THROWING SPORT IMPROVES SHOULDER PROPRIOCEPTION

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Introduction

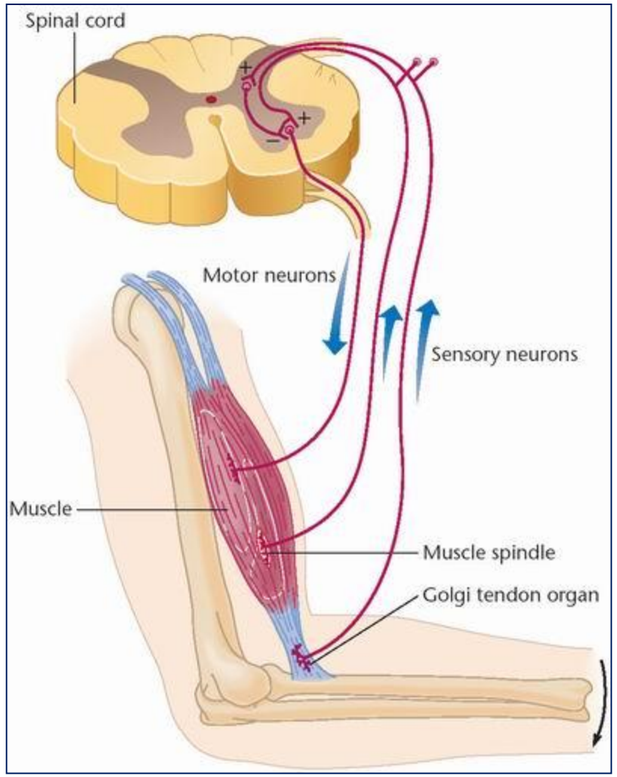
Proprioception – ability to feel the alignment and movement of the body in space and relative position of neighbouring parts of the body

Proprioceptors / Mechanoreceptors:

- Pacini Cells
- Ruffini Nerve Endings
- Free Nerve Endings
- Golgi Organs
- Neuromuscular Spindle

Location:

- Tendons, Ligaments, Muscles, Joint Capsule ,Skin, Fascia



Introduction

Handball players perform up to 100 overhead throwing passes and shots per match

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Overhead pattern is partially dependent on the perception of joint position and joint motion of the shoulder

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Ability to perform the movement is controlled by proprioceptive receptors

↓

Information transmitted from the receptors influences reflex activity to provide shoulder dynamic stability

↓

Proper proprioceptive and neuromuscular control appears to be crucial for overhead athletes

