WORLD AQUATICS

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Injury Prevention Strategies in Elite Swimmers

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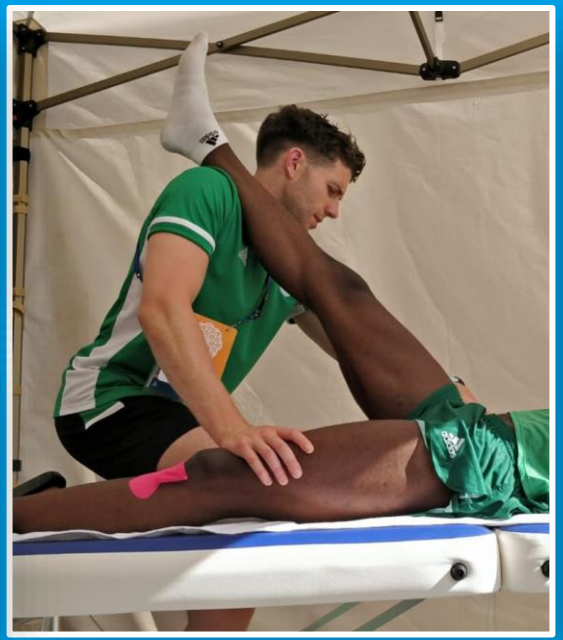
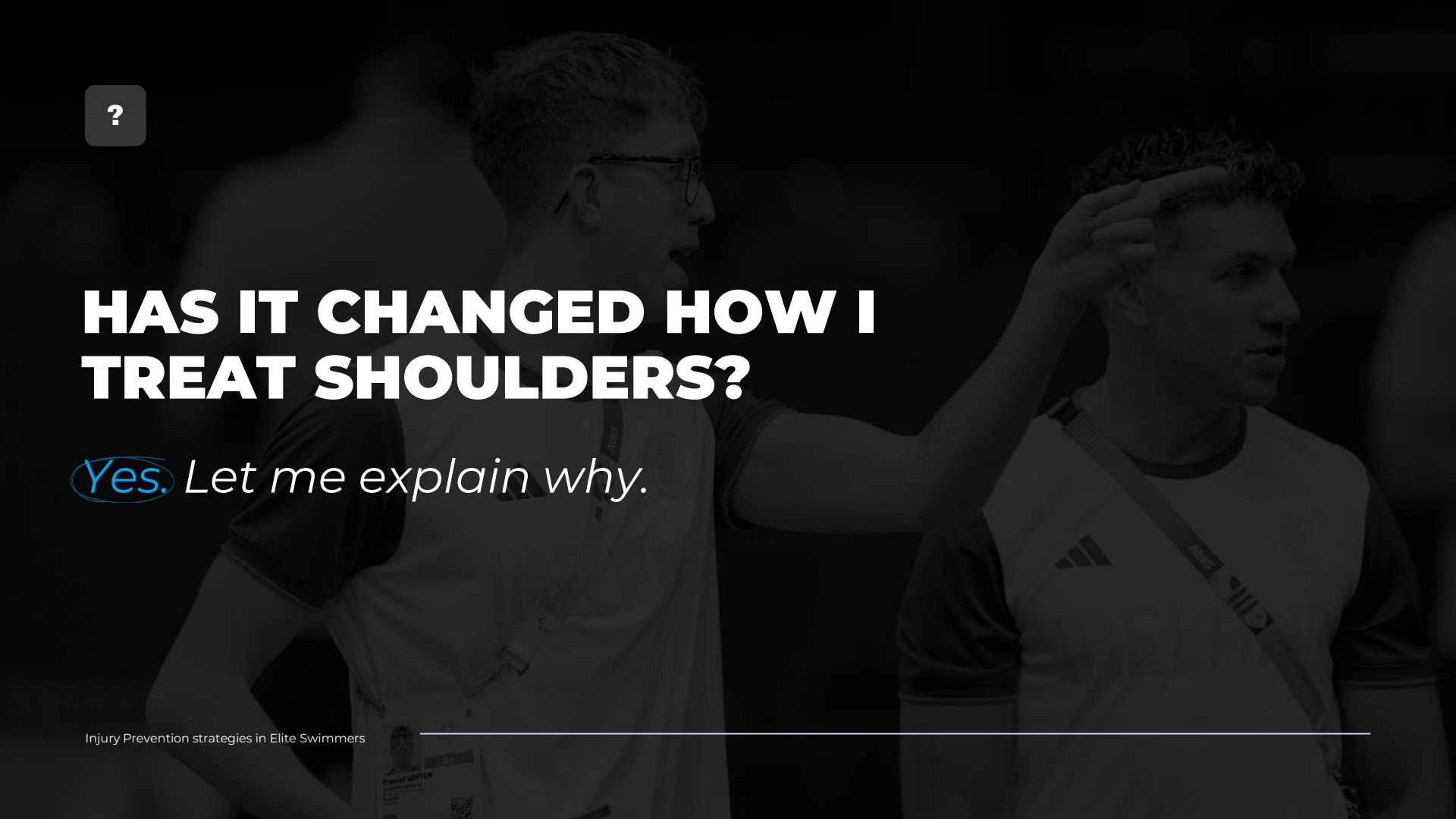
From hardly *any* shoulders...



