

# Multidirectional instability in the overhead athlete: CONSERVATIVE TREATMENT



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Ann Cools Malmö sept 2012

# Purpose of this presentation

- Classification of instability: where does the overhead athlete with instability fit in?
- Research findings, relevant for rehab approach
- General guidelines for conservative treatment of MDI
- Specific issues based on the sport (gymnast, swimmer, volleyballplayer)

# Classification of Instability (1)

**T**RAUMATIC  
**U**NIDIRECTIONAL  
**B**ANKART  
**S**URGERY



**A**CQUIRED  
**I**NSTABILITY  
**O**VERSTRESS  
**S**URGERY



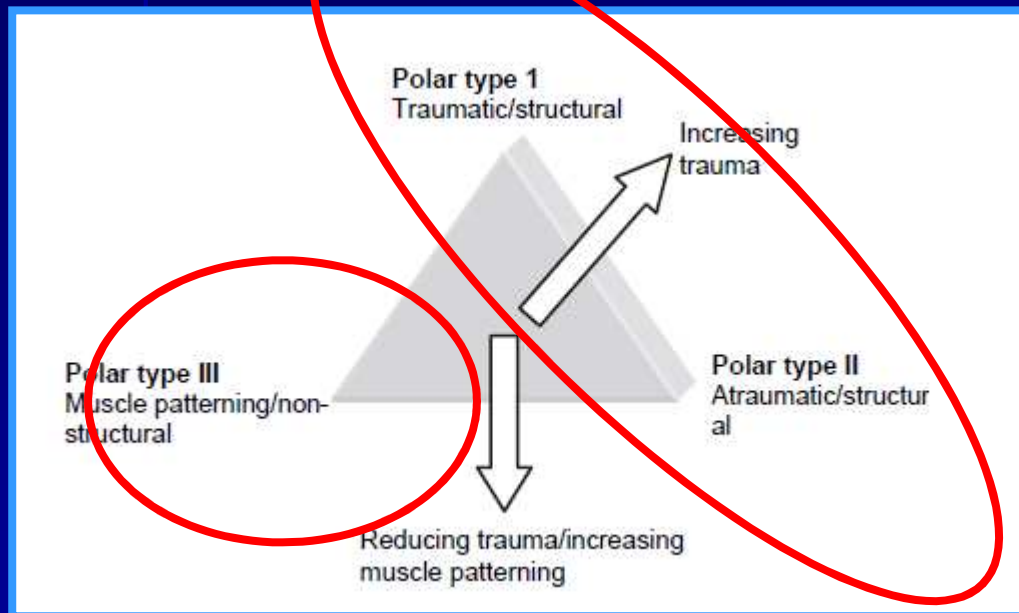
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**A**TRAUMATIC  
**M**ULTIDIRECTIONAL  
**B**ILATERAL  
**R**EHABILITATION  
**I**NFLAMMATORY