Aim

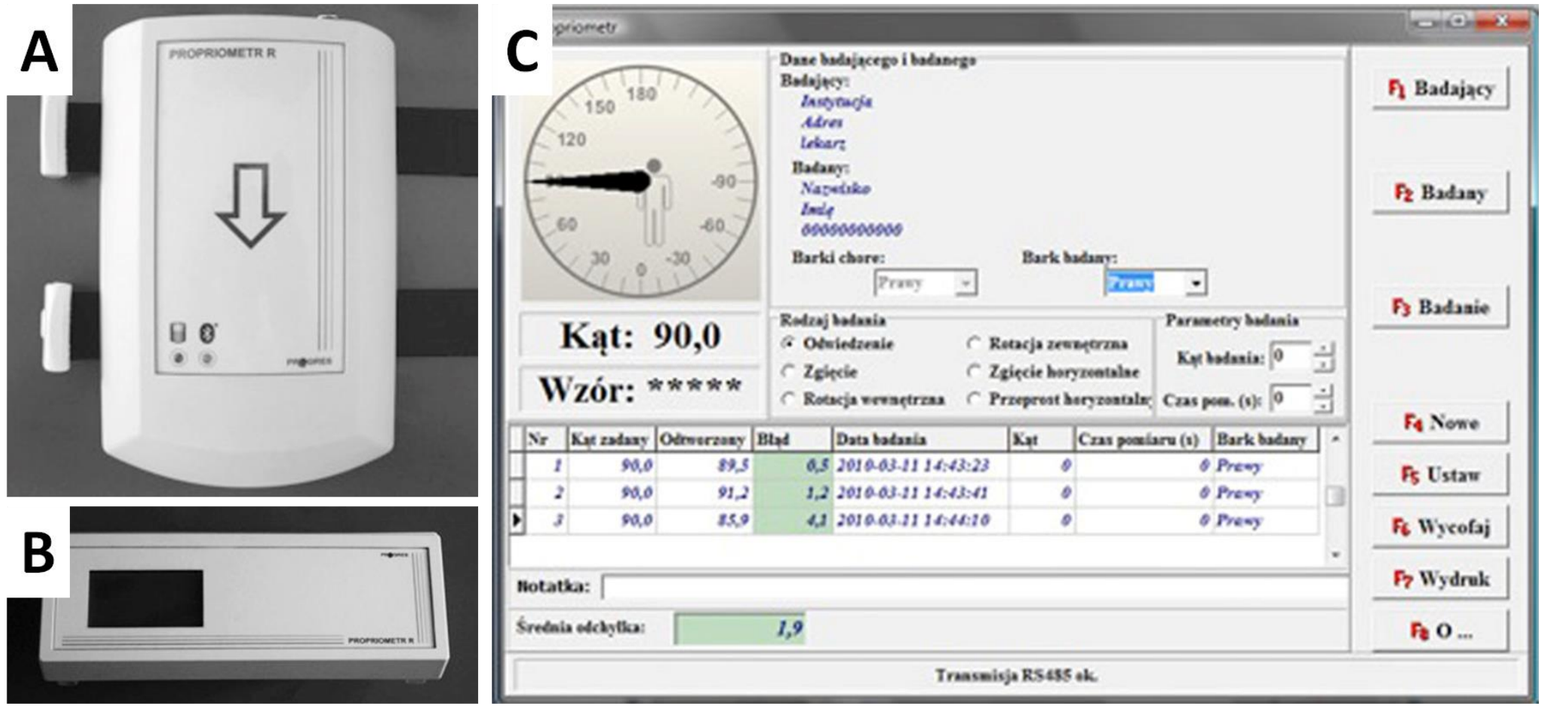
The evaluation of shoulder joint position sense (JPS) of both shoulders of male handball players and both shoulders of non-athletic healthy male individuals

Statistical analyzis – paired t-test with a significance set at **0.05**

The project was funded by the National Science Center based on decision number DEC-2011/01/B/NZ7/03596

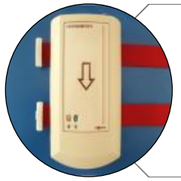
High accuracy electronic goniometer (Propriometer, Progress Poland)

- The devise operates under both direct and PC control
- The supporting software allows recording and archiving the patients' data, together with the results of repeated measurements

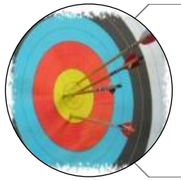


Propriometer: transducer to place on arm (A), PC panel (B), software controlling the Propriometer (C)

Method



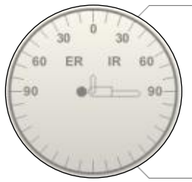
Propriometer (Electronic Goniometer)



