

# Traumatic Anterior Shoulder Instability – which exercises?

**A randomised controlled trial**

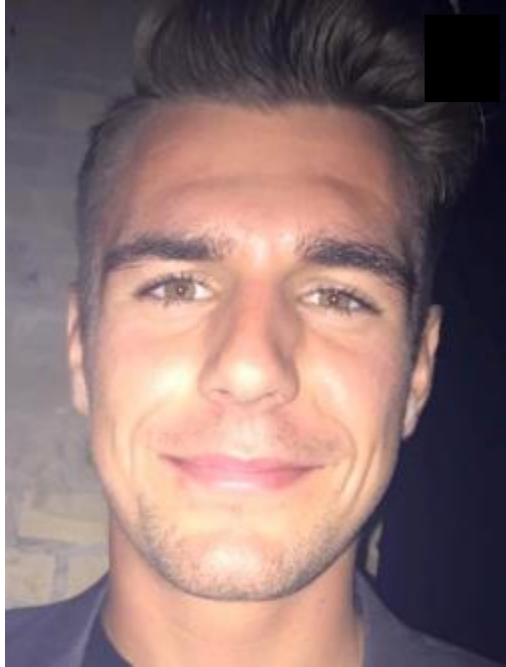


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**Quality of Life Research Center, Odense University Hospital**

# Background (Case story)



**5 shoulder  
dislocations !!!**



**Shoulder-related Quality of Life**



# Background (Symptoms following anterior shoulder dislocation)

*"I feel that my shoulder is slipping"*

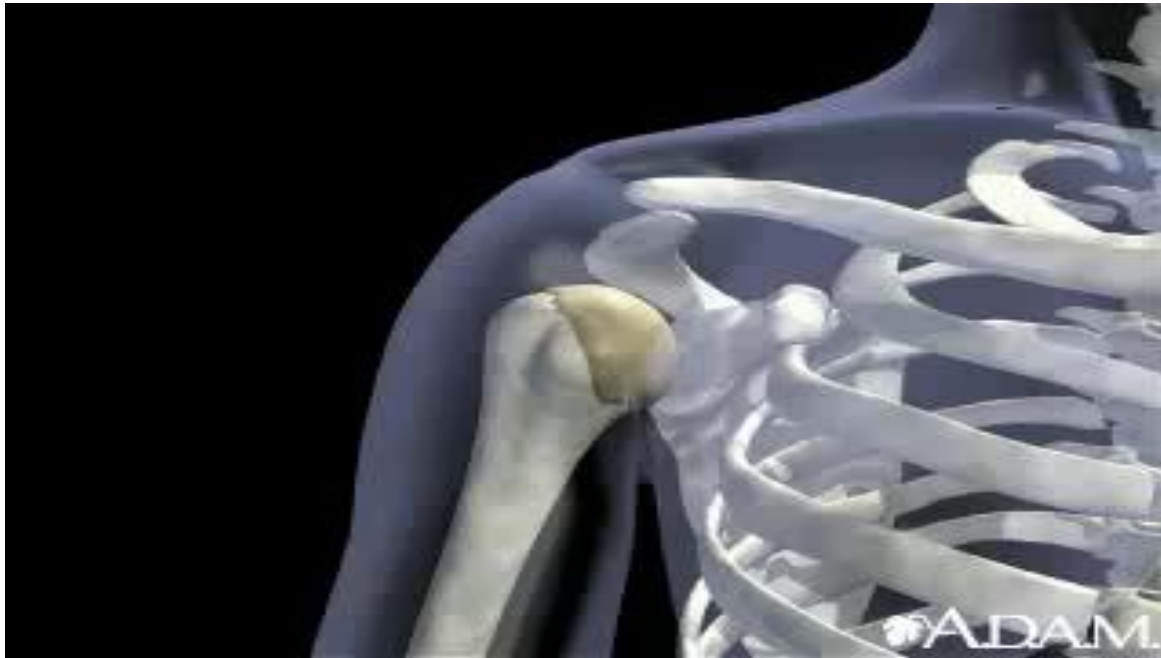
Pain

*"I don't trust my shoulder"*

Apprehension



# Background (Post-traumatic complications)



**2 out of 3 will  
experience recurrent  
shoulder instability**

# Background

- Shoulder dislocation patients **do not** necessarily receive any guidance in post-traumatic rehabilitation

*“I was told to carry a sling for 14 days and to relax my shoulder*

*—  
that was all I got to know”*



# Background

**What to do  
with Theis???**



# Background



- Evidence for optimal treatment is limited
- The shoulder joint is flexible and fragile
- The shoulder relies on muscular control and stability
- Neuromuscular exercise has shown great potential for improving musculoskeletal function and QoL in other body regions

Handoll et al, 10; Agerberg et al, 10  
Eitzen et al,10; Frobell et al,10; Stensrud et al,12





# A neuromuscular exercise programme versus standard care for patients with traumatic anterior shoulder instability: study protocol for a randomised controlled trial (the SINEX study)

Henrik Eshoj<sup>1,10,11\*</sup>, Sten Rasmussen<sup>2,3</sup>, Lars Henrik Frich<sup>4</sup>, Inge Hvass<sup>5</sup>, Robin Christensen<sup>6</sup>, Steen Lund Jensen<sup>7</sup>, Jens Søndergaard<sup>8</sup>, Karen Søgaard<sup>1</sup> and Birgit Juul-Kristensen<sup>1,9</sup>