# Classification of Instability (2)

## ■ Stanmore triangle:



Shoulder injuries in athletes

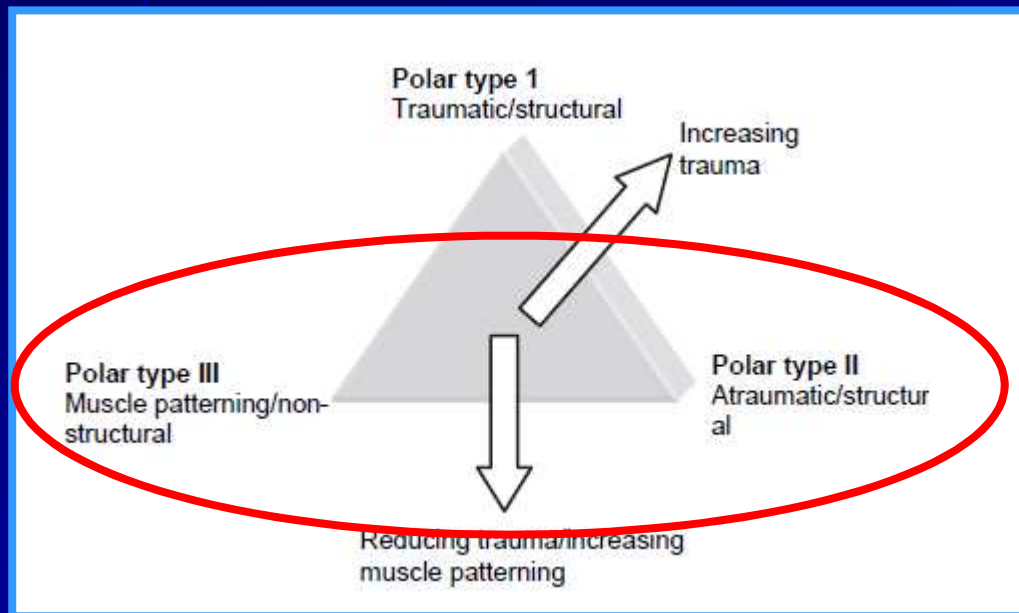
## Rehabilitation for shoulder instability

A Jaggi, S Lambert

*Br J Sports Med* 2010;**44**:333–340. doi:10.1136/bjsm.2009.059311

# Classification of Instability (2)

## ■ Stanmore triangle:



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# Classification of instability (3)

## ■ FEDS classification

**FREQUENCY**–The patient is asked, *“How many episodes have you had in the last year?”*

Solitary – ‘1 Episode’

Occasional- ‘2 -5 Episodes’

Frequent – ‘>5 Episodes’

**ETIOLOGY** – The patient is asked, *‘Did you have an injury to cause this?’*

Traumatic – ‘Yes’

Atraumatic – ‘No’

**DIRECTION** – The patient is asked, *‘What direction does the shoulder go out most of the time?’*

Anterior- ‘Out the Front’

Inferior- ‘Out the Bottom’

Posterior- ‘Out the Back’

The direction is confirmed at the time of the physical examination using provocative tests. During translation testing, the physician asks, which one of the following directions most closely reproduces your symptoms, and then translates anterior, inferior, and posterior. To confirm, the physician may ask which one of these tests most closely reproduces your symptoms: and the anterior apprehension test, the sulcus test, and the posterior jerk test is performed. With the history and physical examination using provocative tests, the patient should be able to distinguish and identify the *primary direction* of his or her instability.

**SEVERITY**–The patient is asked, *‘Have you ever needed help getting the shoulder back in joint?’*

Subluxation– ‘No’

Dislocation – ‘Yes’



EDITOR'S  
CHOICE

## A new classification system for shoulder instability

John E Kuhn

*Br J Sports Med* 2010;**44**:341–346. doi:10.1136/bjsm.2009.071183

# Discussion & summary:

- MDI = symptomatic instability in 2 or more directions with or without associated hyperlaxity
- instability in the overhead athlete is often “subtle”
- “minor instability” versus “excessive laxity”
- Overhead athletes: often combination of hyperlaxity, overuse and minor structural damage

# Scientific background for conservative treatment

1. Muscle recruitment patterns in MDI patients
  - Increased activation of pectoralis major and latissimus dorsi (Barden 2005, Jaggi 2008, 2010)
    - Increased forces in PM en LT increase anteriorly directed forces in end-range positions, resulting in decreased joint stability (Konrad 2006)





# Dominance latt dorsi and pect maj



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# Scientific background for conservative treatment

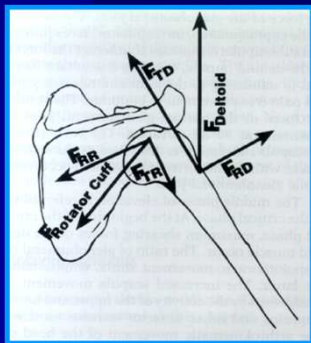
## 1. Muscle recruitment patterns in MDI patients