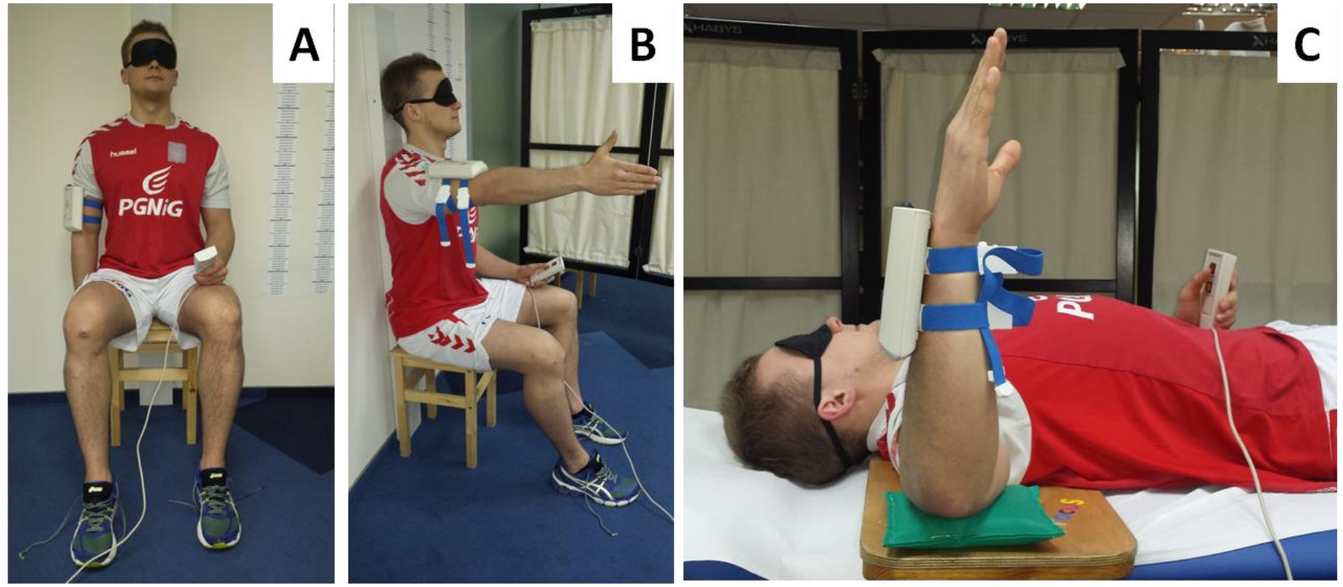
Accuracy 0,1°

Dominant & Non-dominant Shoulder

Flexion & Abduction (60°, 90°, 120°)



External & Internal Rotation (30°, 45°, 60°)



Technique of JPS evaluation: set-up (A), evaluation of flexion (B), evaluation of rotation (C)

EARJP – Error of Active Reproduction of Joint Position

How dose it work ?

1. Presentation of Position
2. Return to Starting Position
3. Reproduction of the Position
4. Error of Active Reproduction of Joint Position (EARJP)