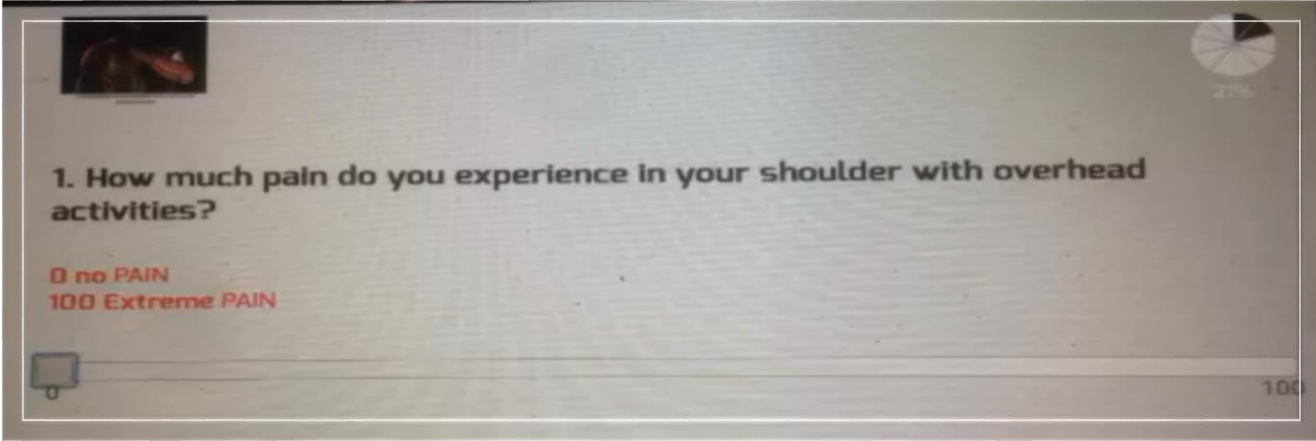
Eshoj et al., 2016



# Design (primary outcome)

## The Western Ontario Shoulder Instability Index (WOSI)

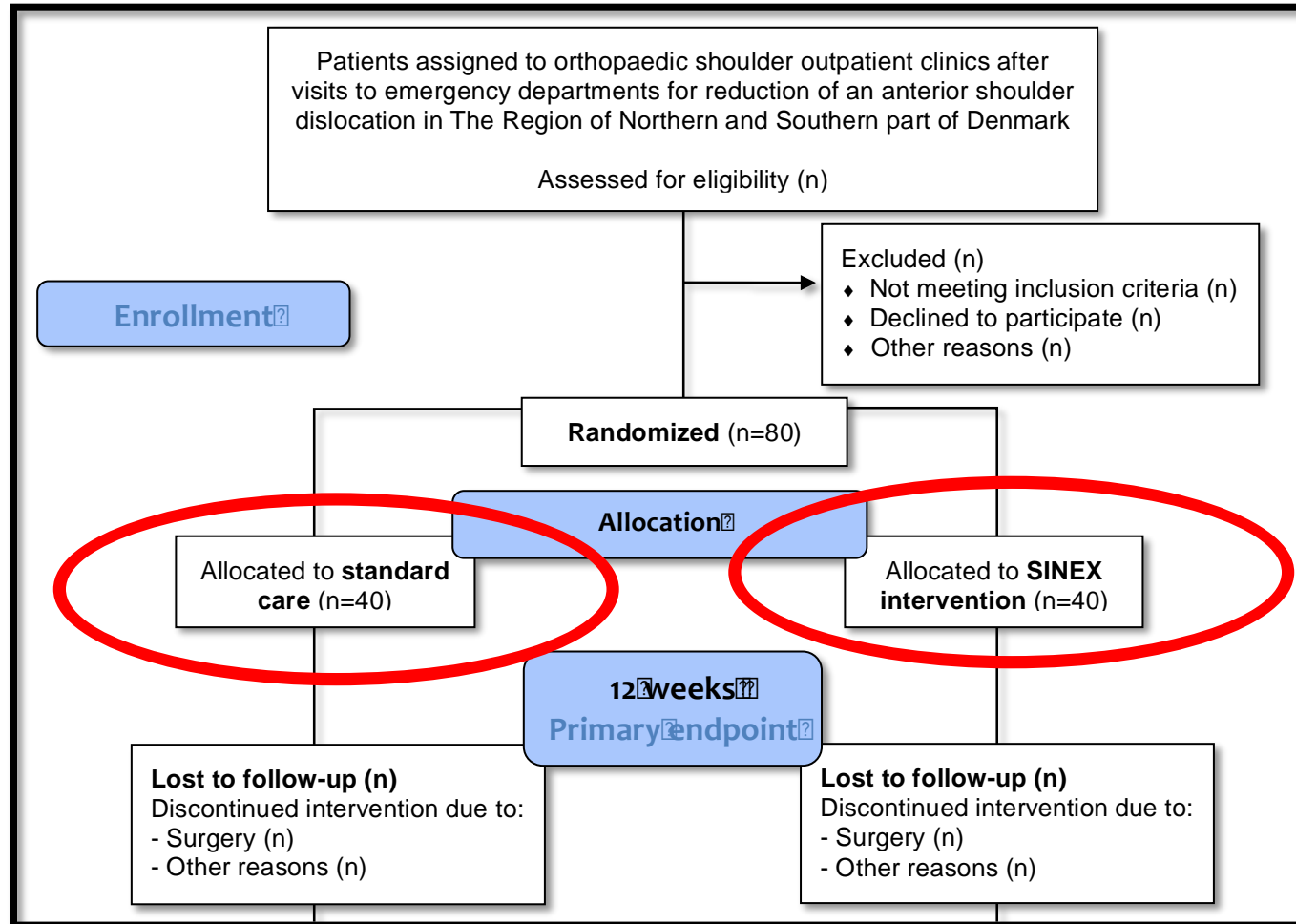
- 21 items (Total score: 0-2100 (2100=worst))
- 4 subdomains (physical symptoms; sport, recreation, work; lifestyle; emotions)



The image shows a screenshot of a questionnaire item. At the top left, there is a small image of a shoulder. The question is: "1. How much pain do you experience in your shoulder with overhead activities?". Below the question, there are two options: "0 no PAIN" and "100 Extreme PAIN". At the bottom, there is a horizontal slider with a small square marker at the 0 position. The number "100" is visible at the right end of the slider.

# Design

## Two-armed Randomized Controlled Trial

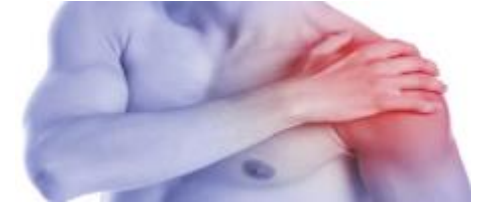


**Primary outcome: WOSI**  
**Primary endpoint: 12 weeks**

# Settings and locations



# Participants



## Men and women with trauma-initiated primary or recurrent anterior shoulder dislocation

### Inclusion

- 18-39 years of age
- X-ray verified anterior shoulder dislocation
- Self-reported shoulder trouble within the latest week

### Exclusion

- > 5 shoulder dislocations
- Shoulder surgery
- Competing diagnosis
- Pregnancy
- Inadequacy in written and spoken Danish
- Not willing to or able to attend 12 weeks of supervised exercise

