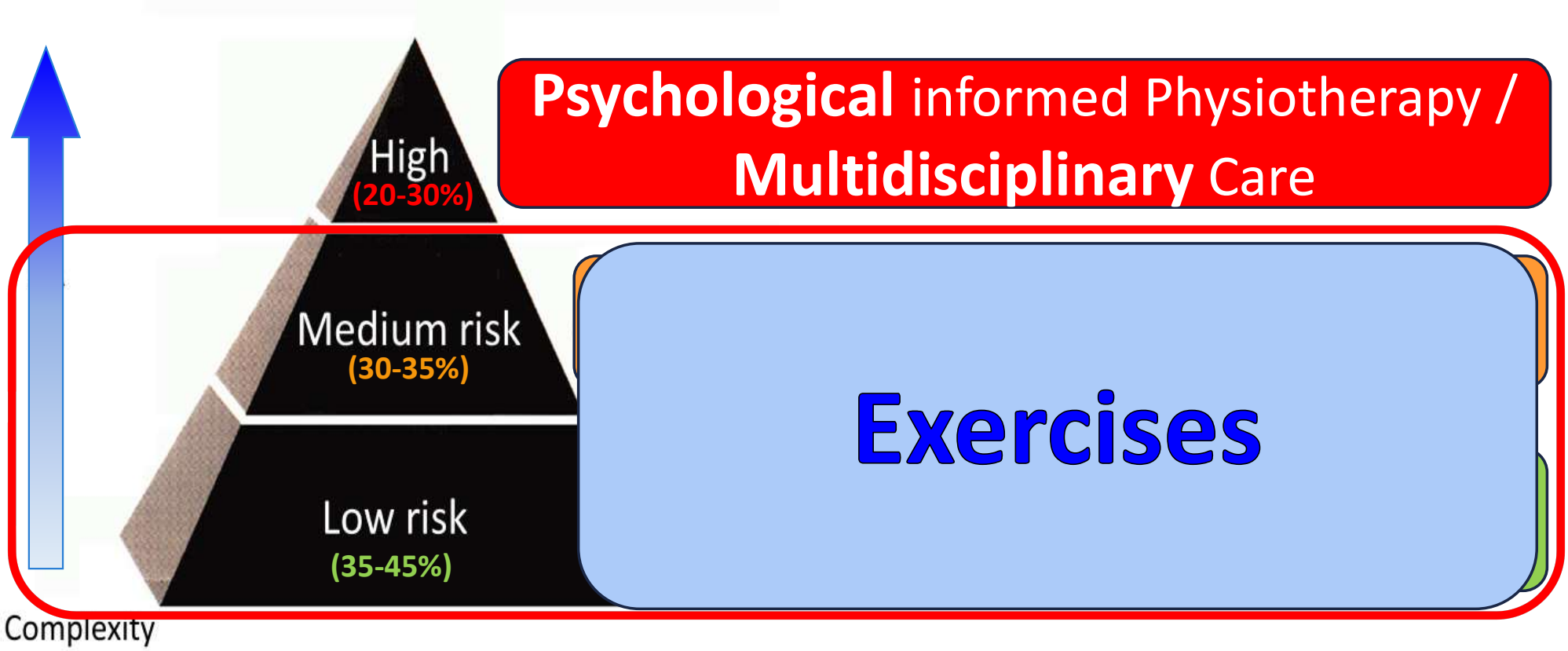
- **STarT Back Screening Tool (SBST)** stratified into : ***Low***, ***medium*** and ***high*** risk for back pain disability
- According to **Physical and Psychosocial** Risk



(Hill et al, 2008)

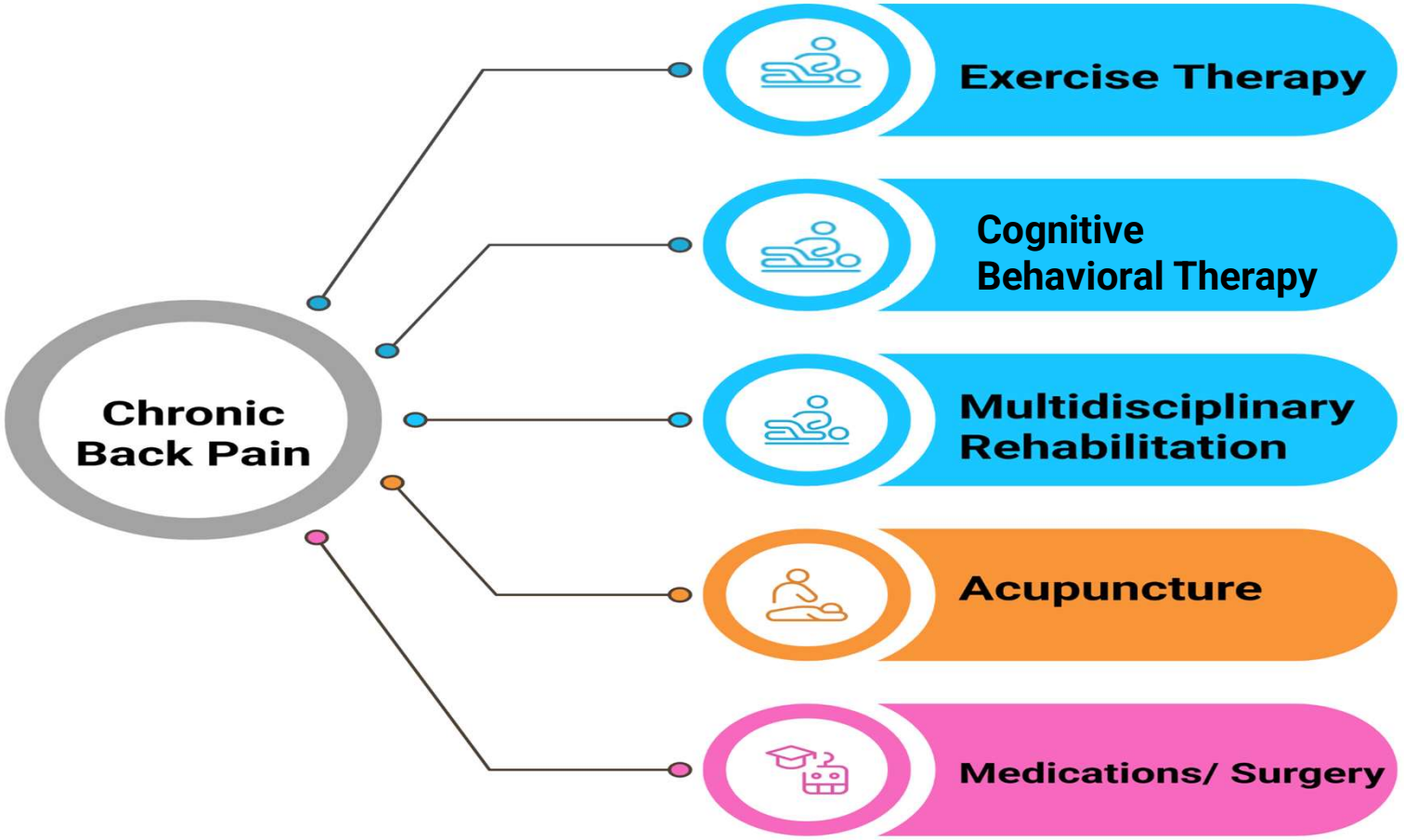
Stratified Care by SBST

➢ **Guides Treatment** Pathways



(Hill et al, 2008)

Evidence-based Physiotherapy Management



(NICE, 2016; Cochrane Database of Systematic Reviews, 2005; American College of Physicians, 2017)

Evidence-based Physiotherapy Management

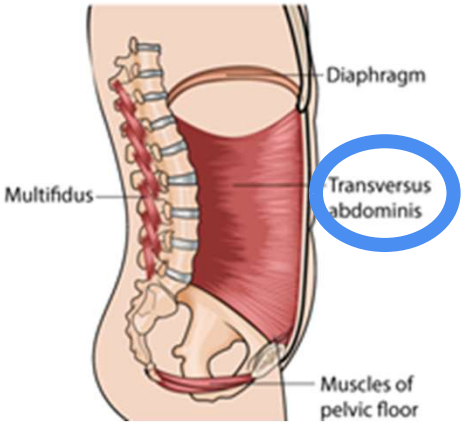
Exercise Therapy

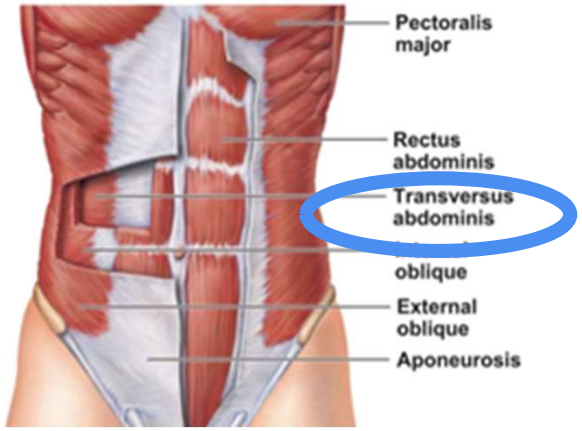
Stro… …isability Reduction, …on for CLBP

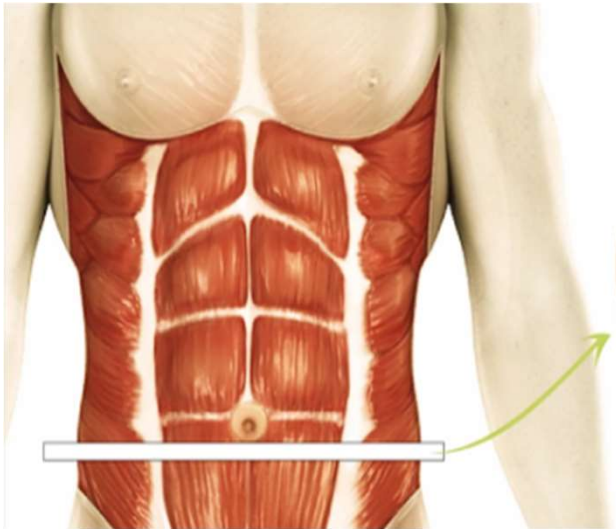
WHAT types of Targeted Exercises?