- Increased activation of pectoralis major and latissimus dorsi (Barden 2005, Jaggi 2008, 2010)



- Increased forces in PM en LT increase anteriorly directed forces in end-range positions, resulting in decreased joint stability (Konrad 2006)

- Decreased activation in deltoid, rather than rotator cuff (Morris 2004)



- Deltoid is an important stabilizer of the GH joint and avoids inferior translation of the humeral head (Gagey 2000, Donatelli 2004)

# Scientific background for conservative treatment

2. Closed chain exercises improve static stability of the joint and stimulate intra- and periarticular mechanoreceptors (Lephart & Fu 2000, Jaggi BJSM 2010)



# General guidelines MDI conservative treatment

- Improve local dynamic joint stability through activation of the **deltoid** (Yamazaki 2003, Milner 2002)
- Use by preference **closed chain exercises** to guarantee static joint approximation (Uhl 2003, Dillman 1994)
- Improve **scapular muscle** control and strength (Cools 2008, Ludewig 2009)
- avoid **activity of latt dorsi and pect major** during exercises (Jaggi 2010)
- Challenge **sportspecific** demands (Bahu 2008, Beasley 2000)

# Deltoid co-contraction: low load closed chain exercises



(Uhl 2003)

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# Multidirectional Instability: low load CKC exercises





# How to avoid latt dorsi and pect maj to be activated: external rotation component!



(Kibler 1998, Vanderhoeven 2006, Kibler 2006, Cools & Walravens 2005, Cools 2008)

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# Scapular rehabilitation in closed chain