# Interventions (12 weeks of active exercise treatment)

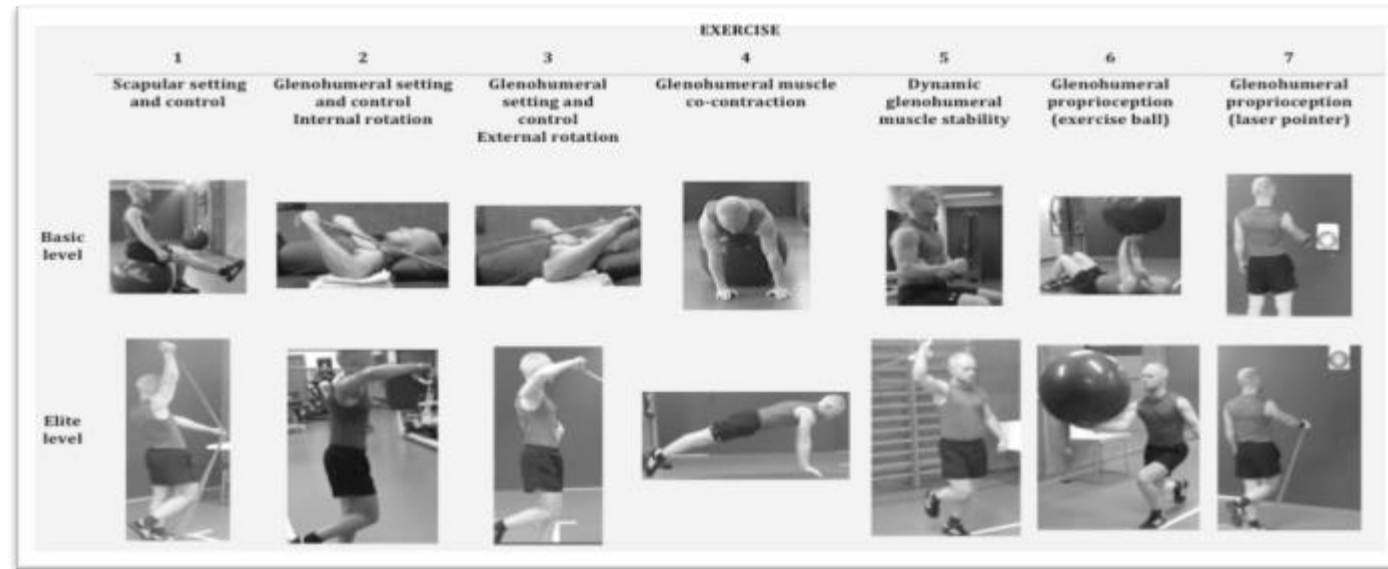
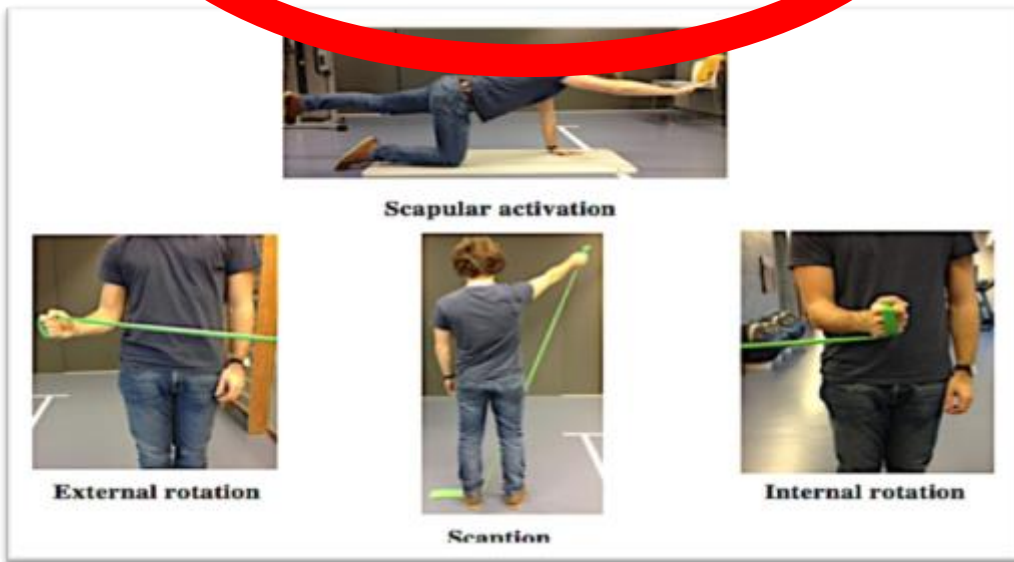
**Control group**

Two arms

**Intervention group**

Self-managed, home-based standard care

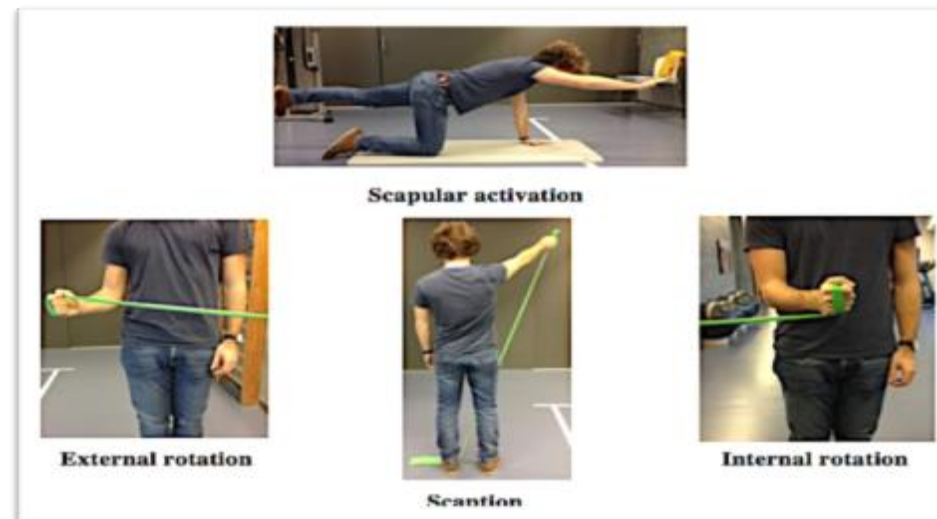
Shoulder Instability Neuromuscular EXercise (SINEX)



# Interventions (Control group)

One introductory PT session

Leaflet with photos and descriptions of each exercise



**Home-based exercise**

**3 times weekly**

**2x10 rep.**

# Control gr. – Self-managed, home-based (RC - abductor mm.)

Isometric abd.