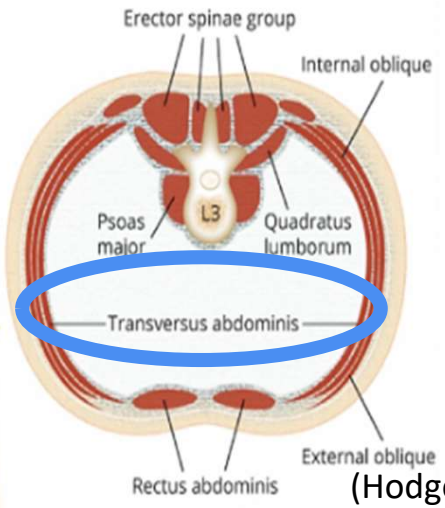
(NICE, 2016; Cochrane Database of Systematic Reviews, 2005; American College of Physicians, 2017)

Transverse Abdominis (TrA) Dysfunction









Found in **60-80%** of CLBP

↓TrA Thickness change during contraction

↓TrA Activation

TrA Thickness = **Biomarker** of **Dysfunction** and **Recovery**

(Hodges & Richardson, 1996; Shanbehzadeh et al, 2022 ; Teyhen DS et al, 2005)

Transverse Abdominis (TrA) Dysfunction

- Reduced Spinal Stability
- Chronic Pain Amplification
- Functional Disability
- Psychosocial Impact

(Hodges and Richardson, 1996;
Tsao & Hodges, 2007;
Koppenhaver SL et al, 2009)

Our Program

- Targeted Physiotherapy Exercise Program with Real Time UltraSound as Feedback-

Targeted on

Core Stabilization:

TrA Specific Exercises

Difficulties in TrA Specific Training

Learning Core Stabilization with TrA Activation is

NOT EASY!!

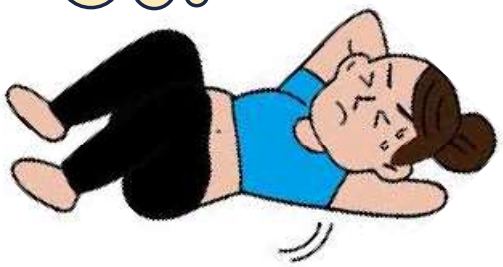
Targeted on
Core Stabilization:
TrA Specific Exercises

Difficulties in TrA Specific Training

Core stabilization exercises with TrA activation is NOT EASY!!

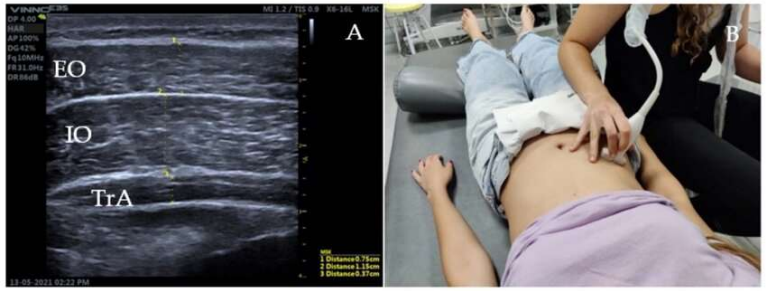
HOW to WORK TrA under my **BIG TUMMY**?

Too WEAK to activate TrA!

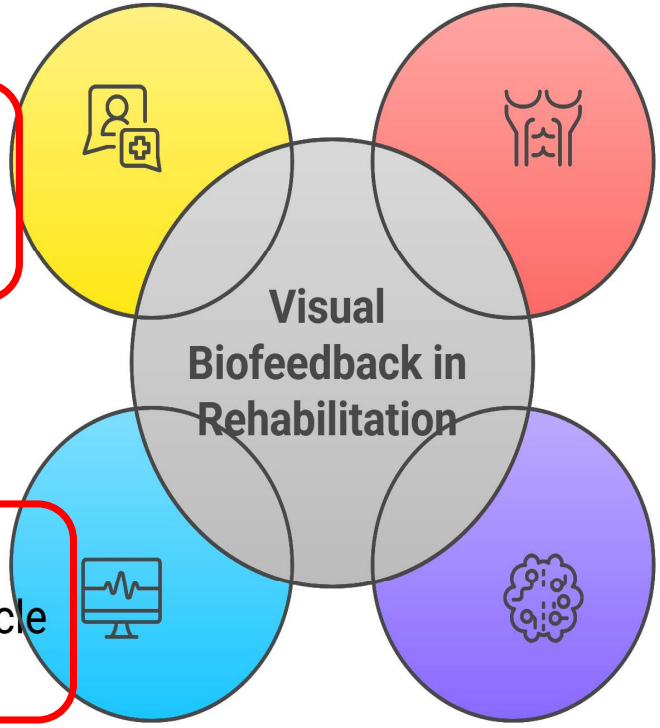


Difficult to do accurately!

Incorporating Real-Time Ultrasound (US) into TrA Training



Patient Engagement
Increases patient adherence through tangible feedback.



Core Stability Training
Focuses on monitoring and improving core muscle stability

Objective Monitoring
Provides measurable data on muscle thickness and contraction.

Neuromuscular Re-education
Enhances muscle activation in rehabilitation exercises

Our Program

1

Evaluate TrA Thickness

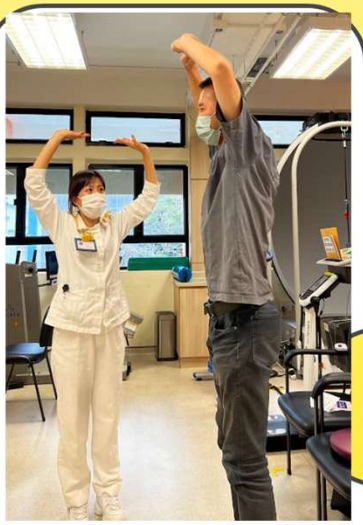
2

Train TrA Activation

3

Train Core Stabilization

4



Generalize into Exercises

1. Evaluate TrA Thickness

Position: Supine in Crook Lying

Ultrasound Imaging Procedure:

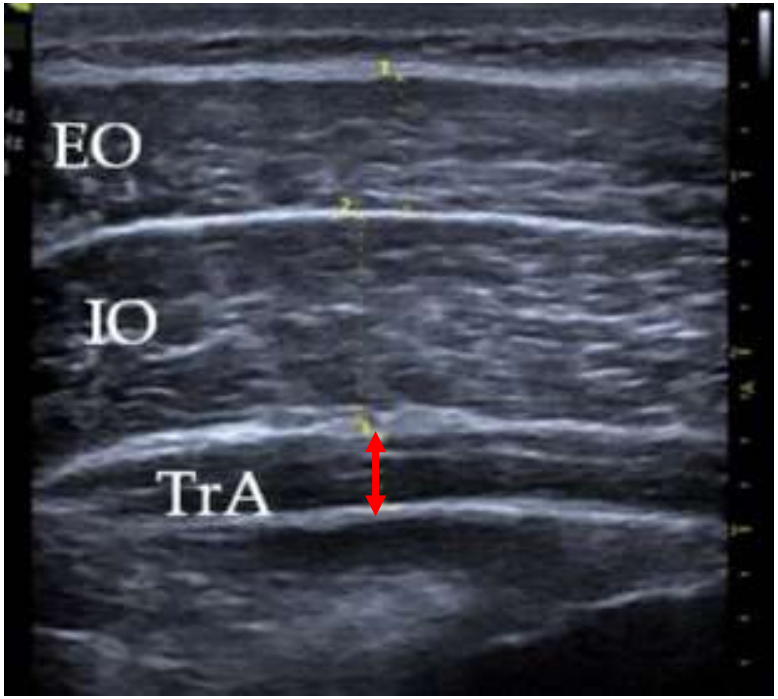
Probe: Linear

Placement of Probe**:** superior to iliac crest on right side in transverse plane

Frequency of Probe: 7.5-10MHz

Depth: 4-6cm (depends on body build)