… To *traumatic* **shoulders.**

… Into the world of *wobbly* shoulders.



?

HAS IT CHANGED HOW I TREAT SHOULDERS?

Yes. Let me explain why.

Why Does It Matter?

but also gymnastics, field hockey, or lacrosse. Shoulder injury rates depend upon many variables such as type of sports, sex, level of performance, and age but are reported to be between 18% and 61% in overhead throwing or smashing sports [1], [2] and up to 90% in elite swimmers [3]. Shoulder problems represent not only injuries leading to the athlete being unable to fully participate in normal training and competition (time-loss) but also any chronic complaint the athlete reports, regardless of participation [4].

This is the first study to report both time- and non-time-loss shoulder injury in elite South African cricketers. All non-time-loss shoulder injuries compromised primary skill, while some resulted in changes to throwing technique and fielding position. Thus shoulder injury, whether it results in time loss or not, potentially impacts match performance.

Considerations

- **PMH**
- **Age**
- **Gender**
- Mileage or weekly training load
- Using on training devices such as fins, kickboards, paddles
- Recent technique changes?
- Training Age
- Stroke Specialization
- Change of coach

!

Risk Factors

Salam et al 2025

ROM

Kinetic Chain

Strength & Endurance

Load Management

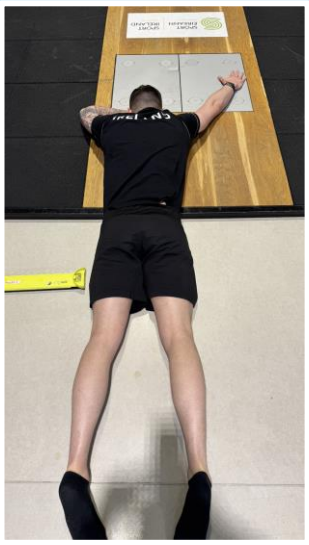
The Pillars of Shoulder Rehab:
A Foundation for Stability

Rehab Functions

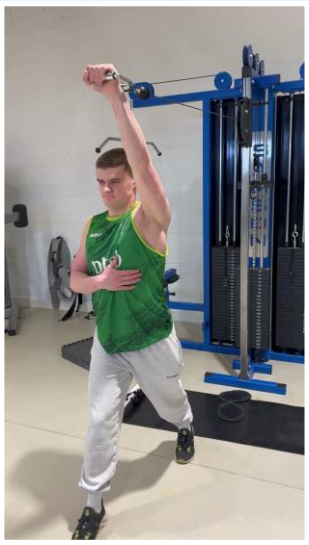
1. Neuromuscular Control
2. Proprioception
3. Kinetic Chain Integration
4. Strength Endurance

Functional Considerations

Can they attain the position required in order to produce force?



Can they produce force in this position?



Can they produce force dynamically from this position?

Can they produce force repeatedly from this position?

Rehabilitation Progression

1

Static Joint Repositioning drills (Closed Chain) for pain modulation followed by motor control.

2

Open-Chain Loading for high-speed dynamic control but should follow foundational stability work.