**A**  
**Sidelying Forward flexion**



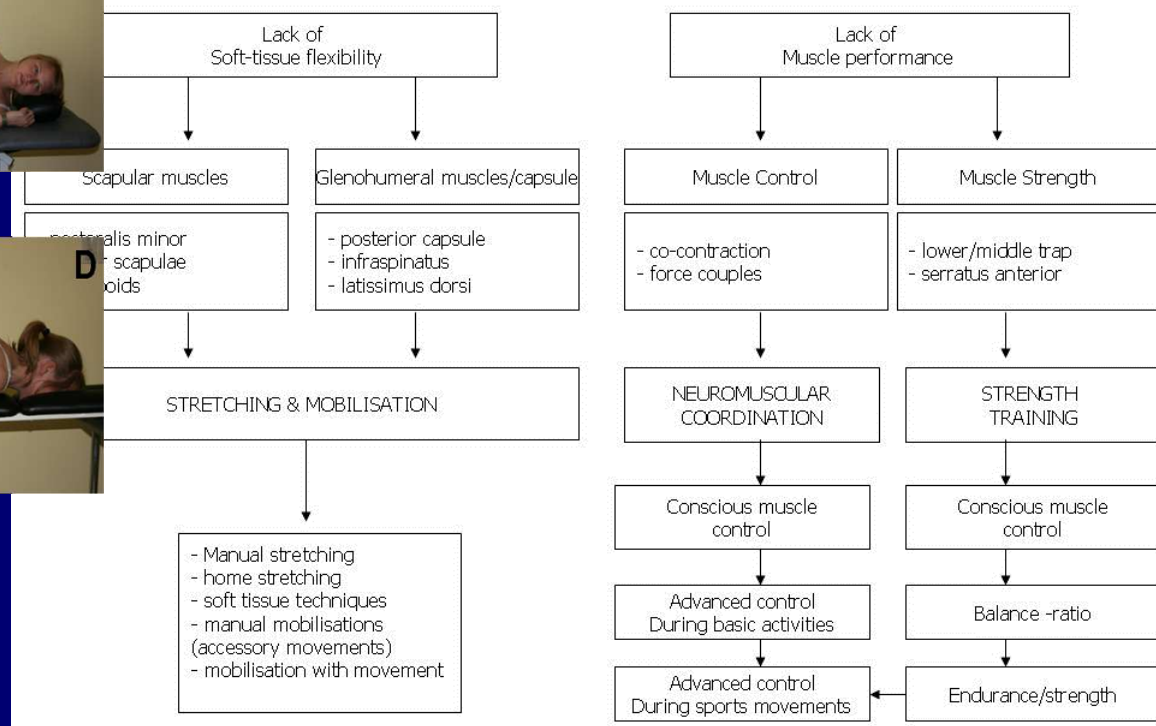
**B**  
**Sidelying Ext Rotation**



**C**  
**Prone Hor Abd + Ext Rot**



## Scapular Rehabilitation Algorithm



### Rehabilitation of Scapular Muscle Balance Which Exercises to Prescribe?

Ann M. Cools,<sup>1</sup> PT, PhD, Vincent Daele,<sup>2</sup> PT, Frederick Lanszweert,<sup>1</sup> PT, Dries Notebaert,<sup>1</sup> PT, Anne Roets,<sup>3</sup> MPTSS, Barbara Soetens,<sup>1</sup> PhD, Barbara Cagnie,<sup>1</sup> PT, PhD, and Erik E. Witvrouw,<sup>1</sup> PT, PhD  
From the <sup>1</sup>Department of Rehabilitation Sciences and Physiotherapy, Faculty of Medicine and Health Sciences, University Hospital, Ghent, Belgium, and the <sup>2</sup>Department of Developmental, Personality and Social Psychology, Faculty of Psychology and Educational Sciences, Ghent University, Ghent, Belgium



### Shoulder injuries in athletes

### Rehabilitation of shoulder impingement syndrome and rotator cuff injuries: an evidence-based review

Todd S. Ellenbecker<sup>1</sup>, Ann Cools<sup>2</sup>



# Scapular rehabilitation in closed chain



Scientific evidence?

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## Electromyographic analysis of knee push up plus variations: what is the influence of the kinetic chain on scapular muscle activity?

A Maenhout,<sup>1</sup> K Van Praet,<sup>2</sup> L Pizzi,<sup>3</sup> M Van Herzele,<sup>1</sup> A Cools<sup>1</sup>