1. Evaluate TrA Thickness at Rest



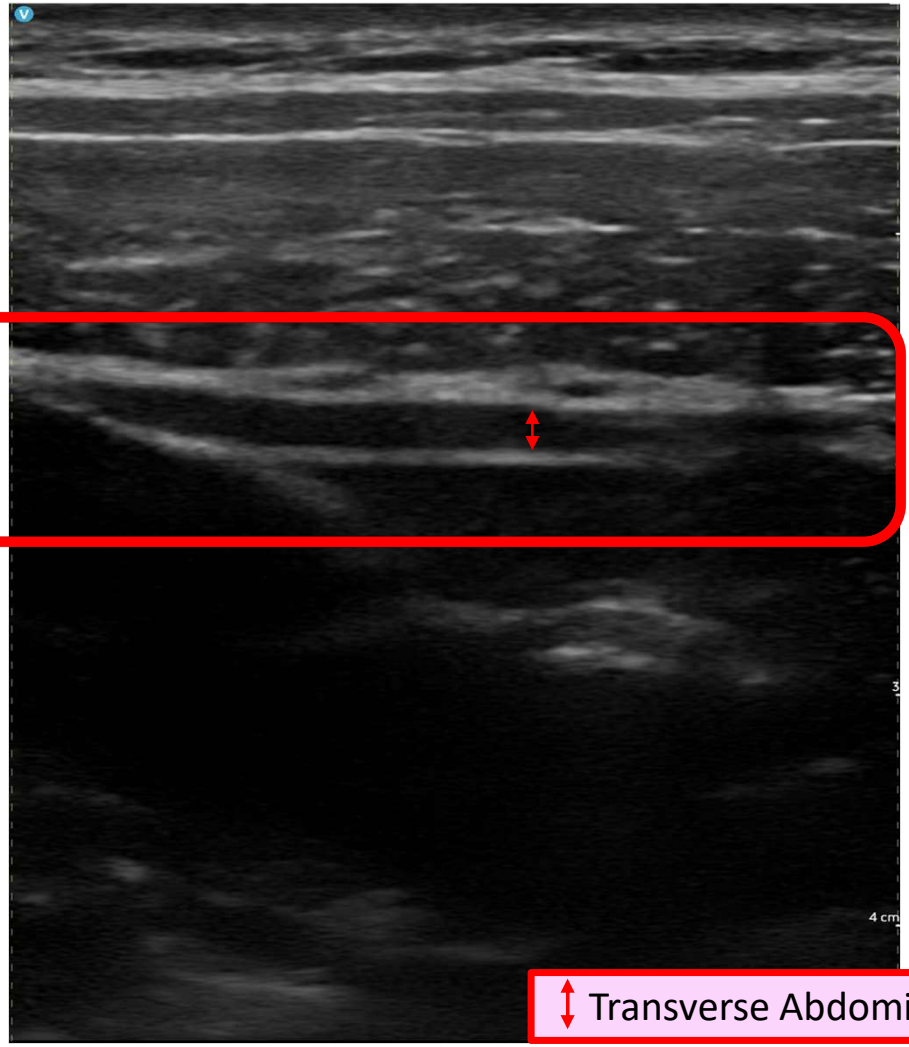
External Oblique

Internal Oblique

Transverse Abdominis

Measure TrA Thickness at Resting

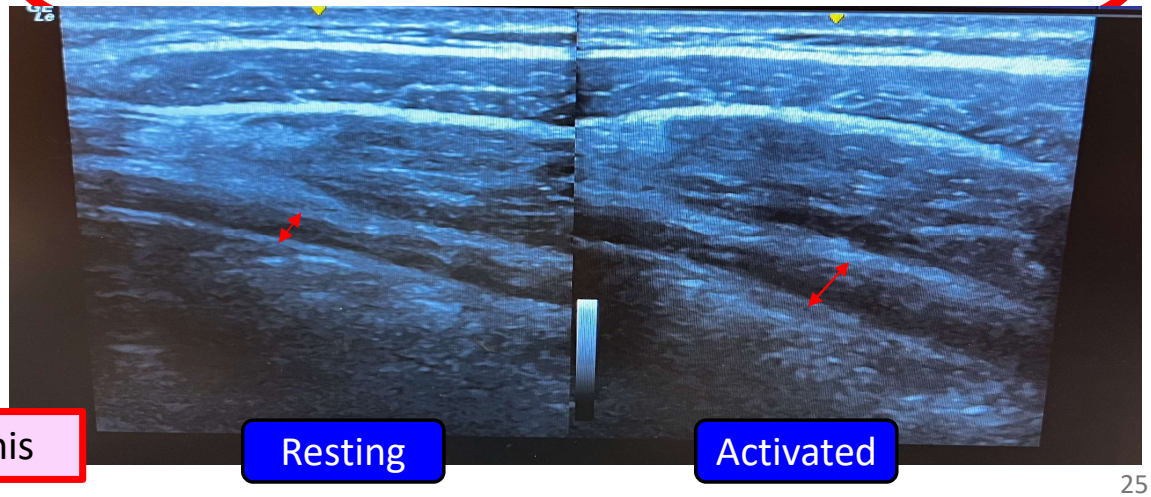
1. Evaluate TrA Thickness at Activation



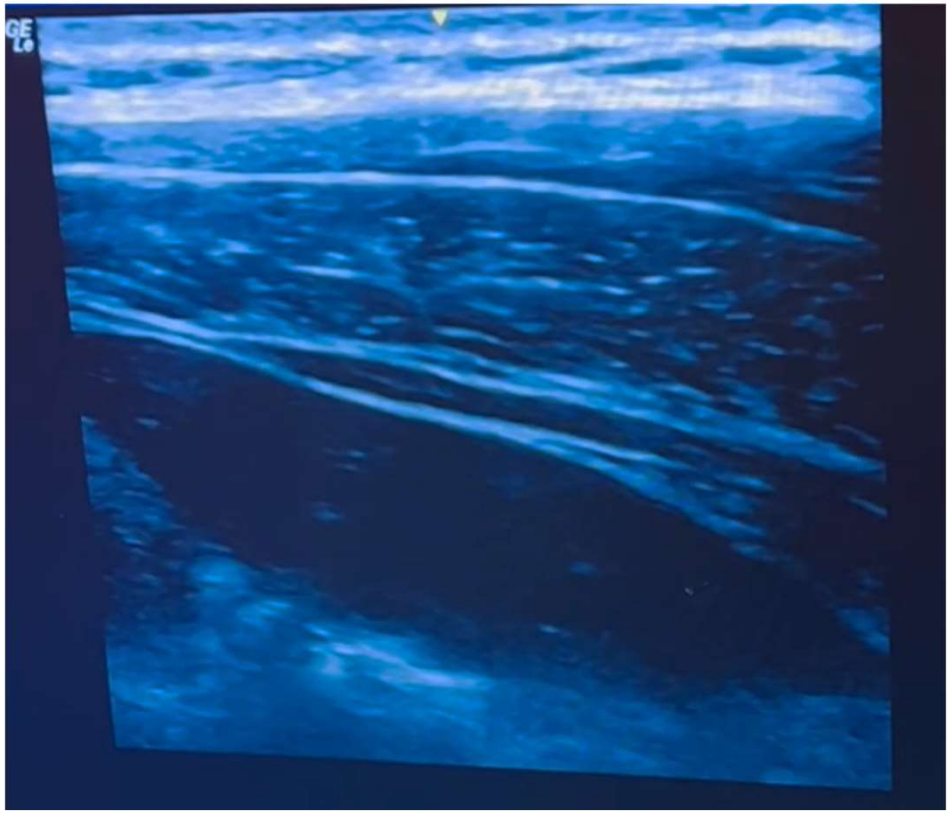
Abdominal Draw-In Maneuver

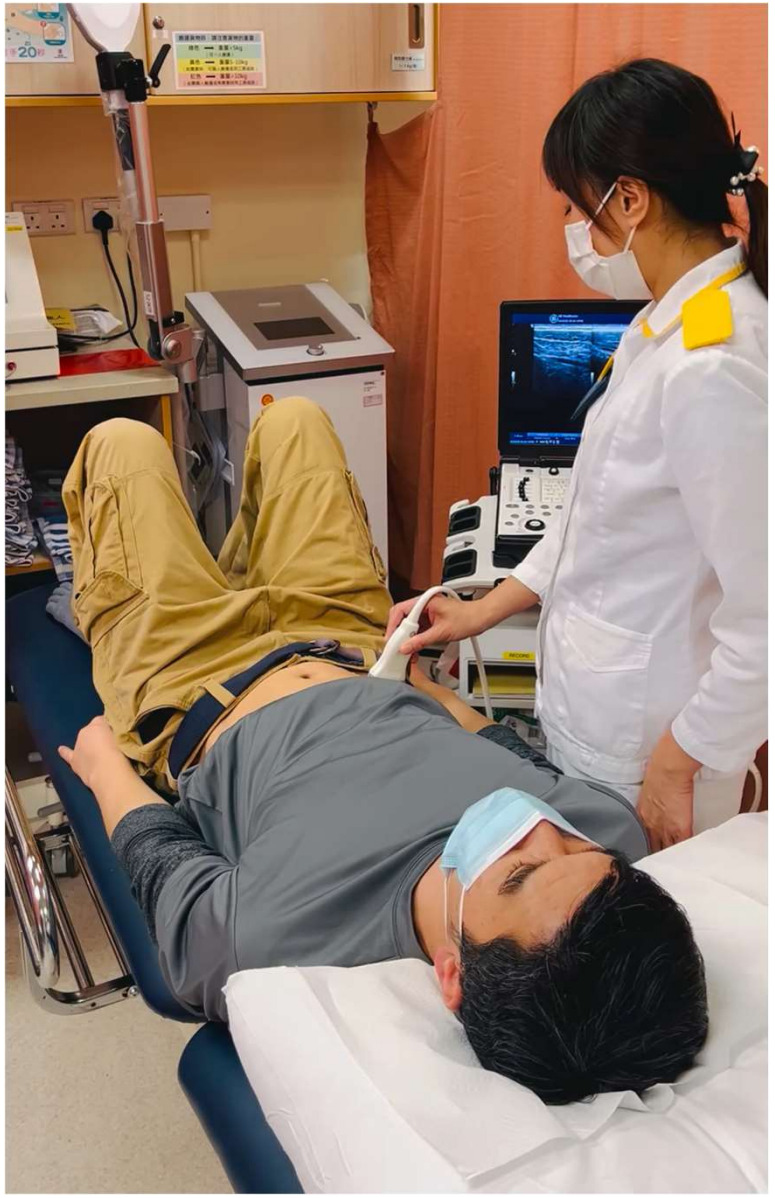
-Verbally instruct “Imagine pulling your belly button towards your spine”

-Measured by Ultrasound Imaging



2. Train TrA Activation





Abdominal Draw-In Exercise:
TrA Activation with Heel Slide

2. Train TrA Activation

Progression:

TrA Activation with

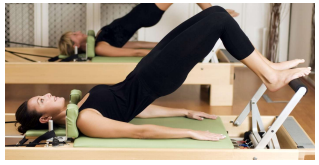
Straight Leg Raise

3. Train Core Stabilizatior

Training On Reformer

- Leg Press

- Bridging

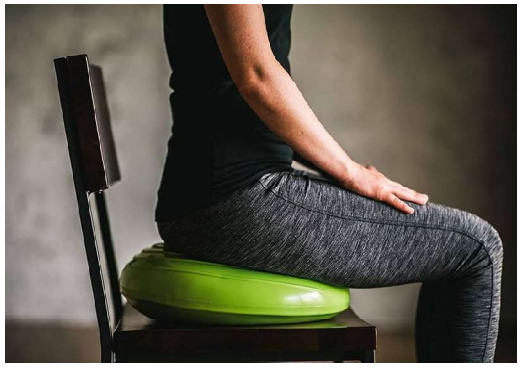


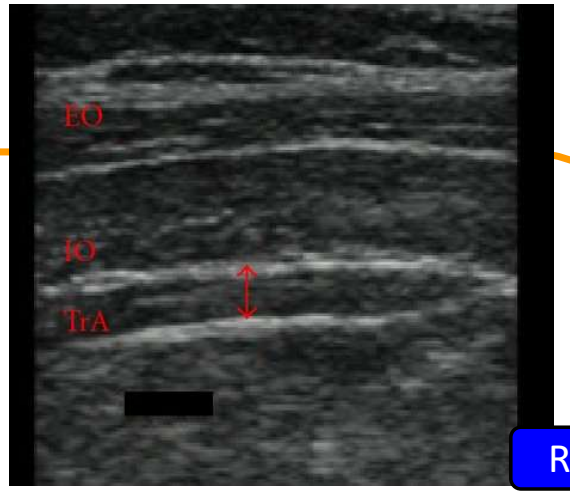
3. Train Core Stabilization

Training In Sitting

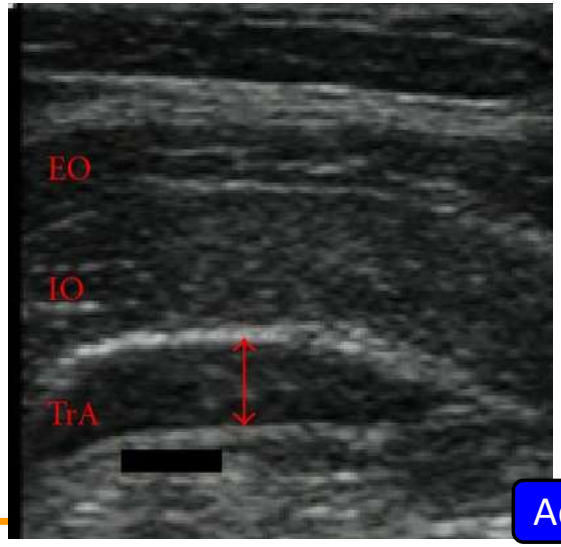
- Limbs Movement

- On Balance Disc



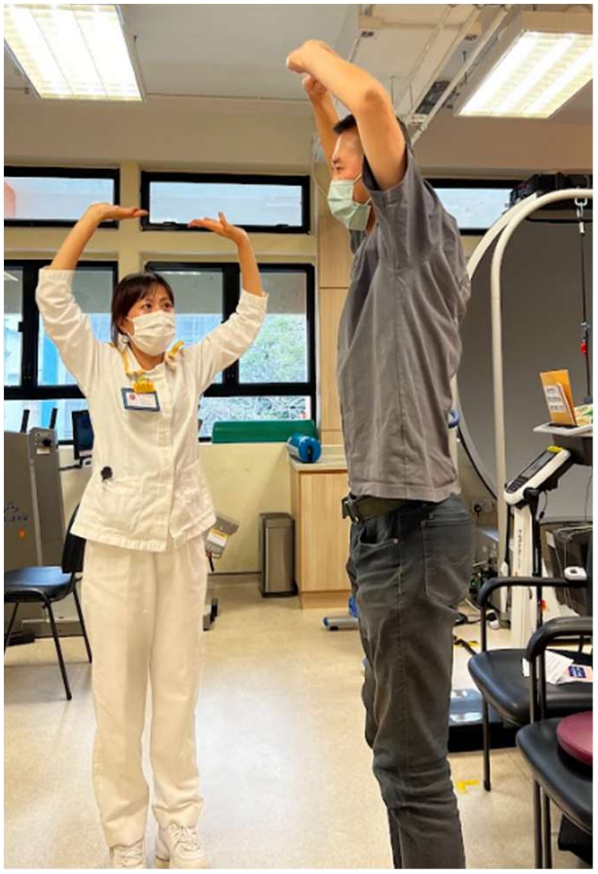


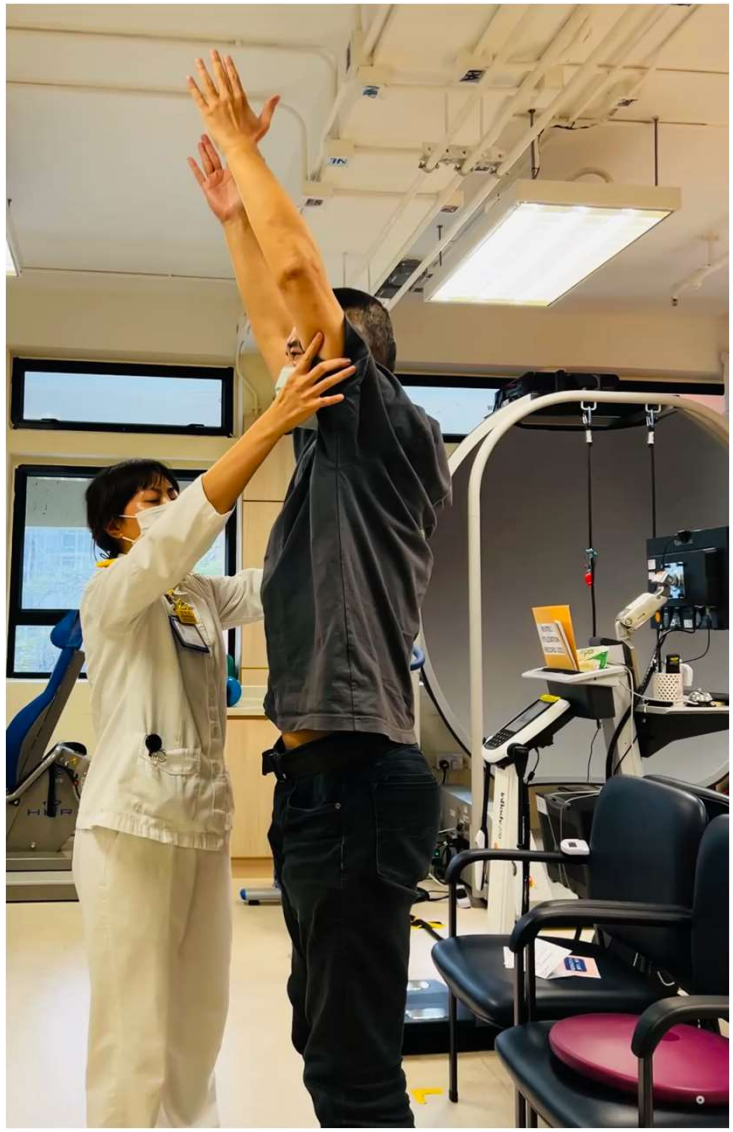
Resting



Activated

4. Generalize into Exercises





Physiotherapeutic Poles Exercises

Objective

- to evaluate the effectiveness of
  Targeted Physiotherapy Exercise Program
  incorporating **real-time US feedback**
  to enhance TrA muscle activation
  in patients with **chronic back pain**

Subjects

Recruited from **HKBH Physiotherapy Department**

Include

- ✓**Adults** (aged >18)
- ✓Referred for **Back** Physiotherapy
- ✓**CLBP** (Onset **> 3 months**)
- ✓STarT Back Screening Tool (**SBST**): **Low / Medium** risk

Exclude

- × **Acute** Injury
- × **Fracture**
- × **Red flags**
- × **Cognitive** impairment
- × **Severe visual or hearing** impairment