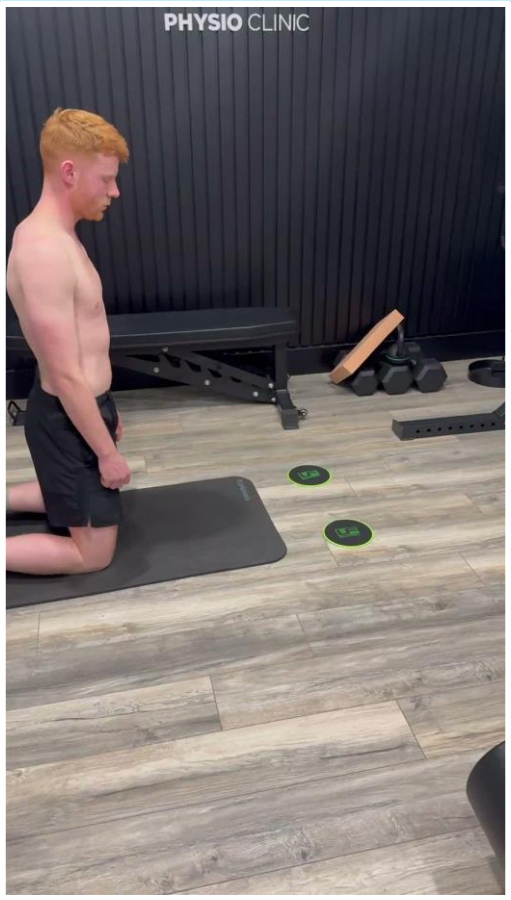
3

Mixed , faster , Ballistic , Chaotic loads.

The reconditioning of an athlete with an unstable shoulder *must cover* all functional requirements!

The athlete needs to FEEL like an athlete.

The Aim to exceed your athletes expectations needs to FEEL like an athlete.



Management Strategies - Unload only as *required!!*

A Balancing Act

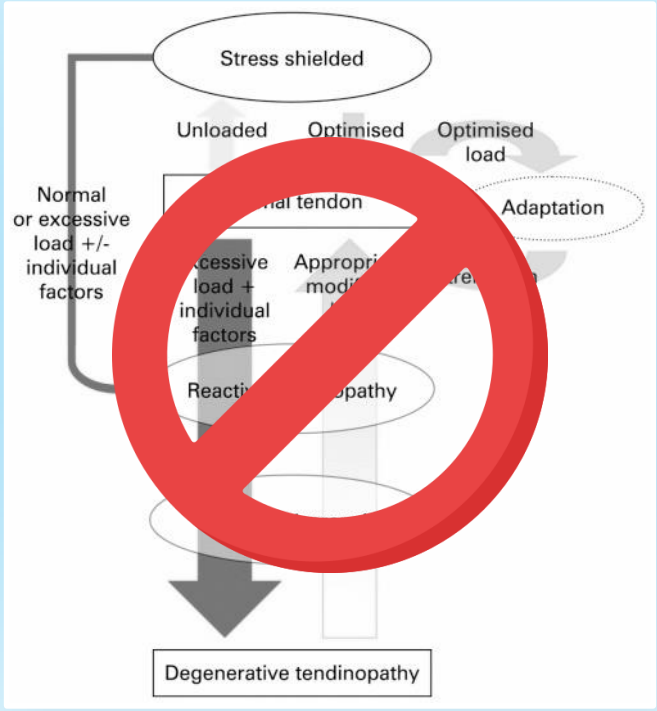
LOUGHBOROUGH SWIMMING

	Weekly Focus	Swim	Approx. Volume	Land
Reuben	Capacity	10	69.5	3+2+0
Jakob	Capacity	10	69.5	3+2+0
Felix	Capacity	11	85.5	2+1+0
Will	Capacity	10	71.5	0+2+2
Dan	Capacity	11	95.5	2+1+0
Nathan	Capacity	11	95.5	2+1+0
Tyler	Capacity	10	75.0	3+2+0
Lucas	Capacity	11	85.5	2+1+0

Tendon Changes

Swimmers undergo tendon swelling over the course of a session naturally due to increased hydrophilic molecule production (approx 5% per session, 10% across a week)

So does loading an overloaded tendon make sense?
Or is load management more important?



Overuse vs Under Recovery?

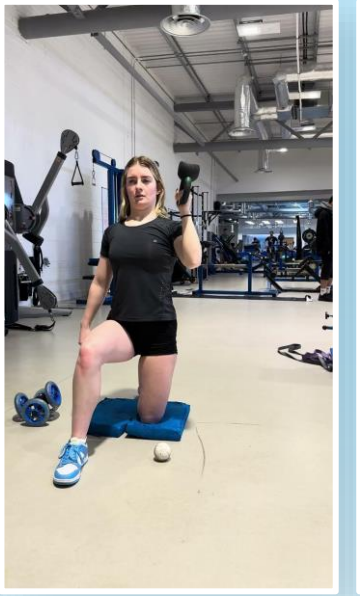
Subscapularis tendinopathy is highly prevalent in elite swimmer's shoulders: an MRI study

Kylie Holt [1], Andrew Delbridge [2], Lawrence Josey [3], Sanjay Dhupelia [4], G C Livingston Jr [5], Gordon Waddington [6], Craig Boettcher [2]

Subscapularis and supraspinatus tendinopathy was the most common tendon abnormality identified in swimming participants, being reported in at least one shoulder in 48/60 (73 %) and 46/60 (70 %) swimmers, respectively.