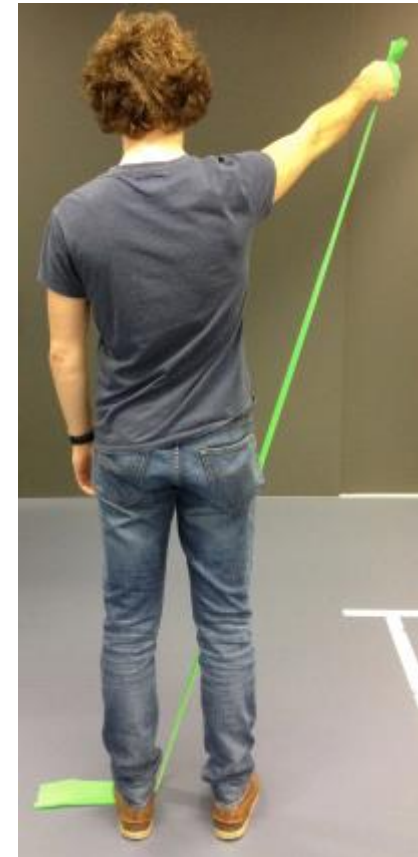


3 times/week  
2x10 rep.

Progression



Dynamic





# Control gr. – Self-managed, home-based (RC – internal rot. mm)

Isometric

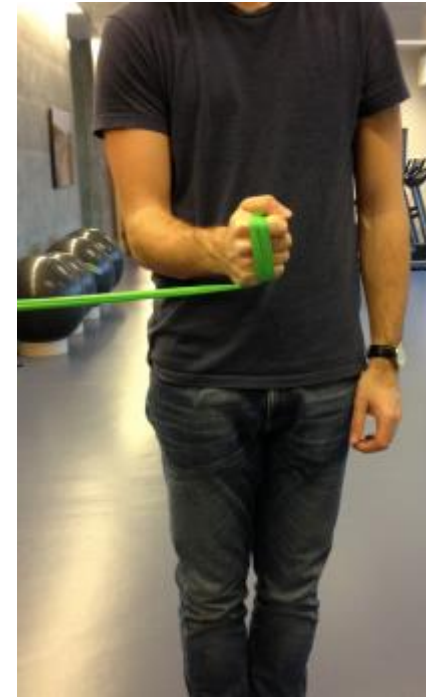


3 times/week  
2x10 rep.

Progression



Dynamic



# Control gr. – Self-managed, home-based (RC – external rot. mm)

Isometric



3 times/week  
2x10 rep.

Progression

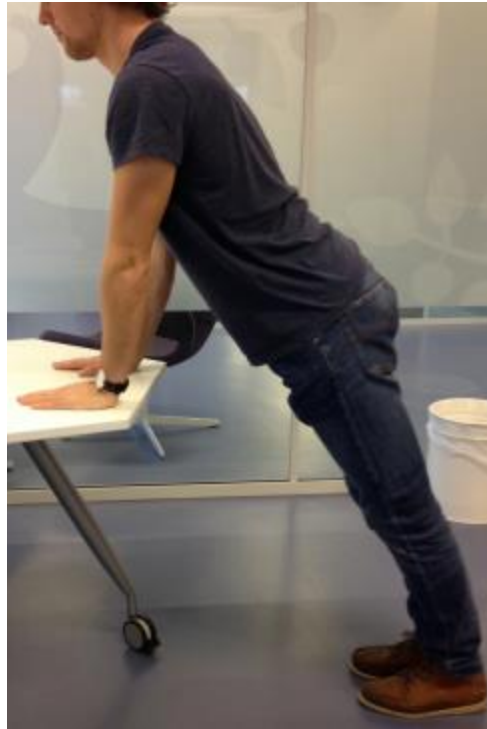


Dynamic



# Control gr. – Self-managed, home-based (Scapular mm.)

**Isometric**



**3 times/week  
2x10 rep.**

**Progression**



**Dynamic**



# Interventions

Two-arms

Control group

Intervention group

Self-managed standard care

Shoulder Instability Neuromuscular EXercise (SINEX)



Scapular activation



External rotation



Scaption



Internal rotation

|             | EXERCISE                     |   |   |                                    |                                       |   |   |
|-------------|------------------------------|---|---|------------------------------------|---------------------------------------|---|---|
|             | 1                            | 2   | 3   | 4                                  | 5                                     | 6   | 7   |
|             | Scapular setting and control | Glenohumeral setting and control<br>Internal rotation | Glenohumeral setting and control<br>External rotation | Glenohumeral muscle co-contraction | Dynamic glenohumeral muscle stability | Glenohumeral proprioception (exercise ball) | Glenohumeral proprioception (laser pointer) |
| Basic level |                              |   |   |                                    |                                       |   |   |
| Elite level |                              |   |   |                                    |                                       |   |   |

# Interventions

**Control group**

**Two-arms**

**Intervention group**

Self-managed standard care

Shoulder Instability Neuromuscular EXercise (SINEX)



Scapular activation



External rotation



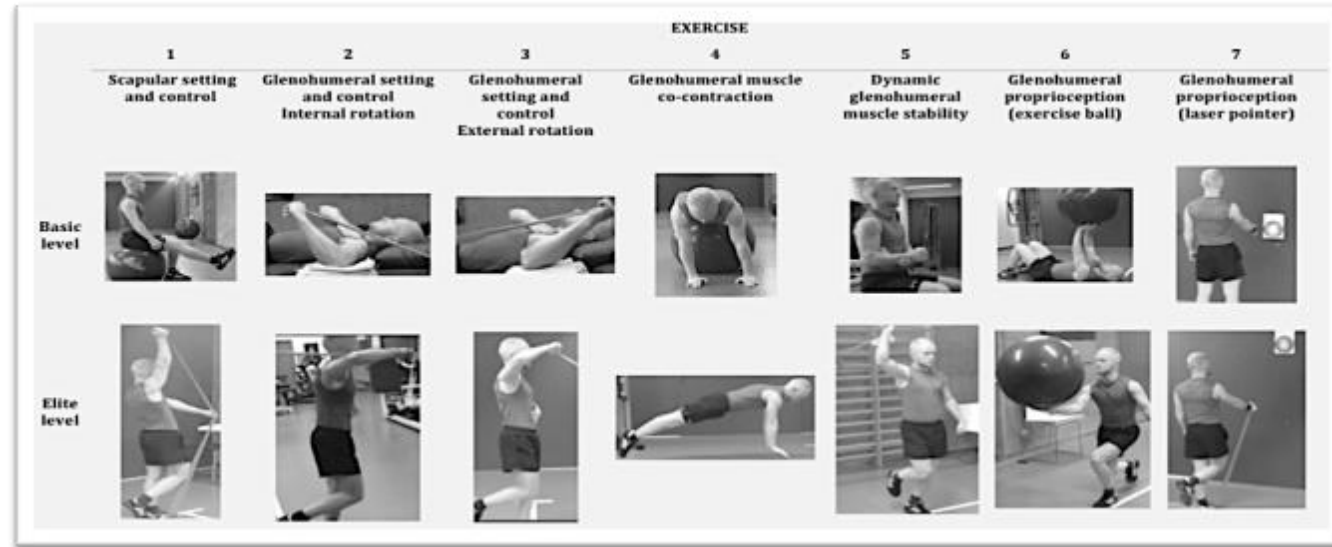
Scaption



Internal rotation

|             | EXERCISE                     |  |  |                                    |                                       |   |
|-------------|------------------------------|--|--|------------------------------------|---------------------------------------|---|
|             | 1                            | 2  | 3  | 4                                  | 5                                     | 6   |
|             | Scapular setting and control | Glenohumeral setting and control (internal rotation) | Glenohumeral setting and control (external rotation) | Glenohumeral muscle co-contraction | Dynamic glenohumeral muscle stability | Glenohumeral proprioception (exercise ball) |
| Basic level |                              |  |  |                                    |                                       |   |
| Elite level |                              |  |  |                                    |                                       |   |