### 6 modalities of the push-up plus exercise (N=32)

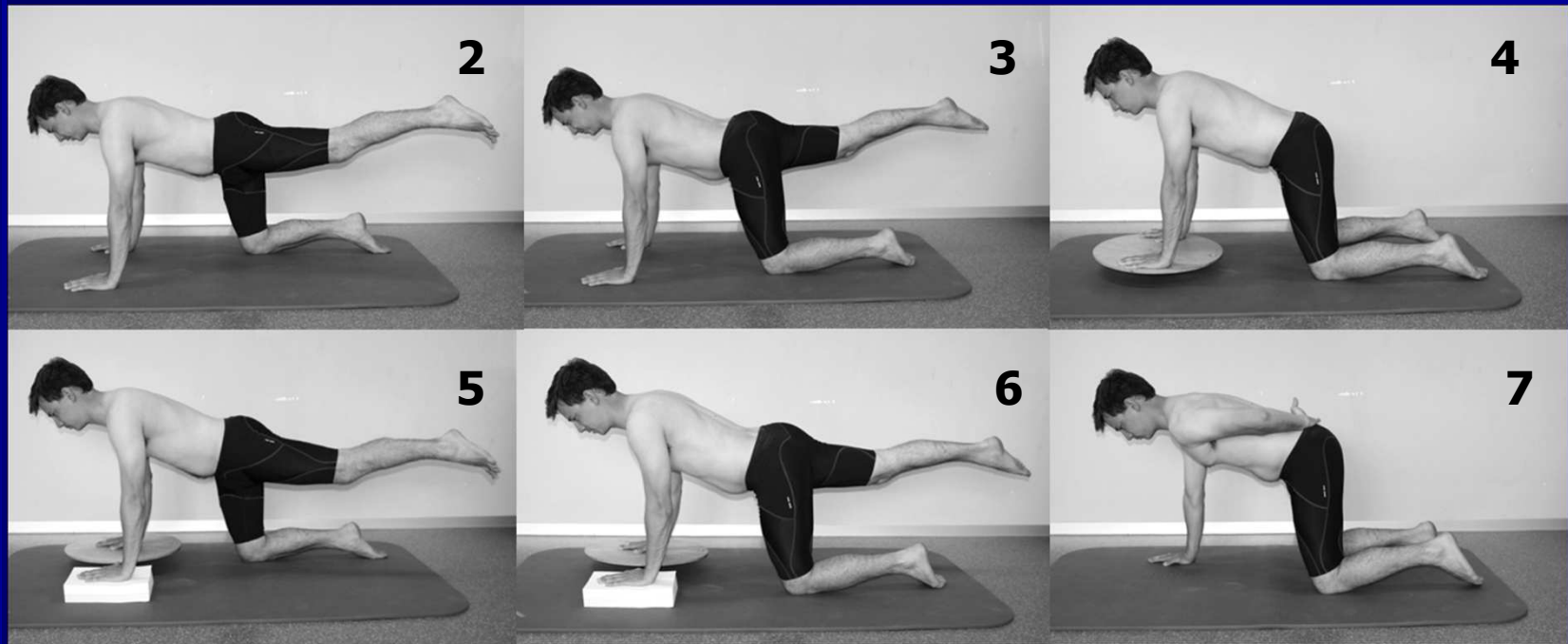


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(Maenhout & Cools BJSM 2009)

# Integration **Kinetic Chain** into **closed chain** shoulder rehabilitation exercises

6 modalities of the push-up plus exercise (N=32)



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(Maenhout & Cools BJSM 2009)

## Results: EMG-activity and muscle balance ratios

- Highest **SA** activity (44%MVC) en best UT/SA ratio (0.40) when **ipsilateral** leg is extended



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(Maenhout & Cools BJSM 2009)

## Results: EMG-activity and muscle balance ratios

- Highest activity in **MT & LT**, when **contralateral** leg is extended (LT=20%MVC)



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(Maenhout & Cools BJSM 2009)

# Challenge sportspecific demands?

Rehabilitation of MDI in

1/ gymnast

2/ swimmer

3/ volleyballplayer



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# MDI in the gymnast



Len Vande Lanotte – Flemish Gymnastic Federation

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# MDI in the gymnast



Len Vande Lanotte – Flemish Gymnastic Federation

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# MDI in the gymnast



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# MDI in the gymnast



Len Vande Lanotte – Flemish Gymnastic Federation

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# Value of Sling therapy?

## THE EFFECTIVENESS OF TRADITIONAL AND SLING EXERCISE STRENGTH TRAINING IN WOMEN

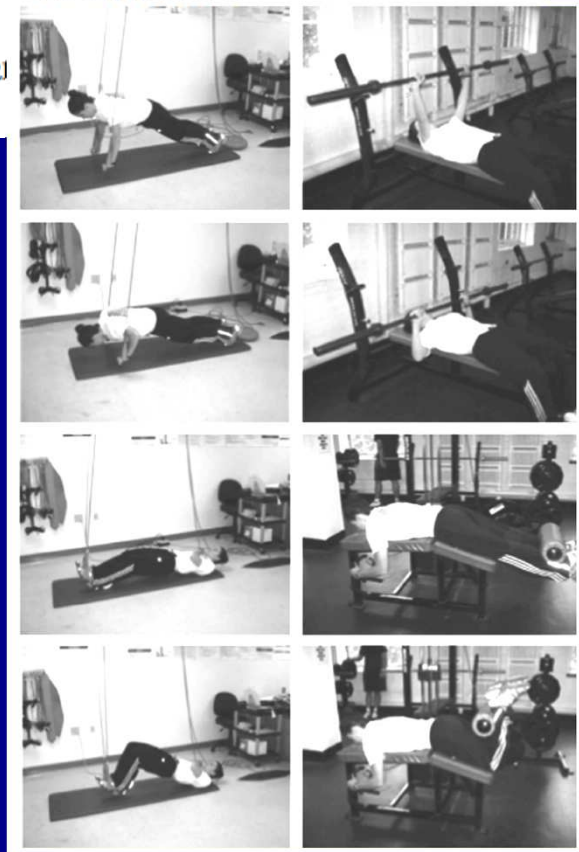
BETHANY D. DANNELLY, SARAH C. OTEY, TED CROY, BLAIN HARRIS,  
JAY N. HERTEL, AND ARTHUR WELTMAN

