FROM WHERE TO WHERE?
-IN A RESEARCH PERSPECTIVE

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From where?
Overall aims of the PhD project

To examine potential impairments in neuromuscular function using electromyography (EMG) in patients with Subacromial Impingement Syndrome (SIS) and to evaluate the clinical assessment methods for scapular kinematic abnormalities (scapular dyskinesia).
Patho-mechanisms of SIS

- scapular insufficiency/dyskinesis
- rotator cuff pathology,
- glenohumeral instability

Subacromial Impingement Syndrome (SIS)

Neuromuscular imbalance

Dyskinesis

Higher activity in upper trapezius, lower in serratus anterior (Ludewig and Cook, 2000; Cools et al., 2004, 2007; Lin et al., 2006)

Higher activation ratio (upper/lower trapezius) (Cools et al., 2007)

Delayed onset of middle and lower trapezius (Wadsworth & Bullock-Saxton, 1997; Cools et al., 2003; Moraes et al., 2008; Padke & Ludewig, 2013).
(A1) Neuromuscular control of scapula muscles during a voluntary task in subjects with Subacromial Impingement Syndrome. A case-control study.

Larsen CM, Søgaard K, Chreiteh SS, Holtermann A, Juul-Kristensen B.

**Aim**

Investigate whether the activity of the trapezius and serratus muscles is different during a voluntary arm movement task in a general population with SIS compared to a matched population without SIS.
(A2) Selective activation of intra-muscular compartments within the trapezius muscle in subjects with Subacromial Impingement Syndrome. A case-control study.

- To investigate whether patients with SIS to the same extent as healthy controls (No-SIS) were able to selectively activate the neuromuscular compartments within the trapezius muscle in sessions with and without EMG biofeedback, respectively.
(A3) Measurement properties of existing clinical assessment methods of scapular positioning and function. A systematic review
Larsen CM, Juul-Kristensen B, Lund H, Søgaard K.

- To compile a schematic overview of published clinical scapular assessment methods available for clinical practice.

- To critically appraise the methodological quality of the involved studies per measurement property of these assessments in order to identify the ´best´ assessment method.
………… Identify the assessment methods with **acceptable** results in the domains of validity and reliability as well as responsiveness, from studies which best meet the standards for **acceptable** methodological quality.
To where?
Shoulder problems in athletic and non-athletic wheelchair users with Spinal Cord Injury.

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Why Wheelchair Users/Athletes?

Spring 2013 request from the Danish Sport Organization for Disabled (DHIF):
’Shoulder problems in Wheelchair RUGBY players?’

Well-known best preconditions for:
-being active in Wheelchair sport
-obtaining best results in sports
...

Shoulder ´healthy´ players

Relevance for other wheelchair users (for fundraising)

- Shoulder pain, seems to be the most pervasive upper extremity problem in individuals with SCI because of the impact on daily life, such as mobility and quality of life, in addition to health care costs.
What is Wheelchair rugby?

• Most popular and fast growing sports

• Started in Dk in start 1990
• 5 clubs in Dk ≈ 100 members (increasing numbers)

• Typically tetraplegics (injuries in upper spinal cord), spastics, subjects with birth or accident injuries.

• Severely affected subjects participate (scoring system for compensation)
Objectives

• To survey the self-reported prevalence of shoulder pain, level of shoulder function and quality of life in manual Danish wheelchair users with spinal cord injuries, (participant characteristics, injury type, the presence and level of sports activity).

• To investigate neuromuscular and clinical function of shoulder and trunk muscles in tetraplegic individuals (wheelchair athletes, wheelchair rugby) with or without shoulder pain.

• To systematically identify and critically appraise the evidence on exercise treatment and prevention strategies for shoulder disorders in manual wheelchair users with spinal cord injuries, both athletes and non-athletes.
Post-doc project focusing on shoulder problems in Wheelchair Users

1) Prevalence of shoulder pain, function and quality of life

2) Neuromuscular/physical function (biomech./clin.)

3) Evidence on management effects

(Current knowledge from able-bodied subjects)

- Development of treatment program to restore shoulder function, prevent injuries
- Test of effect (RCT)
Study 1

1) Prevalence of shoulder pain, function and quality of life
(wheelchair athletes/non-athletes)
(injury type)
(sports type)

Wheelchair Athletes increased shoulder pain, but improved quality of life?

Method: Questionnaire
(WUSPI, general health, QOL)
Study 2

2) Physical/neuromuscular function
(tetraplegic athletes, tetraplegic non-athletes)
(with/without pain)

Tetraplegic athletes with pain altered strength/muscle balance?

Method: Laboratory study
(clinical ex, UL, wheelchair skills, strength/muscle activity balance, 3D)
Study 3

3) Evidence on management effects
(treatment, prevention)

Exercise strategies for treatment and prevention of shoulder pain and dysfunction in wheelchair athletes and non-athletes with SCI?

Method: **Systematic review/meta-analysis**
(Relevant databases; RCT)
Additional projects!
Additional projects!

The ´wheelchair project´

Resilience–concept/term
- Investigate robustness of the individual and the family in relation to the life situation.

Quantitative and qualitative research perspectives

Method development
Cross-cultural validation of a questionnaire and performance based measures.
Cooperation partners

Wheelchair network;
Sports clubs with wheelchair athletes

Organisational network;
DHIF, DHF, DHO, RYK

Research related network;
SDU/IOB/FoF/UCL

International research network; Holland, Belgium

Professional/Research related network;
Afd. for rygmarvsskader, Hornbæk (Glostrup hosp.)
-Vestdansk Center for Rygmarvsskade, Viborg (Århus Univ.hosp.)
-Hammel Neurorehabiliterings- og Forsknings Center
-Landsforeningen for Polio, Trafik og Ulykkesramte (PTU)
-Ortopædkirurgisk afdeling (Odense Univ.hosp.)
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Thank you for your attention!