# Shoulder Instability Neuromuscular EXercise (SINEX) program



- **Based on biomechanical and neuromuscular training principles – adapted from lower limb studies**
- **Aims to improve sensorimotor control and compensatory functional stability**

















# Shoulder Instability Neuromuscular EXercise (SINEX) program















|             | EXERCISE   |  |   |  |  |  |  |
|-------------|--|--|---|--|--|--|--|
|             | 1  | 2  | 3   | 4  | 5  | 6  | 7  |
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| Basic level |   |   |   |   |   |   |   |
| Elite level |  |  |  |  |  |  |  |

















# Supervised neuromuscular shoulder exercise (SINEX) program

|             | EXERCISE   |  |   |  |  |  |  |
|-------------|--|--|---|--|--|--|--|
|             | 1  | 2  | 3   | 4  | 5  | 6  | 7  |
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| Basic level |   |   |   |   |   |   |   |
| Elite level |  |  |  |  |  |  |  |















# Supervised neuromuscular shoulder exercise (SINEX) program

|             | EXERCISE   |  |   |  |  |  |  |
|-------------|--|--|---|--|--|--|--|
|             | 1  | 2  | 3   | 4  | 5  | 6  | 7  |
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| Basic level |   |   |   |   |   |   |   |
| Elite level |  |  |  |  |  |  |  |

# Supervised neuromuscular shoulder exercise (SINEX) program















|             | EXERCISE   |  |   |  |  |  |  |
|-------------|--|--|---|--|--|--|--|
|             | 1  | 2  | 3   | 4  | 5  | 6  | 7  |
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| Basic level |   |   |   |   |   |   |   |
| Elite level |  |  |  |  |  |  |  |

# Supervised neuromuscular shoulder exercise (SINEX) program

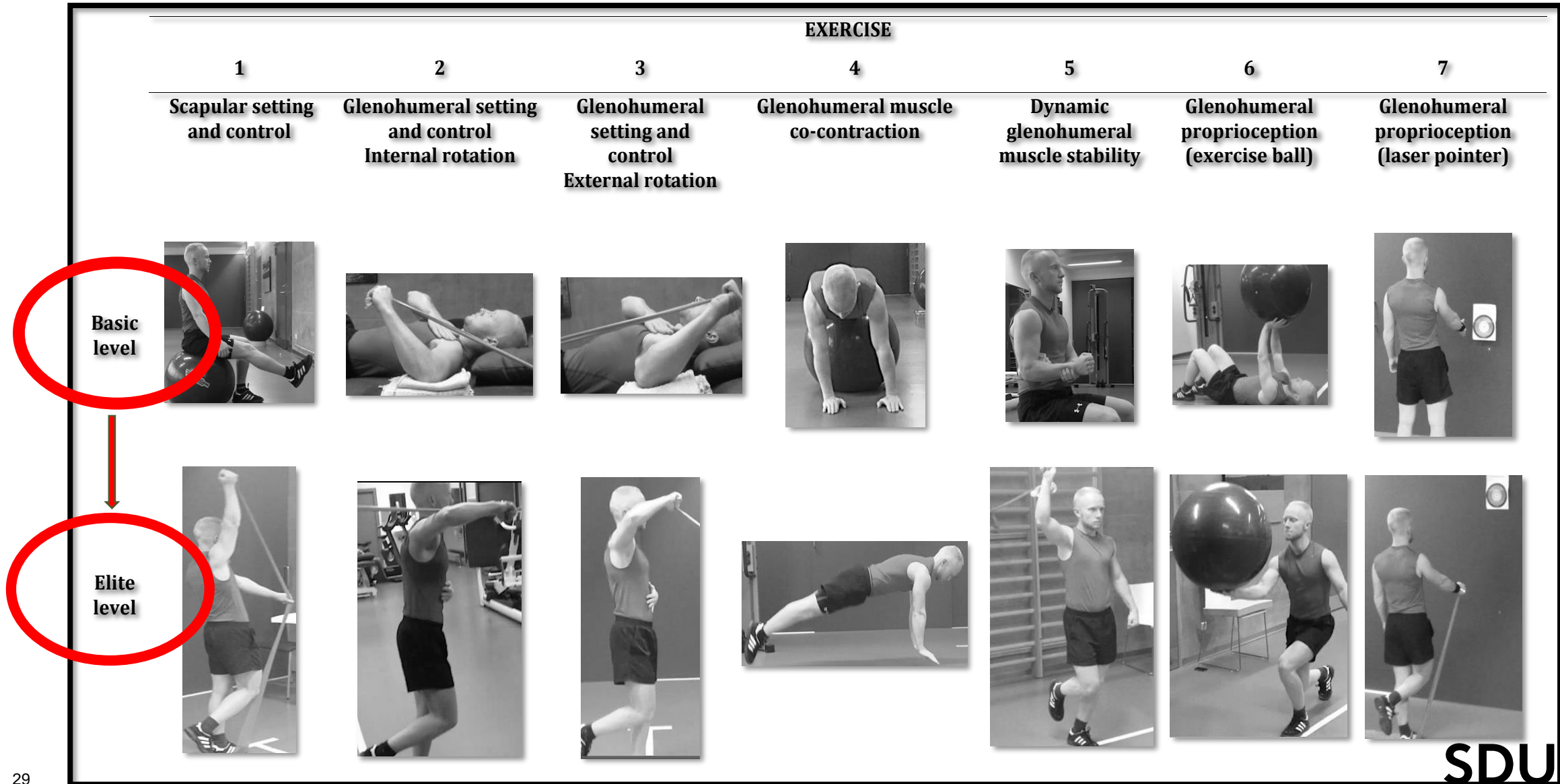
|             | EXERCISE   |  |   |  |  |  |  |
|-------------|--|--|---|--|--|--|--|
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| Basic level |   |   |   |   |   |   |   |
| Elite level |  |  |  |  |  |  |  |