Material

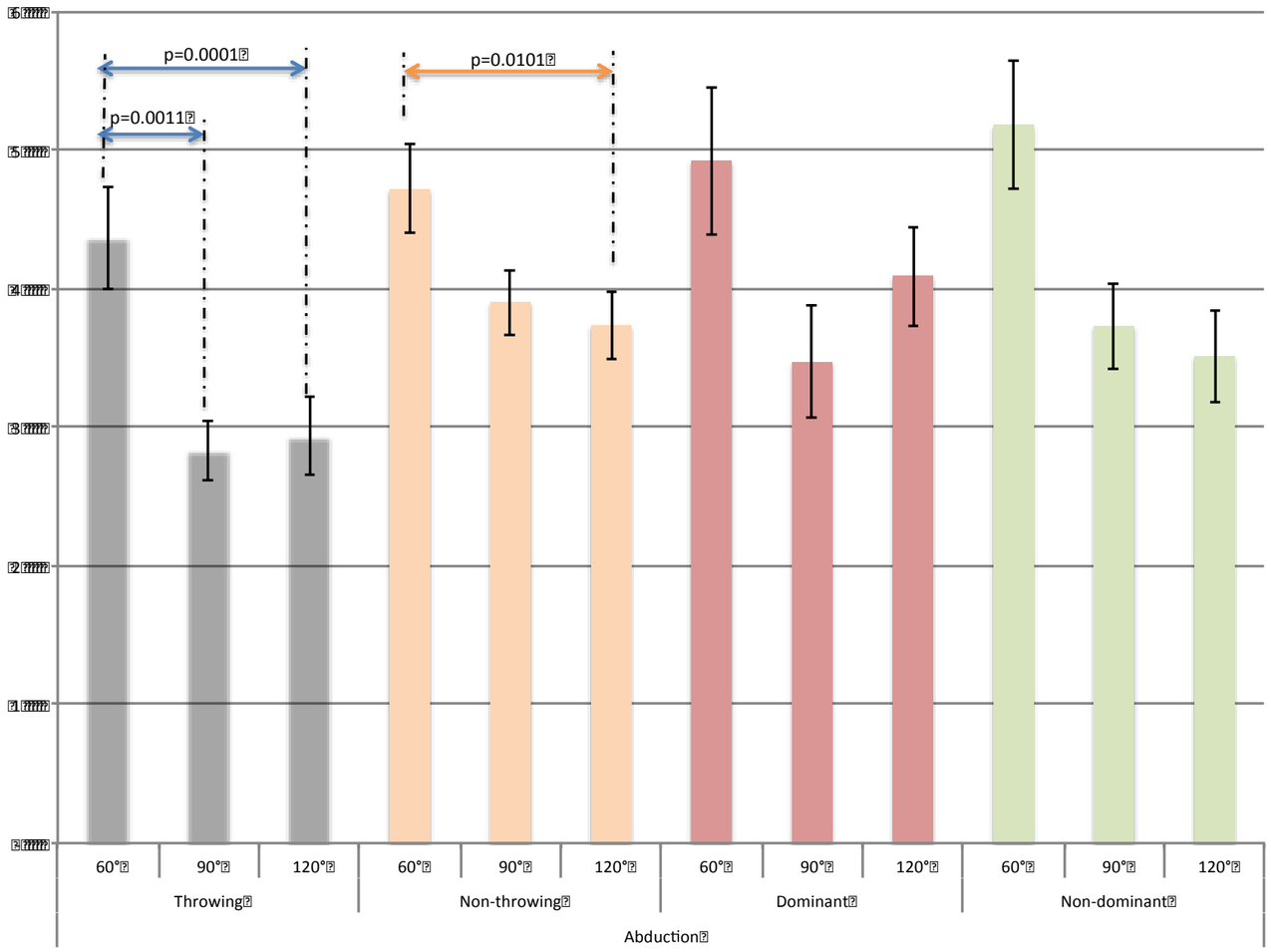
Examined Group

- **90 handball players**
  - Age: 25,0 (±4,7)
  - Height: 189,0 (±6,2)
  - Weight: 92,3 (±11,2)
  - Throwing arm: R – 72; L – 18

Control Group

- **32 healthy volunteers**
  - Age: 22,4 (±1,4)
  - Height: 180,3 (±5,1)
  - Weight: 77,4 (±11,2)
  - Dominant arm: R – 31; L – 1

Results – Abduction



Throwing shoulder – significantly better joint acuity in abduction at 90° and 120° comparing to 60°

(2.8°±0.2° vs. 2.9°±0.3° vs. 4.4°±0.4°, respectively)

Non-throwing shoulder – significantly better joint acuity in abduction at 120° comparing to 60° and 90°