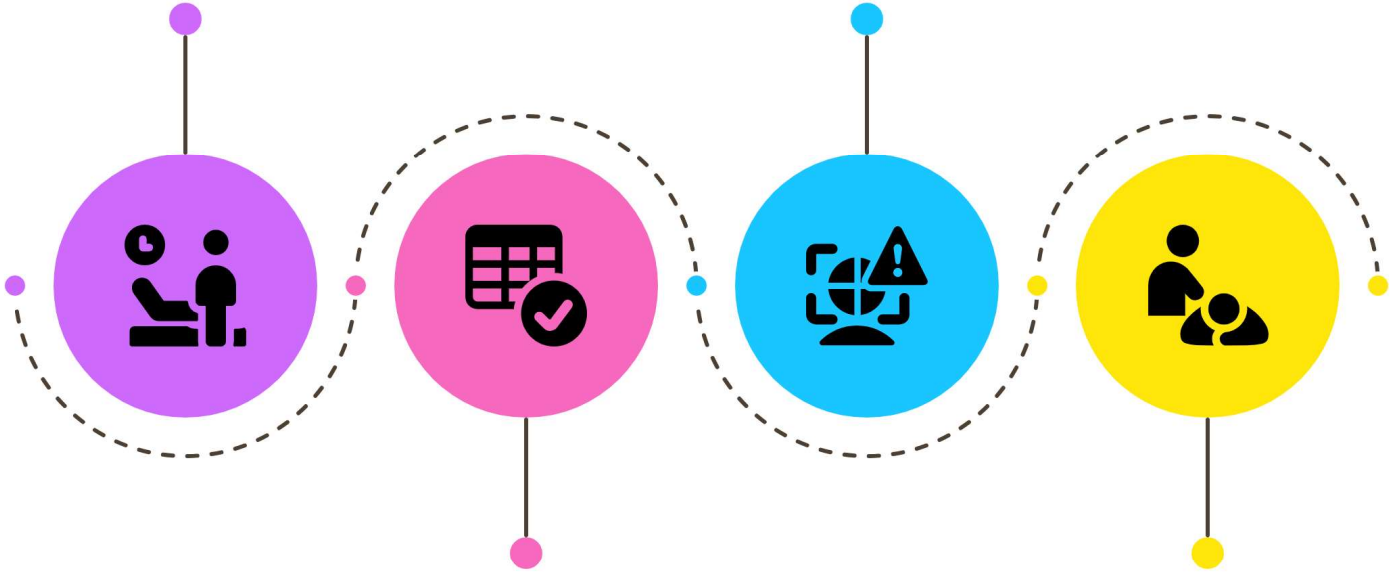
Method

Recruit Patients

Chronic back pain (onset > 3 months)
Appointment dated: Oct- Dec 2024

Identify Risk Group

Low / medium risk group



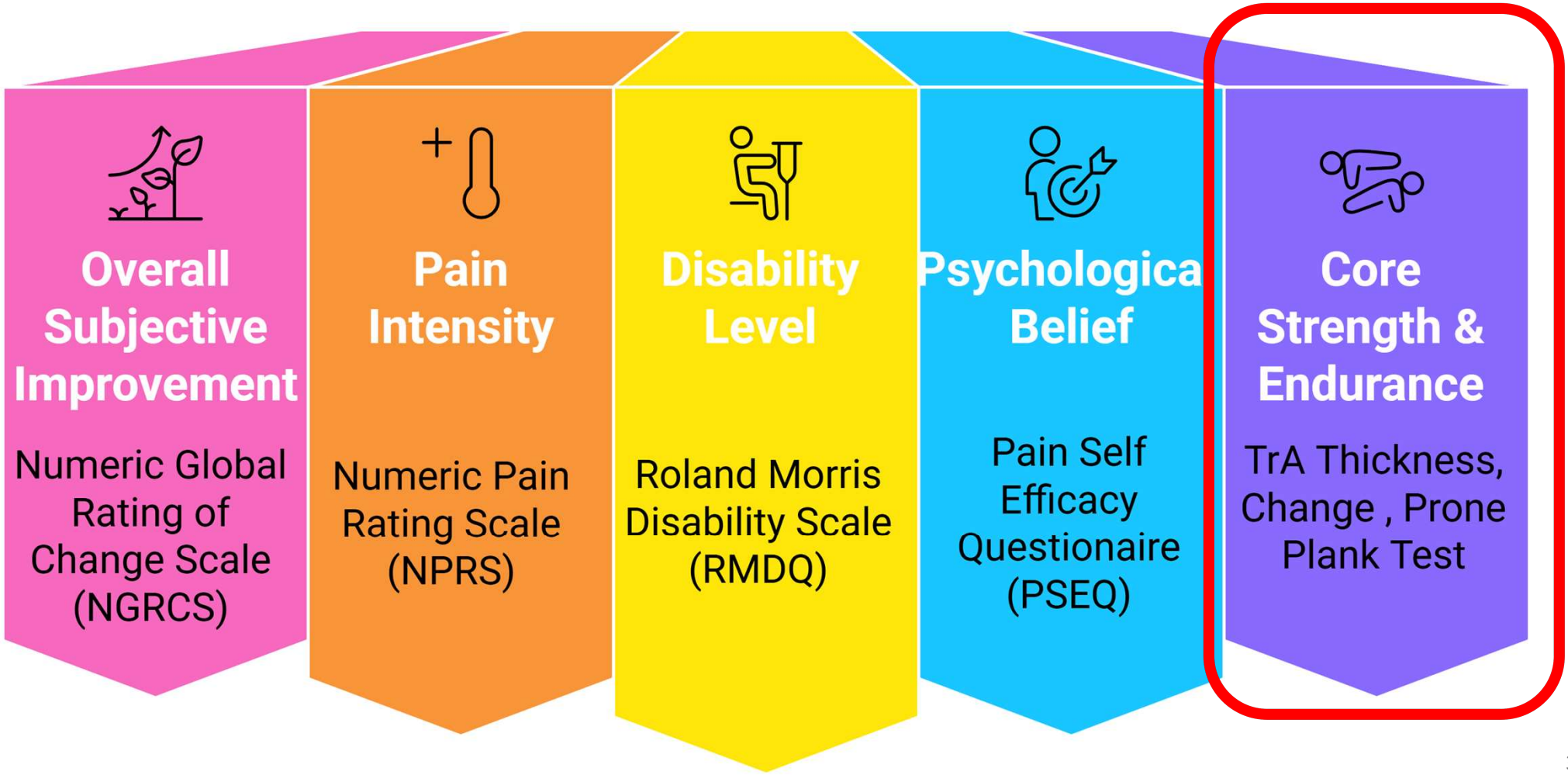
Stratify Patients

By STarT Back Screening Tool

Join 6-week Exercise Program

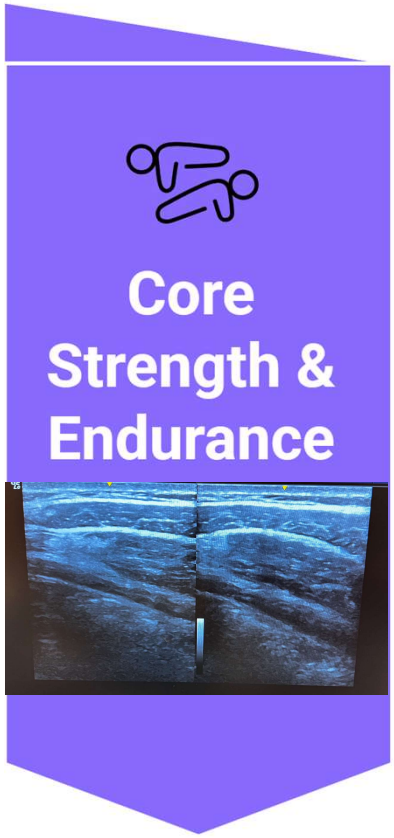
Six-week exercise program

Outcomes Measures



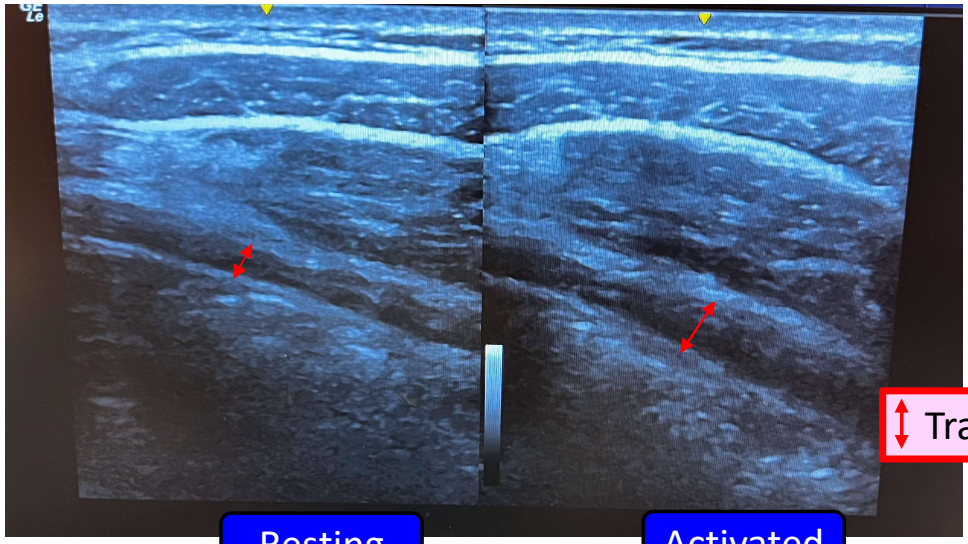
Outcomes Measures

Core Strength



TrA Thickness Change = **Activated – Resting**

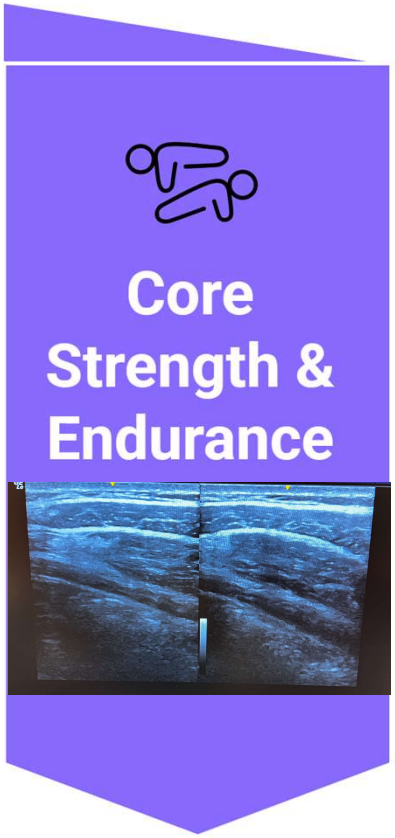
- Minimal Important Change: 0.3cm



(Djordjevic O et al, 2014)

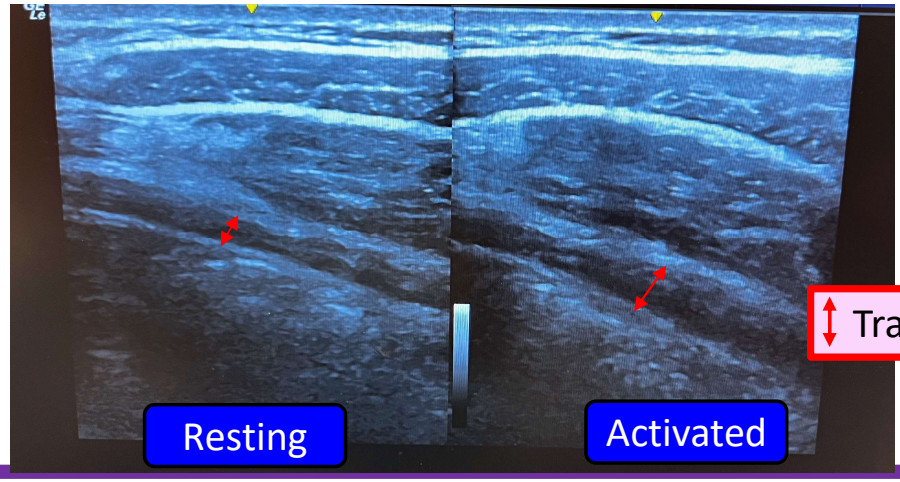
Outcomes Measures

Core Strength



TrA Activation Ratio = $\frac{\textbf{Activated thickness}}{\textbf{Resting thickness}}$

- **Healthy Norm: 1.5-2.0**
- Impaired Control: <1.5



(Teyhen DS, et al, 2005)

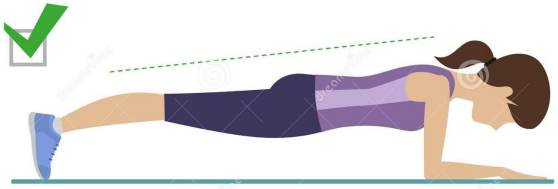
Outcomes Measures

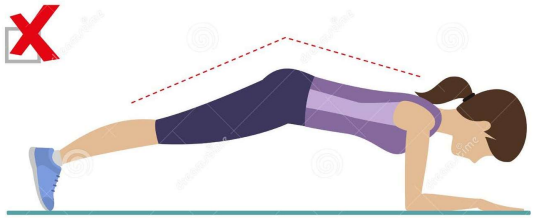
Core Endurance: Prone Plank Test

Core Strength & Endurance

Holding Time for body in straight line from shoulder to ankles, with elbows and forearm on ground

- **Adequate** Core Stability: **>90s**
- Core Endurance Deficits: <60s

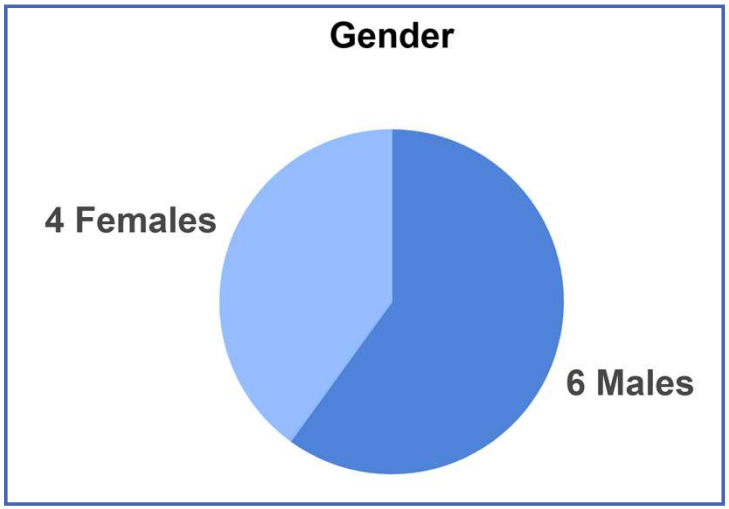


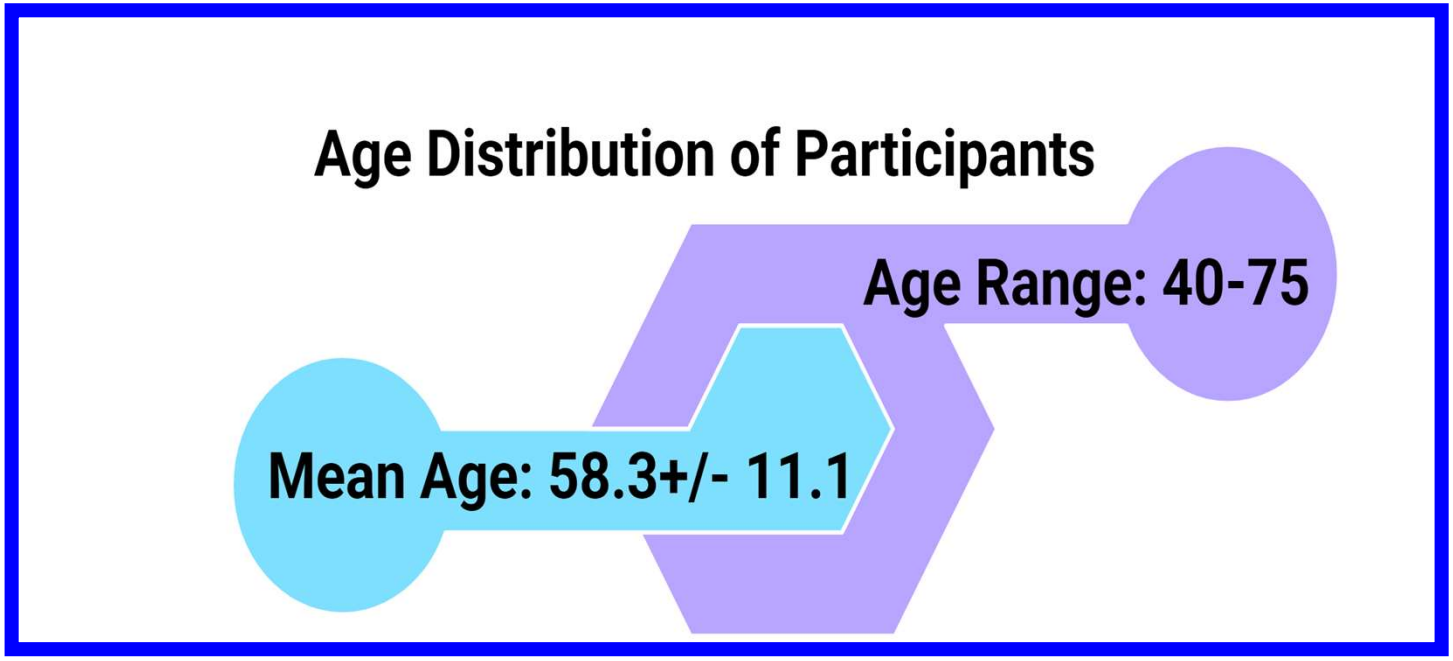


(Strand SL et al, 2014)