# Supervised neuromuscular shoulder exercise (SINEX) program

|             | EXERCISE   |  |   |  |  |  |  |
|-------------|--|--|---|--|--|--|--|
|             | 1  | 2  | 3   | 4  | 5  | 6  | 7  |
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| Basic level |   |   |   |   |   |   |   |
| Elite level |  |  |  |  |  |  |  |

# Supervised neuromuscular shoulder exercise (SINEX) program



# Supervised neuromuscular shoulder exercise (SINEX) program

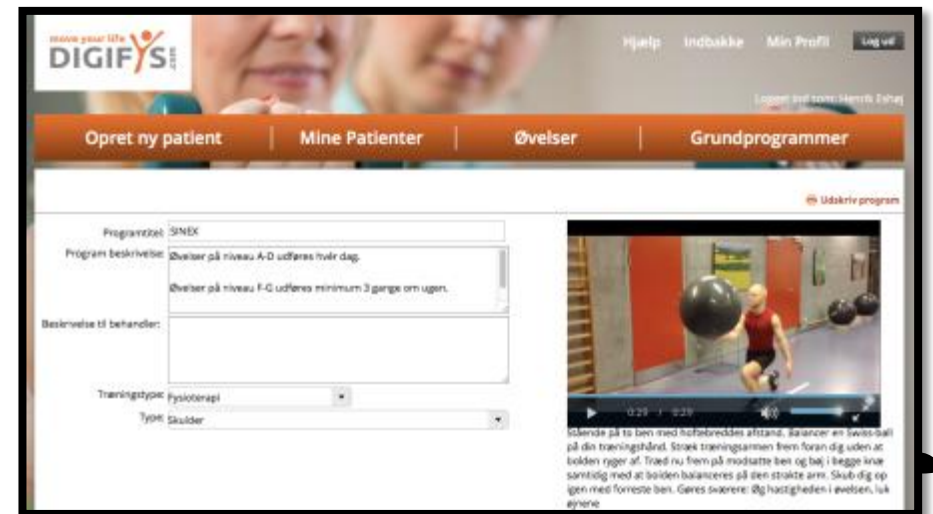
## Exercise dose

- 12 weeks of exercise
- Basic level exercises (A-E): 7 days/week; 2x20-25 rep. (low load)
- Elite level exercises (F-G): 3 times/week; 2x8-12 rep. (high load)

## Physiotherapy supervised sessions















- Week 1-2: 1-2 times weekly
- Week 3-12: 1 time weekly

## Online instructions and recordings of all exercises





# Supervised neuromuscular shoulder exercise (SINEX) program

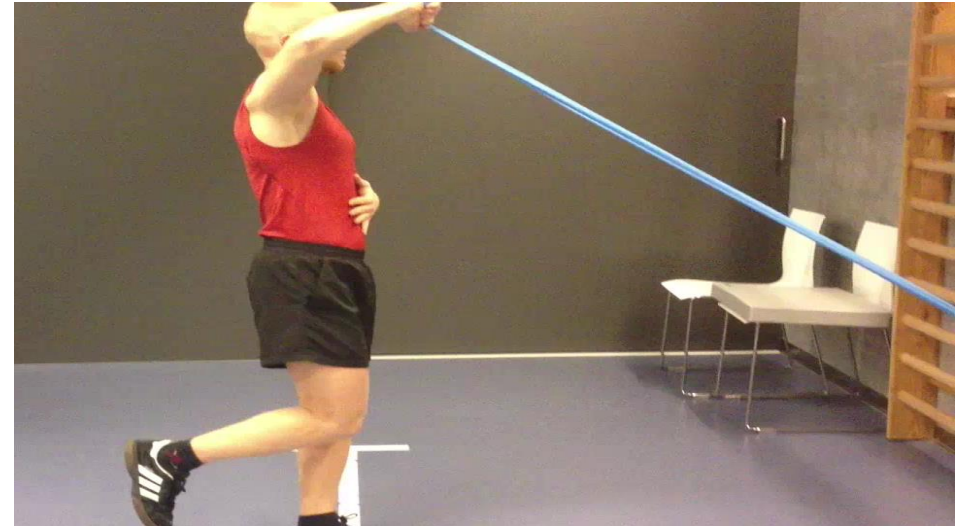
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| Basic level |   |   |   |   |   |   |   |
| Elite level |  |  |  |  |  |  |  |

# Intervention gr. – glenohumeral setting and control (internal rotation)















Basic level



Elite level

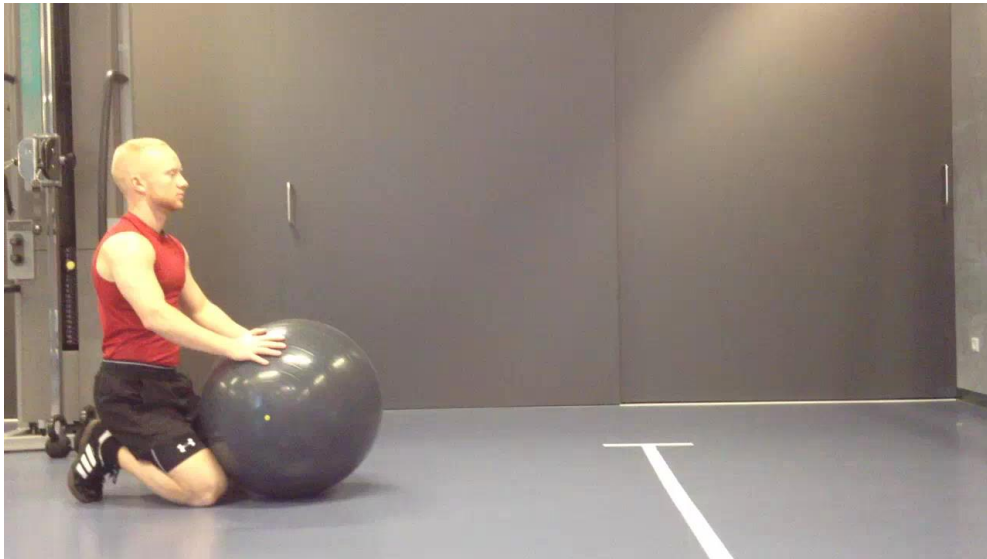


# Supervised neuromuscular shoulder exercise (SINEX) program

|             | EXERCISE   |  |   |  |  |  |  |
|-------------|--|--|---|--|--|--|--|
|             | 1  | 2  | 3   | 4  | 5  | 6  | 7  |
|             | Scapular setting and control   | Glenohumeral setting and control<br>Internal rotation                              | Glenohumeral setting and control<br>External rotation                               | Glenohumeral muscle co-contraction   | Dynamic glenohumeral muscle stability  | Glenohumeral proprioception (exercise ball)  | Glenohumeral proprioception (laser pointer)  |
| Basic level |   |   |   |   |   |   |   |
| Elite level |  |  |  |  |  |  |  |