Pathology was not a predictor of current pain!!

Case Example. 1500m swimmer

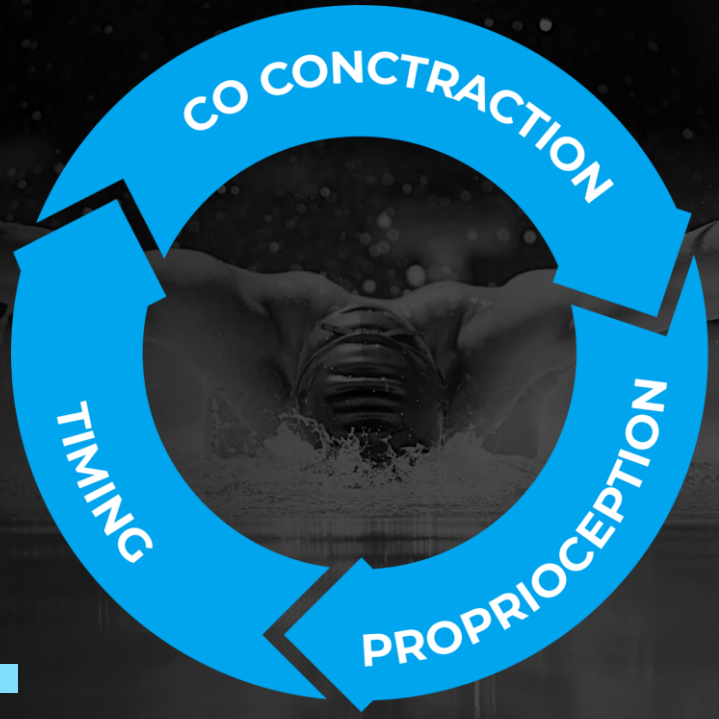


Why Strength Alone Fails –

The Neuromuscular Basis of Stability

Strength ≠ Stability (Cools et al., 2015) Stability is governed by timing, co-contraction, and proprioception, not just force production.

Swimmers need: High rotator cuff endurance (low-load, high-rep training) Scapulothoracic control to limit excessive anterior translation Pre-activation training to improve reflexive stability



Delayed Rotator Cuff Activation

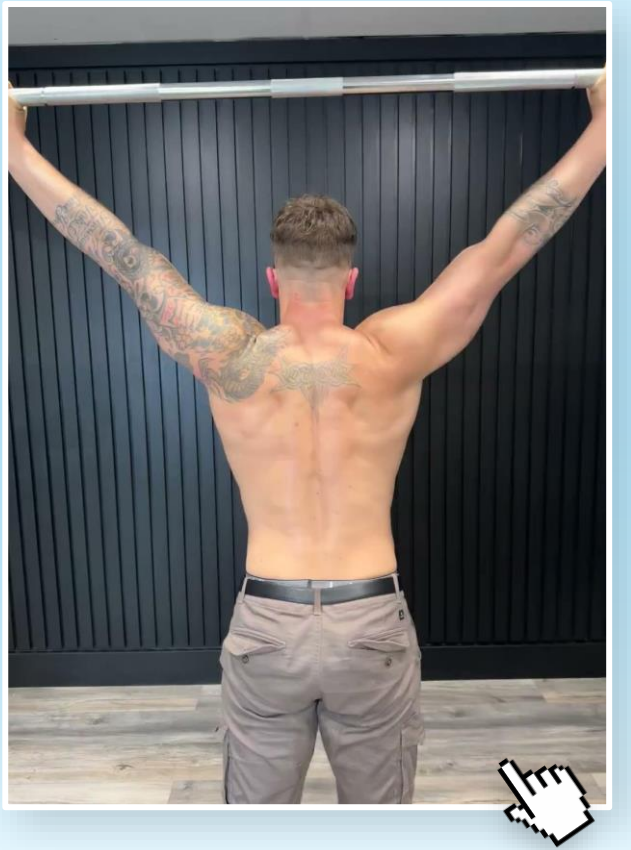
Poor Humeral Head Control

Impingement Risk

Neuromuscular Instability –
When Coordination Fails

Aberrant muscle activation patterns:

- Delayed lower trap & serratus anterior activation.
- Overactive upper traps & pec minor.
- Poor rotator cuff timing (dominance of global over stabilizing muscles).