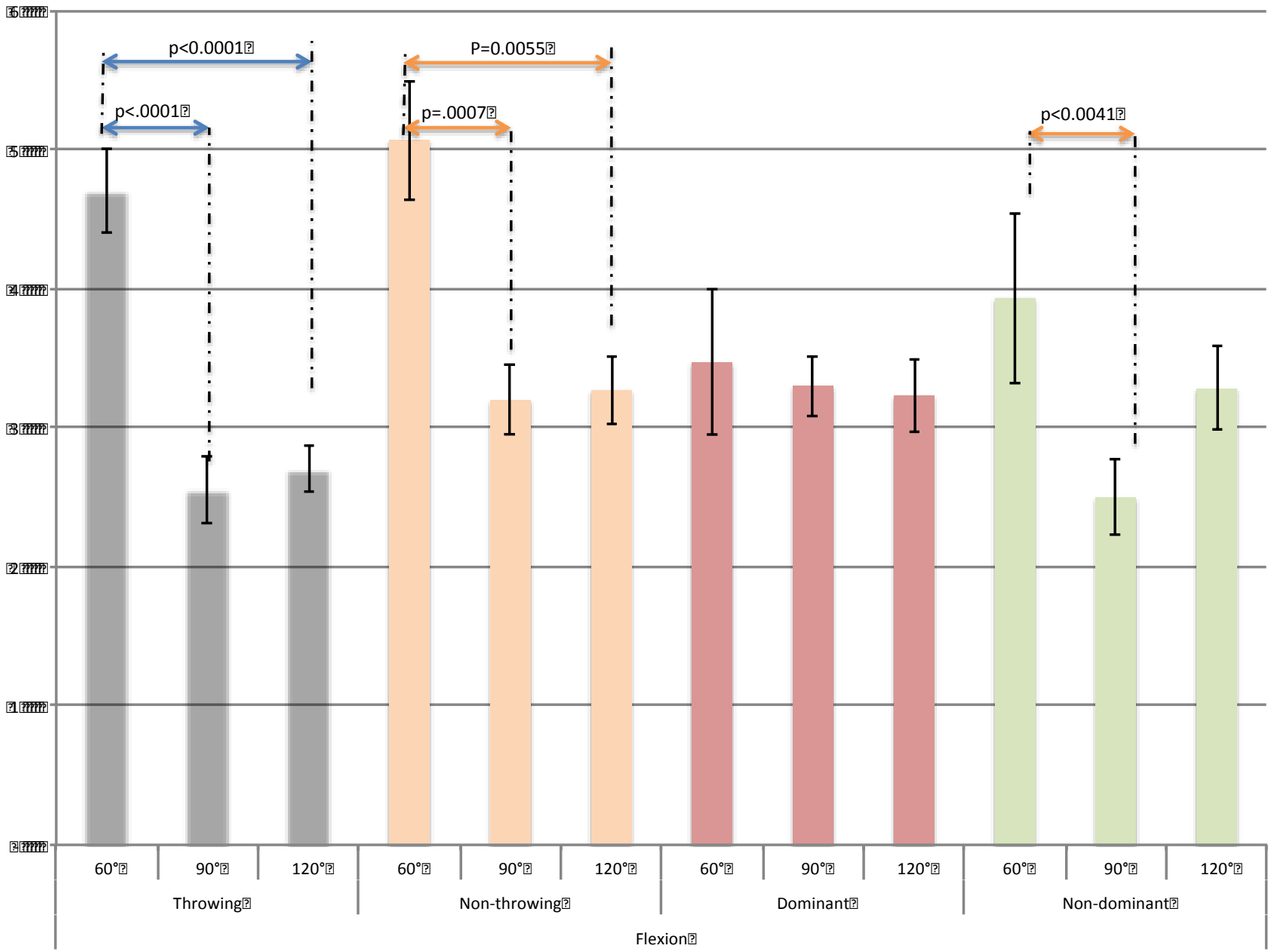
(3.7°±0.3° vs. 4.7°±0.3° vs. 3.9°±0.2°, respectively)

Compared with non-throwing shoulders, throwing shoulders proved significantly better joint acuity in abduction at 90° and 120°

(2.8°±0.2°vs. 3.9°±0.2° and 2.9°±0.3°vs. 3.7°±0.3°, respectively)

No significant differences were noted in the control group

Results – Flexion



Throwing shoulder – significantly better joint acuity in flexion at 90° and 120° comparing to 60°

(2.6°±0.2° vs. 2.7°±0.2° vs. 4.7°±0.3°, respectively)

Non-throwing shoulder – significantly better joint acuity in flexion at 90° and 120° comparing to 60°

(3.2°±0.3° vs. 3.2°±0.2° vs. 4.7°±0.3°, respectively)