13 weeks 6x/w

Open versus Sling exercises

"Sling exercises are equally as effective as open chain exercises in a strength training program for women, with a small advantage for sling regarding push-up"

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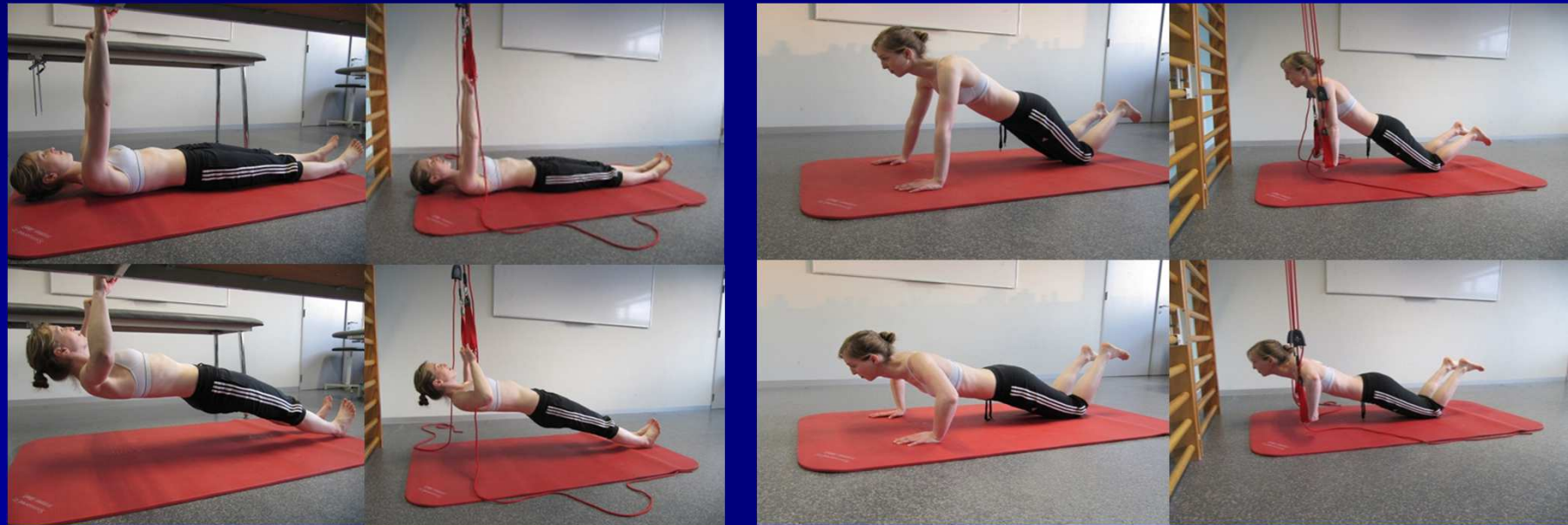




# Value of sling therapy

Shoulder muscle activation levels during 4 closed kinetic chain exercises with and without Redcord slings