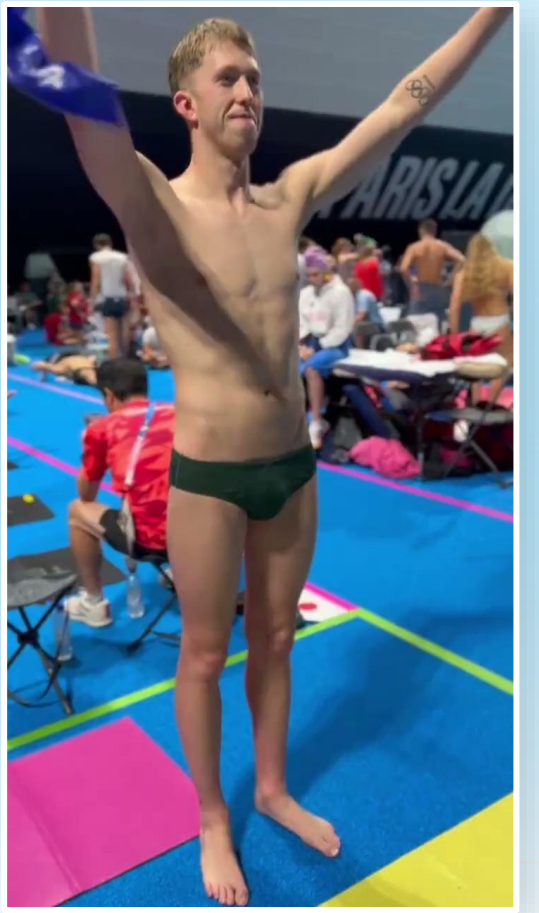


Atraumatic Instability – When *Laxity Becomes a Liability*

Stability is the goal, not mobility.

Impact on Stability:

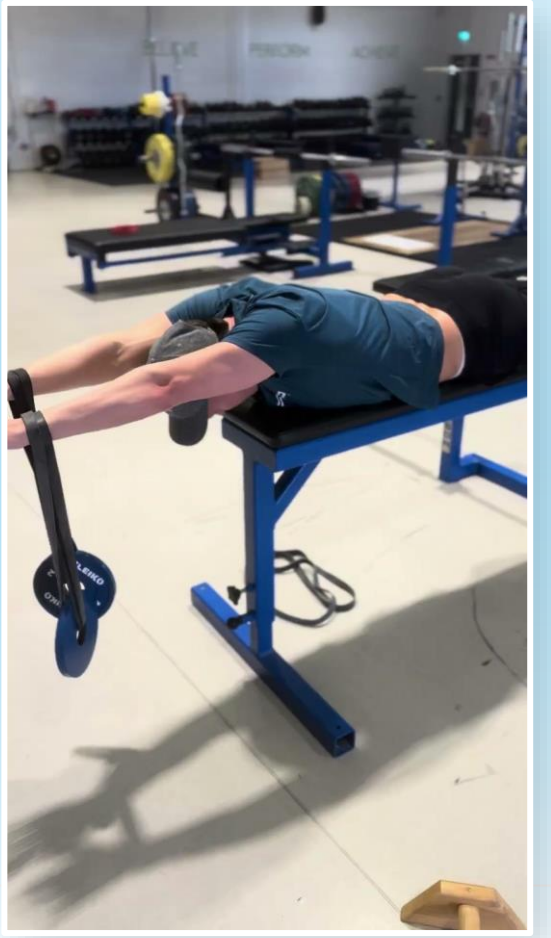
- **Over-reliance on passive structures** (capsule & ligaments) instead of active stabilizers.
- **Delayed or inefficient rotator cuff & scapular muscle activation.**
- **Increased energy leak in kinetic chain** → Poor force transfer in overhead athletes



Proprioceptive Deficits in Shoulder Instability: *How Do We Fix Them?"*

- Static joint repositioning drills.
- Reactive perturbation- based exercises.
- Dynamic sport- specific proprioceptive challenges

Expose the athlete to controlled positions of vulnerability that re-educate muscle synergy in required position.



Can we change muscle recruitment by utilizing the Kinetic Chain? YES!