# Intervention gr. – glenohumeral muscle co-contraction

Basic level

















Elite level





# Supervised neuromuscular shoulder exercise (SINEX) program

|             |             | EXERCISE   |  |   |  |  |  |  |
|-------------|-------------|--|--|---|--|--|--|--|
|             |             | 1  | 2  | 3   | 4  | 5  | 6  | 7  |
|             |             | Scapular setting and control   | Glenohumeral setting and control<br>Internal rotation                              | Glenohumeral setting and control<br>External rotation                               | Glenohumeral muscle co-contraction   | Dynamic glenohumeral muscle stability  | Glenohumeral proprioception (exercise ball)  | Glenohumeral proprioception (laser pointer)  |
| Basic level |             |   |   |   |   |   |   |   |
|             | Elite level |  |  |  |  |  |  |  |

# Intervention gr. – glenohumeral proprioception

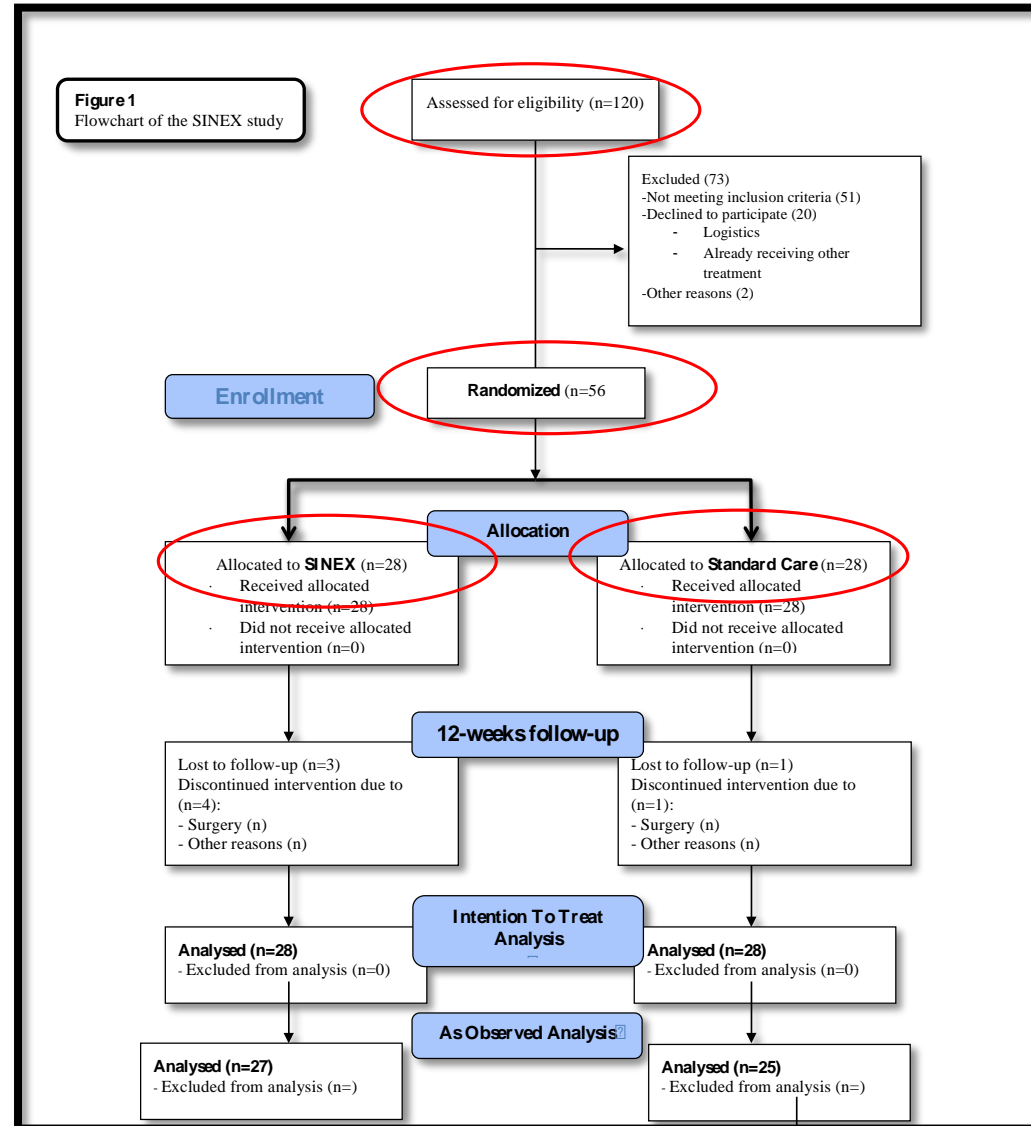
**Basic level**



**Elite level**

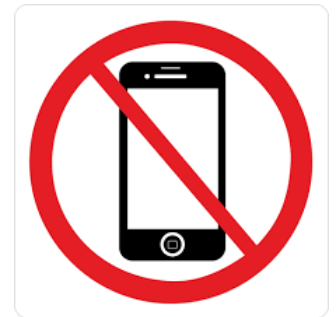


# Results



Screened = 120 patients

Included = 56 patients





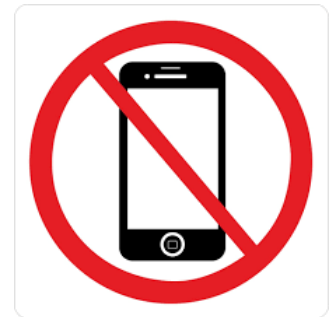
# Results

**Table 1.** Baseline demographic and historical information for patients with trauma initiated primary and recurrent anterior shoulder dislocation allocated to the SINEX vs. Standard care groups. Estimates are reported for each group with Mean  $\pm$  Standard Deviation (SD), n (%).