Kristof De Mey, PT\*; Lieven Danneels, PT, PhD\*; Barbara Cagnie, PT, PhD\*; Dorien Borms, PT\*; Zilke T'Jonck, PT\*; Eline Van Damme, PT\*. Ann M. Cools, PT, PhD\*



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## Shoulder muscle activation levels during 4 closed kinetic chain exercises with and without Redcord slings

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Classification of mean muscle activation										
Exercise	Redcord	Category	UT	MT	LT	SA	PM	AD	PD	LD
Half push-up	Without	<20	X		X					
		20-40		X					X	X
		41-60				X		X		
		>60					X			
	With	<20	X	X	X					
		20-40				X			X	X
		41-60						X		
		>60					X			
Knee push-up	Without	<20	X							
		20-40		X	X				X	X
		41-60				X				
		>60					X	X		
	With	<20	X	X						
		20-40			X	X			X	X
		41-60						X		
		>60					X			
Knee prone bridging plus	Without	<20	X							
		20-40		X	X		X		X	X
		41-60				X				
		>60						X		
	With	<20	X	X	X				X	
		20-40						X		X
		41-60				X				
		>60					X			
Pull-up	Without	<20					X			
		20-40	X			X				
		41-60						X		
		>60		X	X				X	X
	With	<20					X			
		20-40				X				
		41-60	X	X				X		
		>60			X				X	X

**Shoulder muscle activation levels during 4 closed kinetic chain exercises with and without Redcord slings**

Kristof De Mey, PT\*; Lieven Danneels, PT, PhD\*; Barbara Cagnie, PT, PhD\*; Dorien Borms, PT\*; Zilke T'Jonck, PT\*; Eline Van Damme, PT\*. Ann M. Cools, PT, PhD\*

- Conclusion of the study: “The large glenohumeral muscles were highly activated when using RS, especially the pectoralis major during the push-up and knee prone bridging exercise and the posterior deltoid and latissimus dorsi during the pull-up exercise.”

# Preparing the athlete for the “impact”



# Preparing the athlete for the “impact”





# MDI in the swimmer

- Lots of repetitions / endurance
- Focus on core stability prone/supine
- Swim-specific positions



# MDI in the swimmer



# MDI in a volleyball player

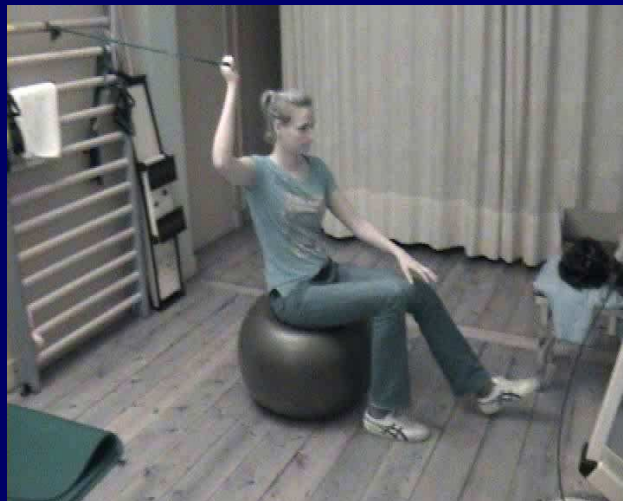
- From closed to open kinetic chain
- Challenge throwing and smashing
- Core-stability training
- Strength lower extremities

# MDI in a volleyball player



- External rotation with slight abduction
- Deltoid activation
- Compression force on GH joint
- LT activation with low UT activity (Cools AJSM 2007)

# MDI in a volleyball player



- Plyometric exercises in abd – ER
- Core stability training on swiss ball with minimal input from the feet

# Take home message

- The gymnast's shoulder: in between MDI and sportsrelated instability
- Basic rehabilitation in closed chain with focus on neuromuscular coordination
- Advanced rehabilitation in sportsspecific positions





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AND RETURN TO PLAY AFTER INJURY**

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