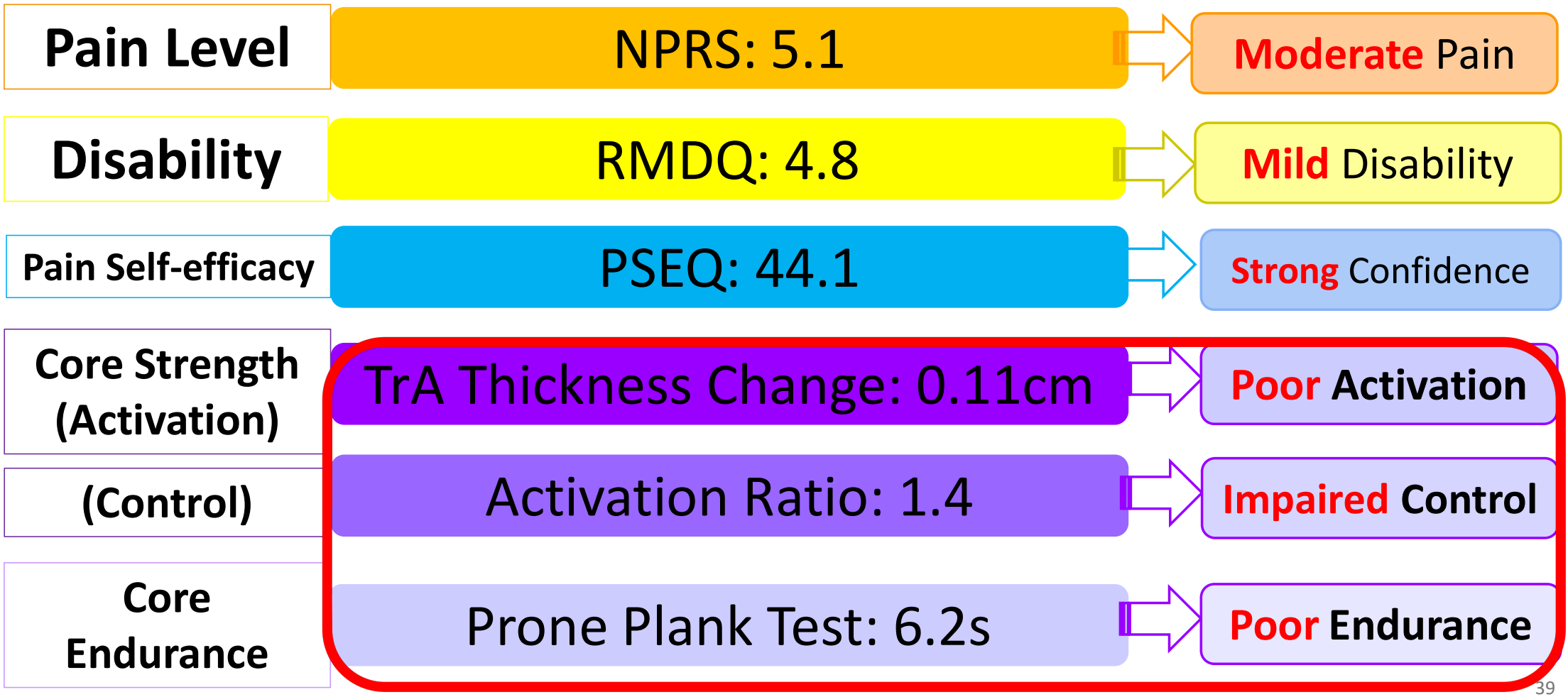
Results: Demographics

10 Participants Joined





Results: Demographics (Mean)

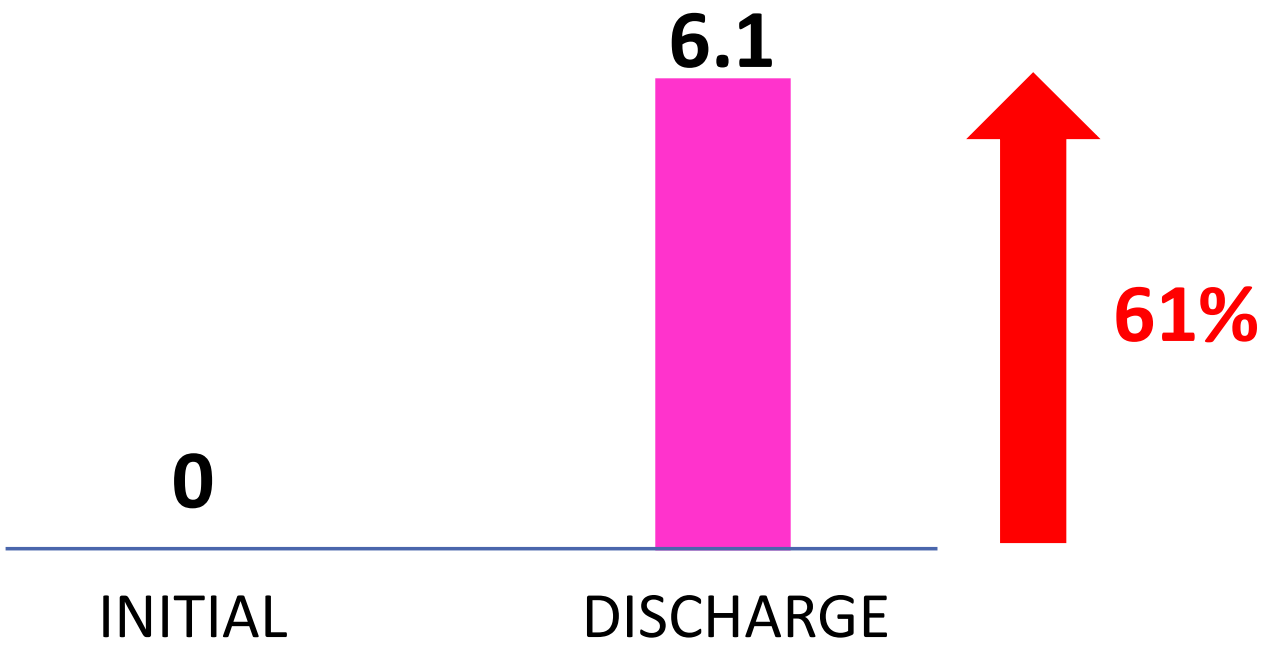


Results: Overall Subjective Improvement

1. Numeric Global Rate of Change Scale (NGRCS)

0 : no improvement

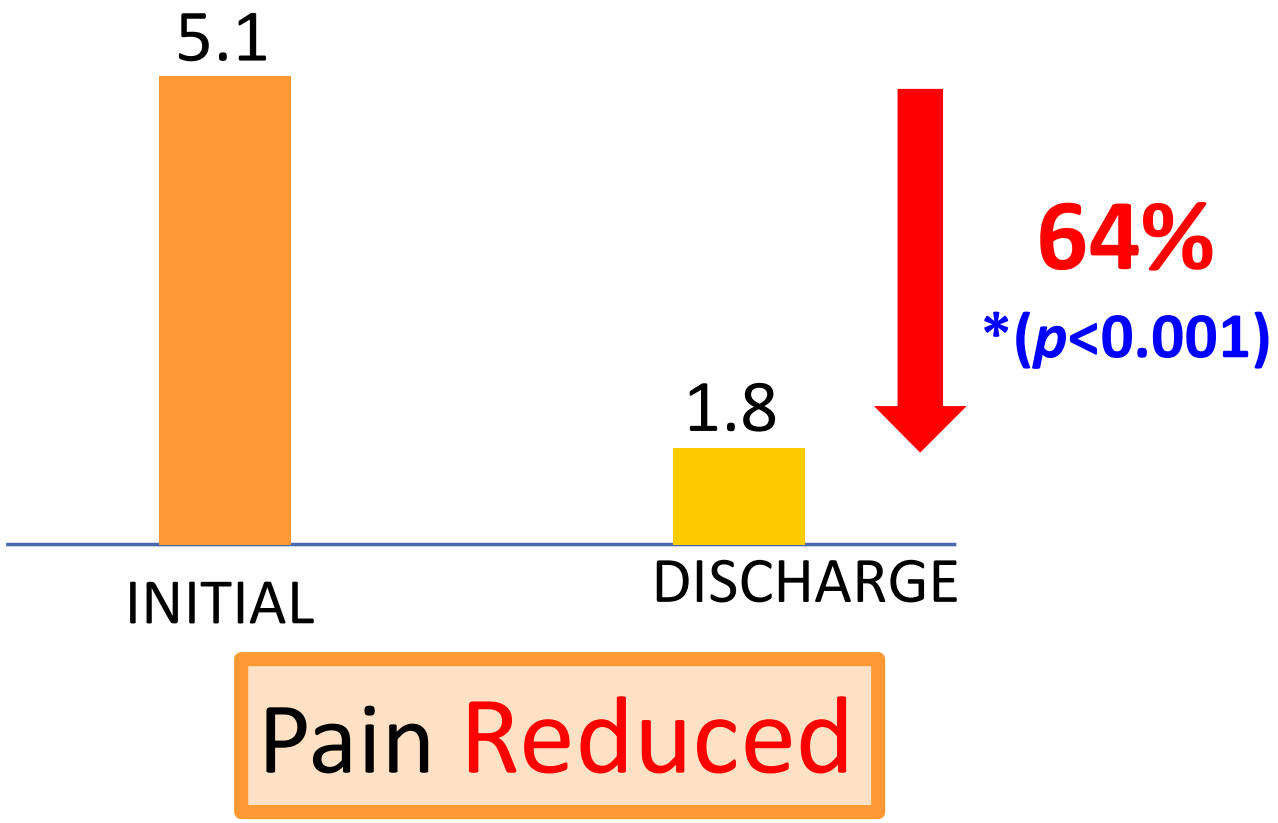
10 : 100% subjectively improved



Subjectively **Improved**

Results: Pain Intensity

2. Numeric Pain Rating Scale (NPRS)



Results: Disability Level

3. Roland Morris Disability Scale (RMDQ)

Met Clinically Important Difference (2-5points)

Patient-Report Questionaire

Score: 0-24

Level of Disability

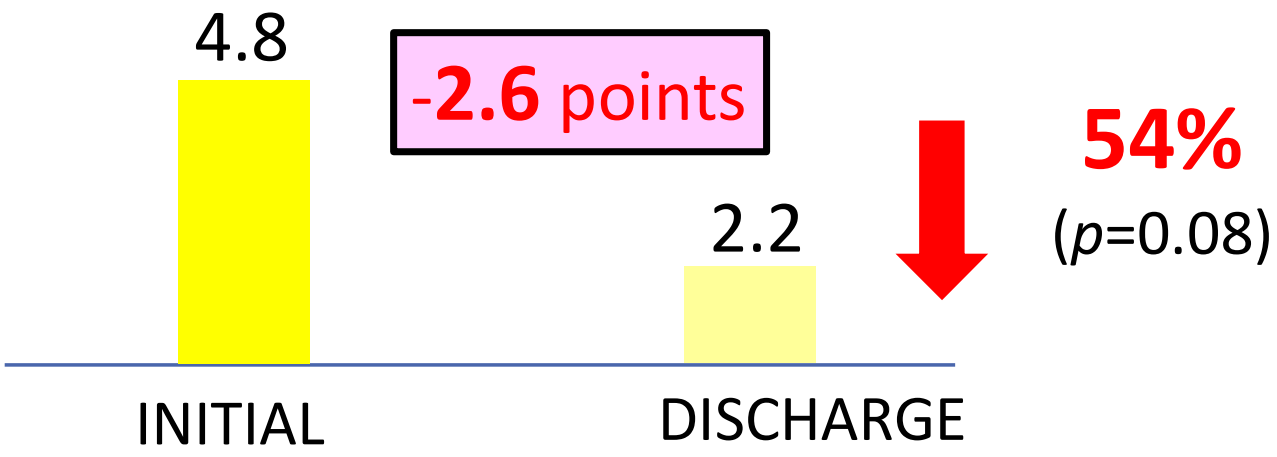
0-3: Minimal

4-10: Mild to Moderate

11-17: Moderate to Severe

18-24: Severe

(Jordan K et al, 2006)