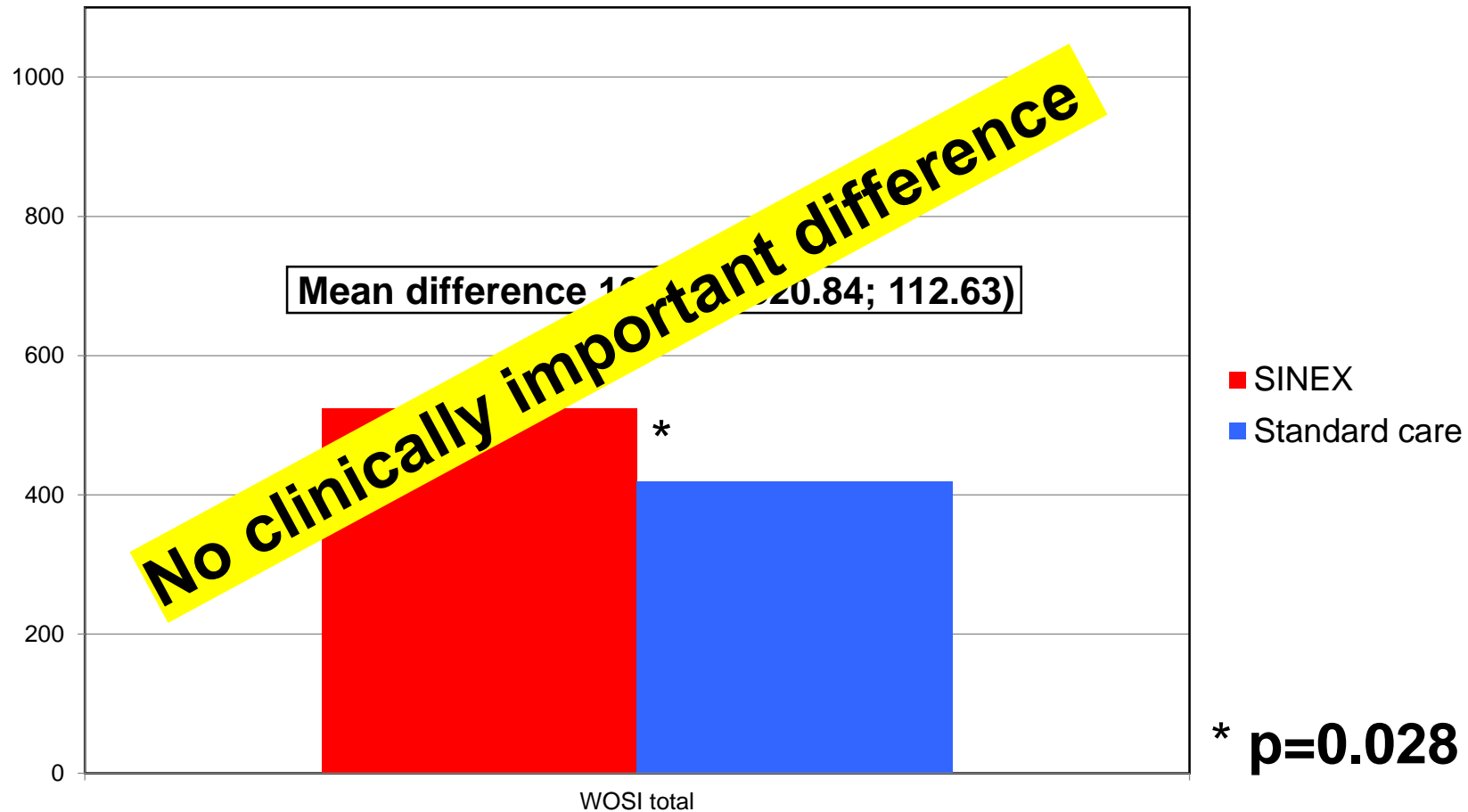
| Variables   | SINEX Group<br>(n=28) | Standard Care<br>Group (n=28) |
|---|-----------------------|-------------------------------|
| <b>Gender (male) (%)</b>  | 26 (92.9%)            | 23 (82.1%)                    |
| <b>Age (yrs) Mean (SD)</b>                                      | 26.21 (6.35)          | 25.82 (5.78)                  |
| <b>Weight (kg) Mean (SD)</b>                                    | 85.99 (19.04)         | 80.75 (13.39)                 |
| <b>Height (cm) Mean (SD)</b>                                    | 180.84 (8.03)         | 178.25 (8.03)                 |
| <b>Educational level (n (%))</b>                                |                       |                               |
| Academic  | 7 (25.0)              | 10 (35.7)                     |
| White collar  | 12 (42.9)             | 12 (42.9)                     |
| Blue collar   | 5 (17.9)              | 2 (7.1)                       |
| Uneducated  | 4 (14.3)              | 4 (14.3)                      |
| <b>Employment status (n (%))</b>                                |                       |                               |
| Full-time   | 16 (57.1)             | 15 (53.6)                     |
| Part-time   | 2 (7.1)               | 0 (0)                         |
| Student   | 9 (32.1)              | 10 (35.7)                     |
| Un-employed/retired   | 0 (0)                 | 0 (0)                         |
| Sick-leave  | 1 (3.6)               | 3 (10.7)                      |
| <b>Dominant arm (right (%))</b>                                 | 25 (89.3)             | 25 (92.6)                     |
| <b>Injured shoulder (right (%))</b>                             | 16 (57.1)             | 12 (44.4)                     |
| <b>Injury mechanism (n (%))</b>                                 |                       |                               |
| Fall on the arm   | 13 (46.4)             | 15 (53.6)                     |
| Pull in the arm   | 4 (14.3)              | 3 (10.7)                      |
| External force to the shoulder                                  | 2 (7.1)               | 1 (3.7)                       |
| Other   | 9 (32.1)              | 9 (32.1)                      |
| <b>Number of orthopedic treated shoulder reductions (n (%))</b> |                       |                               |
| Unknown   | 0 (0)                 | 0 (0)                         |
| 1   | 18 (64.3)             | 19 (70.4)                     |
| 2   | 7 (25.0)              | 6 (21.4)                      |

**No baseline gr.-differences**

**Mean age 26 (males=89%)**



# Results (primary outcome; WOSI)



# Results (secondary outcomes)

No group-difference in:

- Number of days away from work
- Number of episodes with recurrent shoulder instability
- Number of shoulder stabilizing surgery
- Number of adverse events



**Both groups showed significant and clinically relevant within-group improvements !!**

# Conclusion and perspectives

- This is the first study to compare the efficacy and safety of two non-operative exercise treatment strategies for patients with traumatic anterior shoulder dislocation
- No clinically relevant effect from SINEX on shoulder-related QoL, function and pain compared to standard care
- Type 2 fault??
- Interventions are equally effective when measured on WOSI
- Long-term effects unknown - 12 months follow-up is next



# Acknowledgements

**Patients and personnel from Aalborg University Hospital – Farsoe, Odense University Hospital, Odense and South-West Jutland Hospital, Esbjerg.**



## Funders

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- Research Foundation of the Danish Association of Physiotherapy
- Aalborg University Hospital