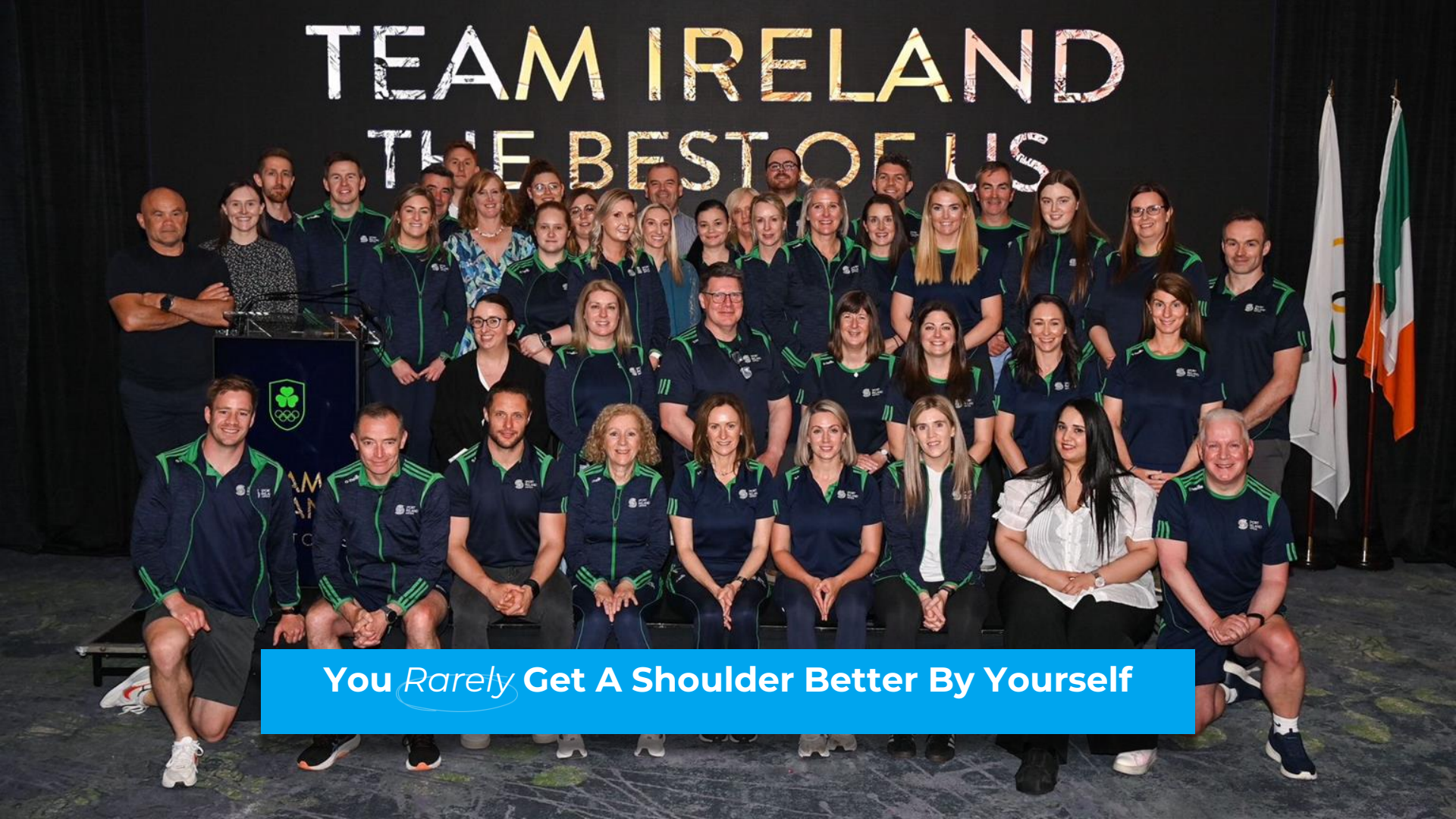
Evidence

- Diagonal exercises leads to increase scapular muscle activity *(Maenhout BJSM, 2009, De Mey JSCR 2012)*
- Challenging Core Stability increases serratus anterior activity *(Vega Thoro Man Ther 2017)*
- Trunk Rotation Increases trapezius activity *(Mlakoshi JSES 2019)*

Management Strategies.

Bridging Research and Performance

- Rotator cuff endurance v rotator cuff strength
- Periodization of shoulder loading in season
- Role of manual therapy
- Decision making when to push vs when to protect



You *Rarely* Get A Shoulder Better By Yourself

Thank you.
Any questions?

References

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