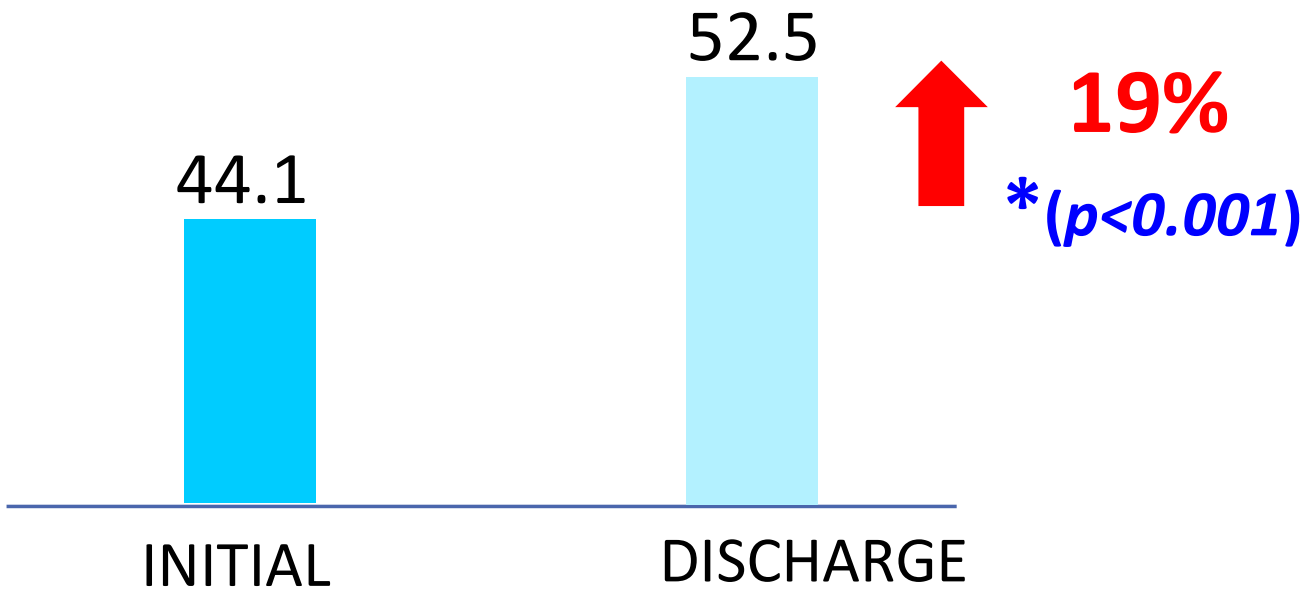
Reduced Disability

Results: Psychological Belief

4. Pain Self-Efficacy Questionnaire (PSEQ)

Self –Report Questionaire
Score: 0-60
Level of Confidence in performing activities despite pain
40-60: Strong Confidence
20-39: Moderate Confidence
0-19: Poor self-efficacy

(Nicholas MK, 2007)



Pain Self-Efficacy **Enhanced**

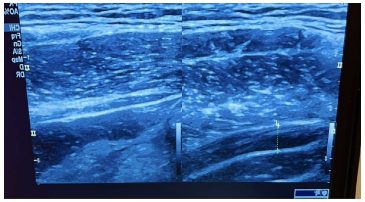
Results: Core Strength
5. TrA Thickness Change

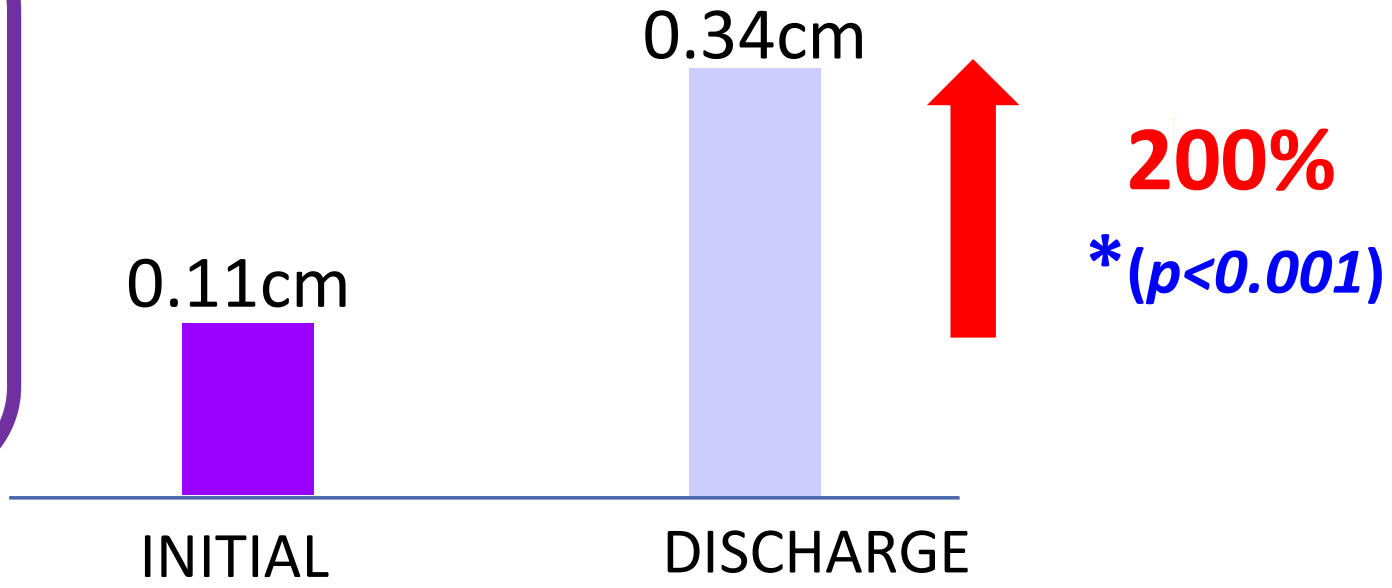
TrA Thickness Change

= Activated – Resting

- Minimal Detectable Changes: **0.3cm**

(Djordjevic O et al, 2014)





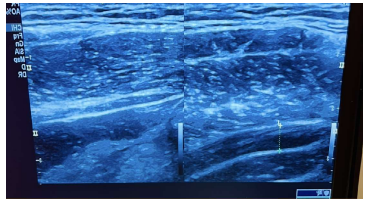
TrA Activation **Improved**

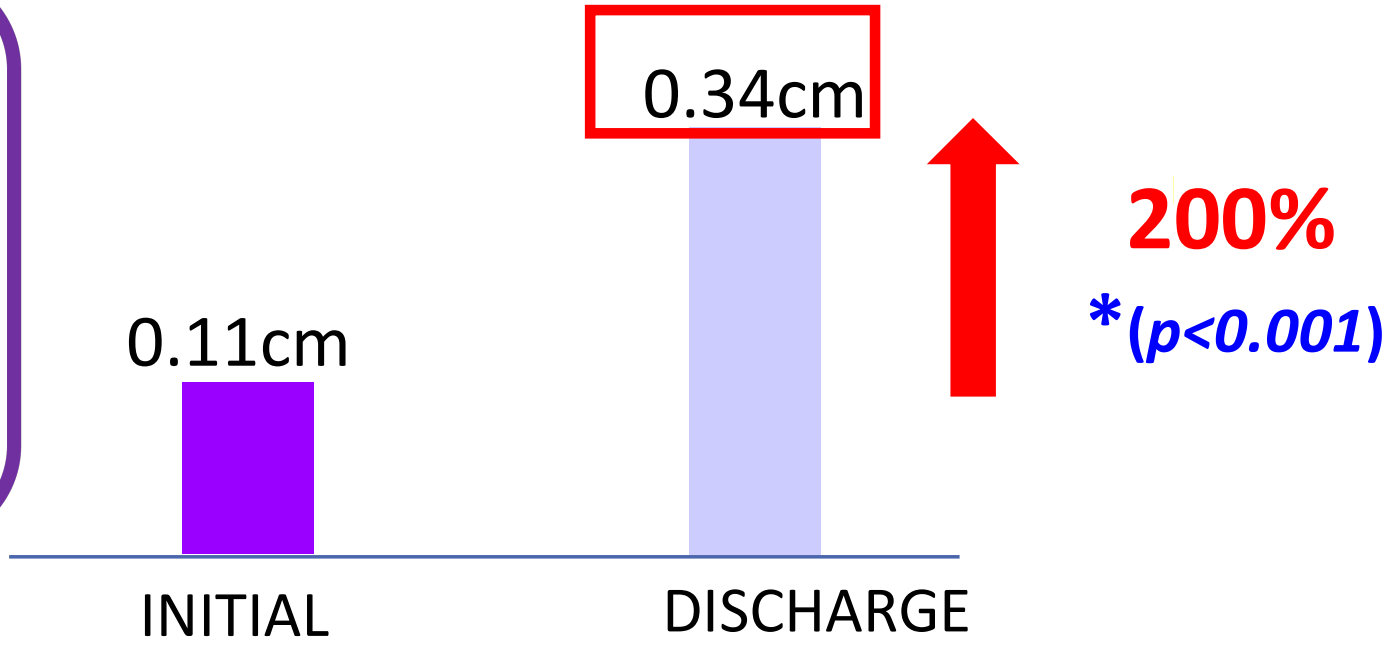
Results: Core Strength
5. TrA Thickness Change

TrA Thickness Change

= Activated – Resting

- Minimal Detectable Changes: **0.3cm**





TrA Activation **Improved** and **GOOD**

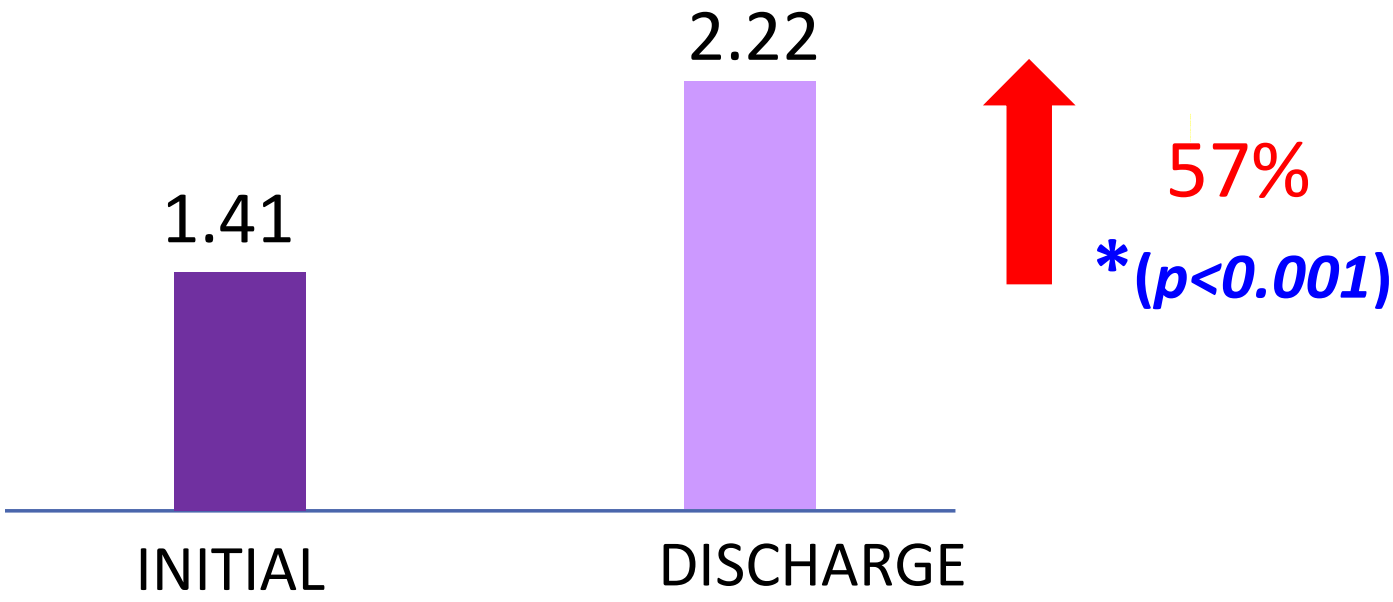
Results: Core Strength

6. Activation Ratio

$$\frac{\text{Activated thickness}}{\text{Resting thickness}}$$

- **Healthy Norm: 1.5-2.0**
- Impaired Control: <1.5

(Teyhen DS, et al, 2005)



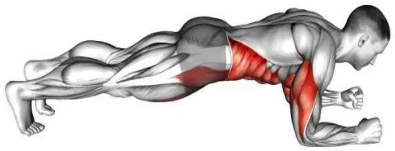
TrA Control Improved and Good

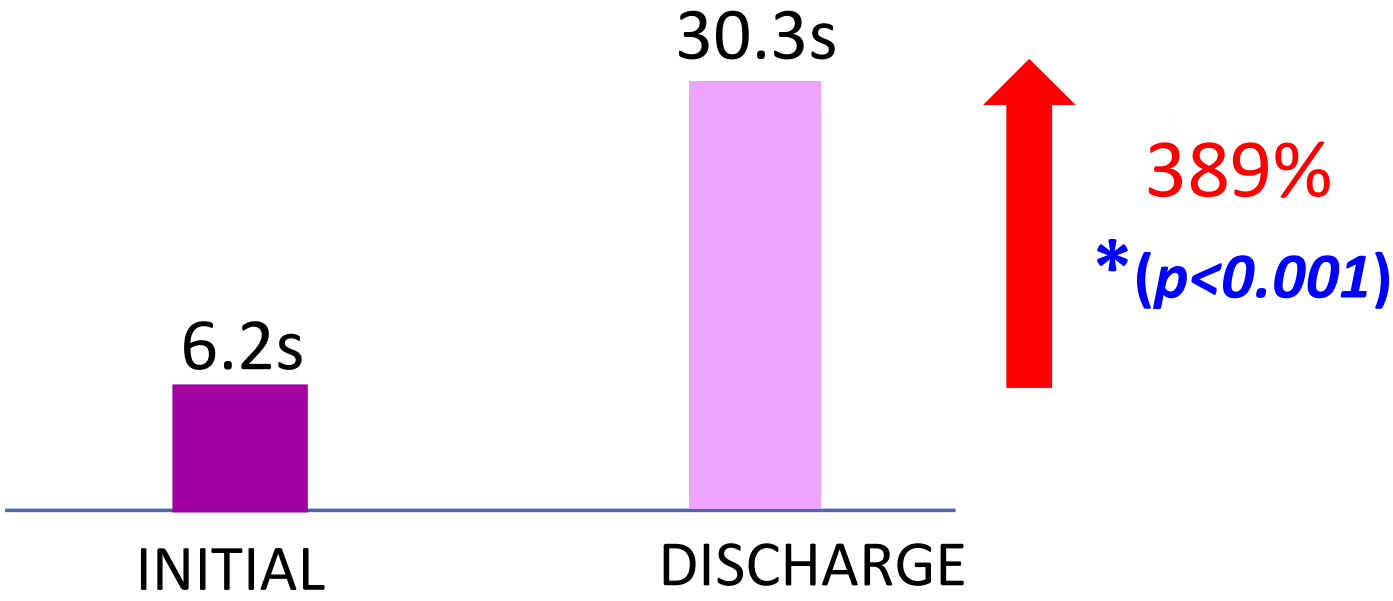
Results: Core Endurance

7. Prone Plank Test

Met Clinically Important Difference (↑20-30s)

- **Norm: >90s**
- Impair: <60s





Core Endurance **Improved**

Patient's Positive Feedback

On Use of Real-time Ultrasound (US) for TrA specific Training/ Self Exercises

How Easy?

5

1

No US

Use of US

Easy

How Confident?

4

1

No US

Use of US

Confident

How satisfactory on general condition? Mean scored 5

0- feeling worst ; 5- feeling best

Satisfactory

Our Program

- Targeted Physiotherapy Exercise Program with Real Time UltraSound as Feedback-

Stratified Assessment — Screening to Allocate Treatment Appropriateness

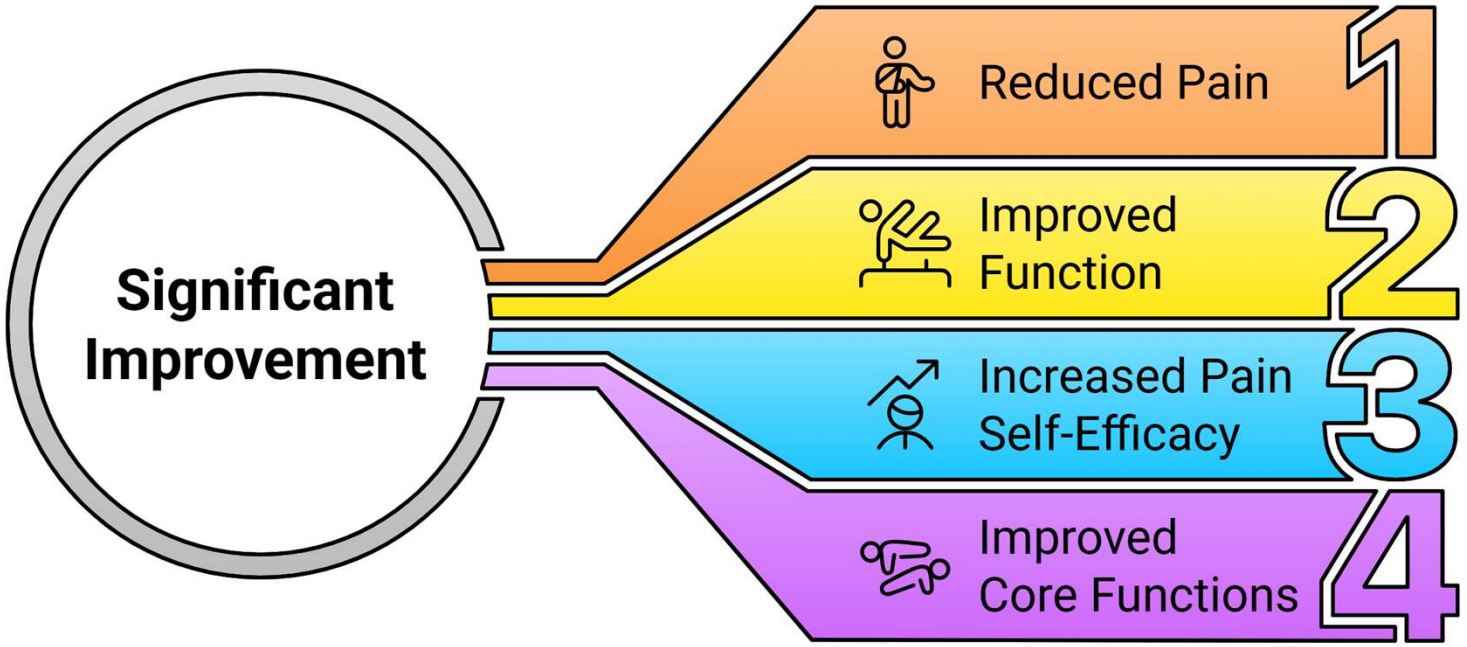
Targeted Training — Targeted TrA Training to Improve Outcomes

Ultrasound Feedback — Real-time Feedback to Improve Effectiveness

Our Program

- Targeted Physiotherapy Exercise Program with Real Time UltraSound as Feedback-

- Showed **Effective** for CLBP with Low / Medium risk



Our Program

Drive Success Through **Innovation** & **Service Enhancement**

Professional Service

Emphasizes the importance of delivering high-quality, reliable services.

Engaged Staff

Highlights the role of motivated and dedicated employees in achieving goals.

Patient-Centered Innovation

Focuses on integrating new ideas to enhance patient care and outcomes.

Teamwork

Encourages collaboration and collective effort to drive success.

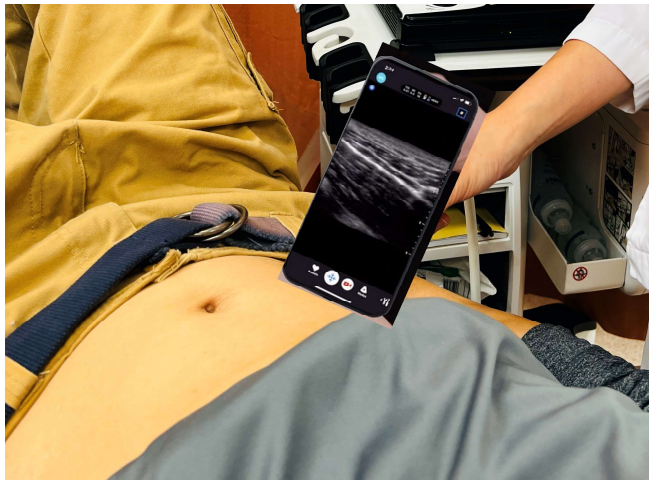
Ways Forward

Larger Sample Study

Expands research validity and generalizability

Self-Empowerment Program

Increases patient engagement and self-management



Tele-Training with AI

Provides innovative, tech-driven solutions for feedback

Acknowledgement

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- Physiotherapy Department, HKBH

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