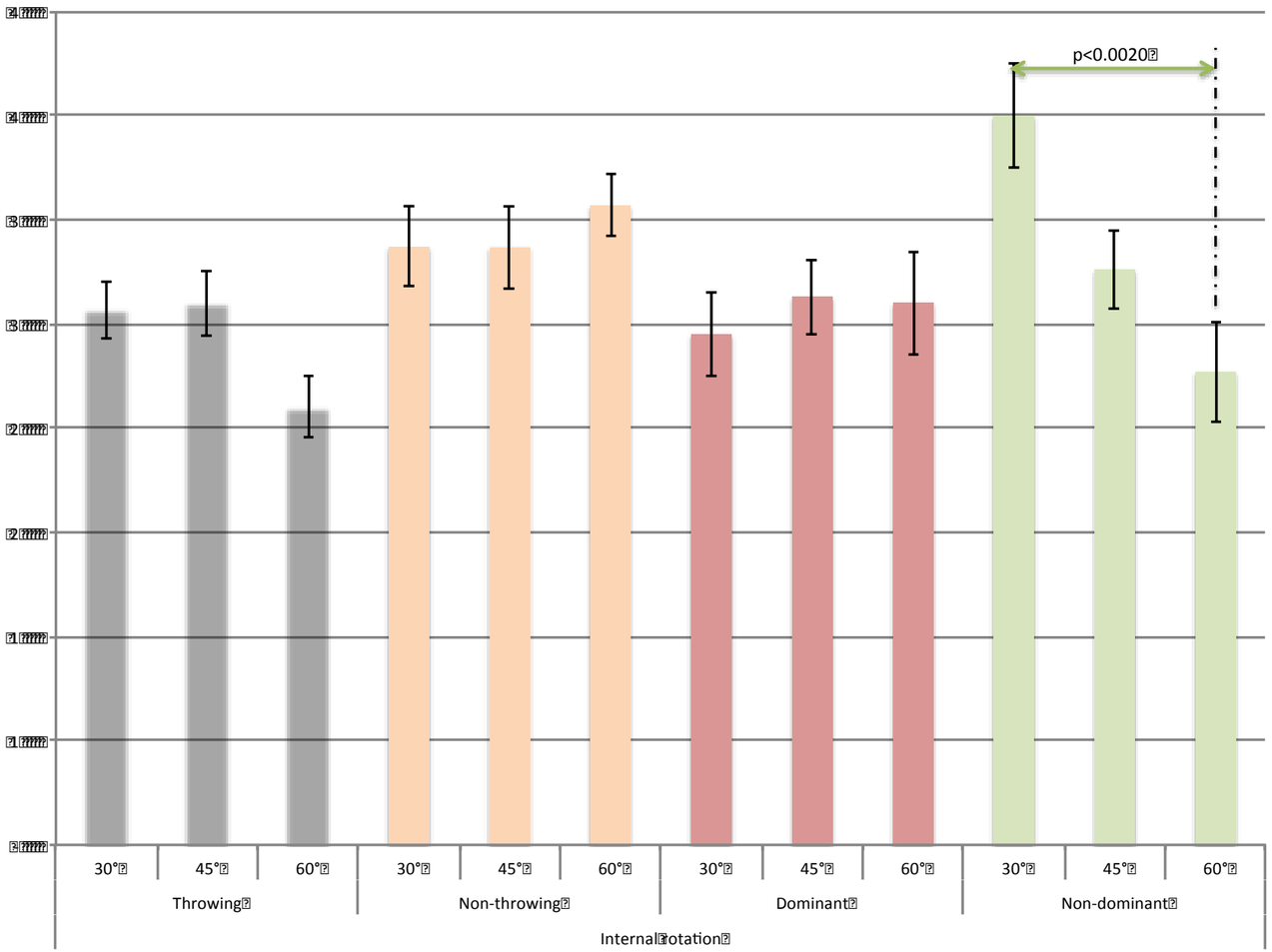
Throwing shoulders proved significantly better in EARJP, comparing to the non-throwing ones, in flexion at 90° and 120°

(2.6°±0.2° vs. 3.2°±0.3° and 2.7°±0.2° vs. 3.3°±0.2°, respectively)

Control group – significantly higher results at 60° comparing to 90° of flexion for the non-dominant shoulder

(3.9°±0.6° vs. 2.5°±0.3°)

Results – Internal rotation



Significantly better joint acuity in internal rotation at 60° comparing to 30° in the control group

(2.3°±0.2° vs. 3.5°±0.3°)

Side-to-side results:

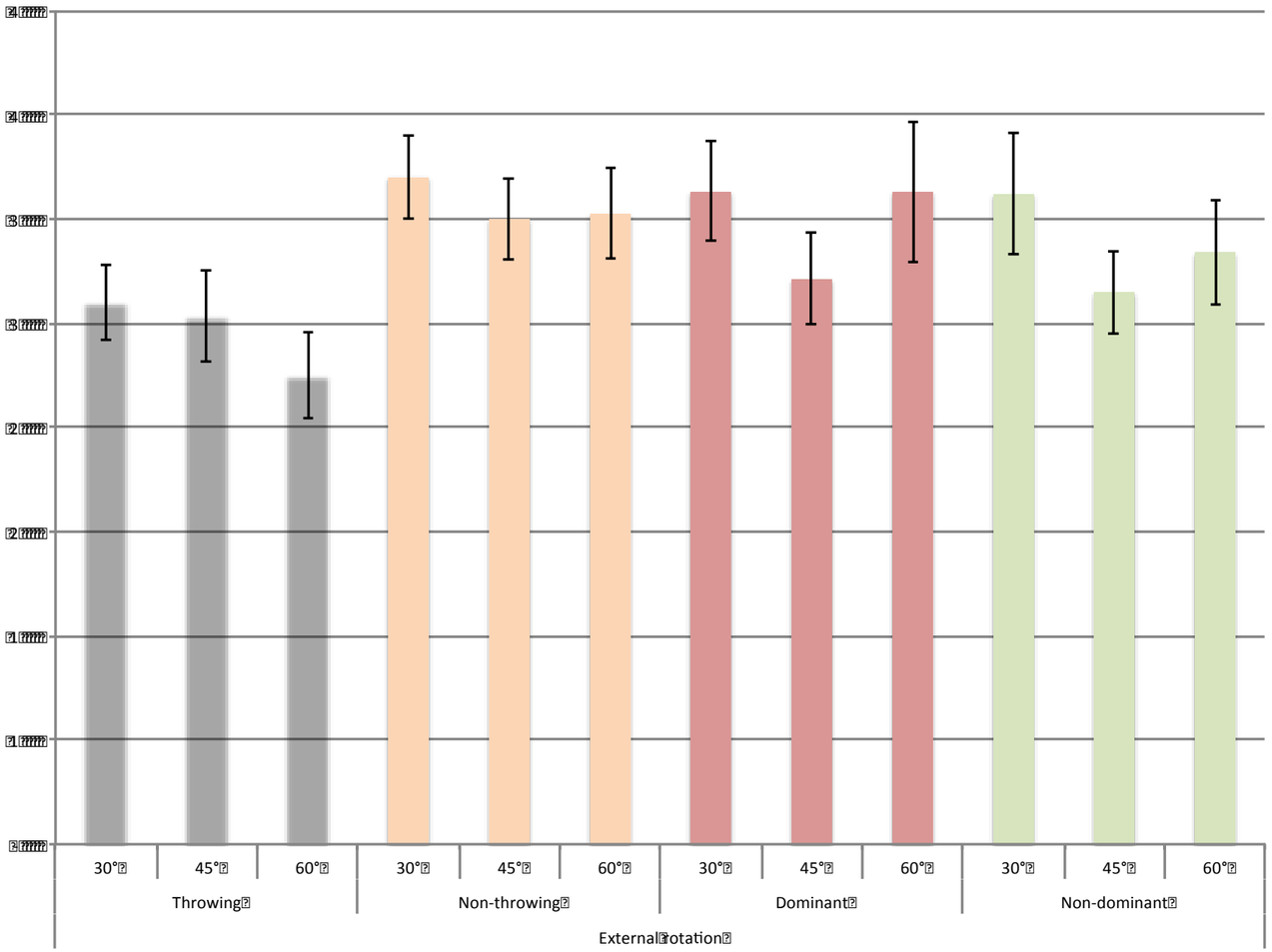
Significantly better joint acuity in the dominant shoulder at 30° of internal rotation for the control group

(2.5°±0.2° vs. 3.5°±0.3°)

Significantly better joint acuity in throwing shoulder at 60° of internal rotation for handball players

(2.1°±0.1° vs. 3.1°±0.2°)

Results – External rotation



No statistical differences within the control group or the handball players group for any of the degrees of external rotation movement

Side-to-side results:

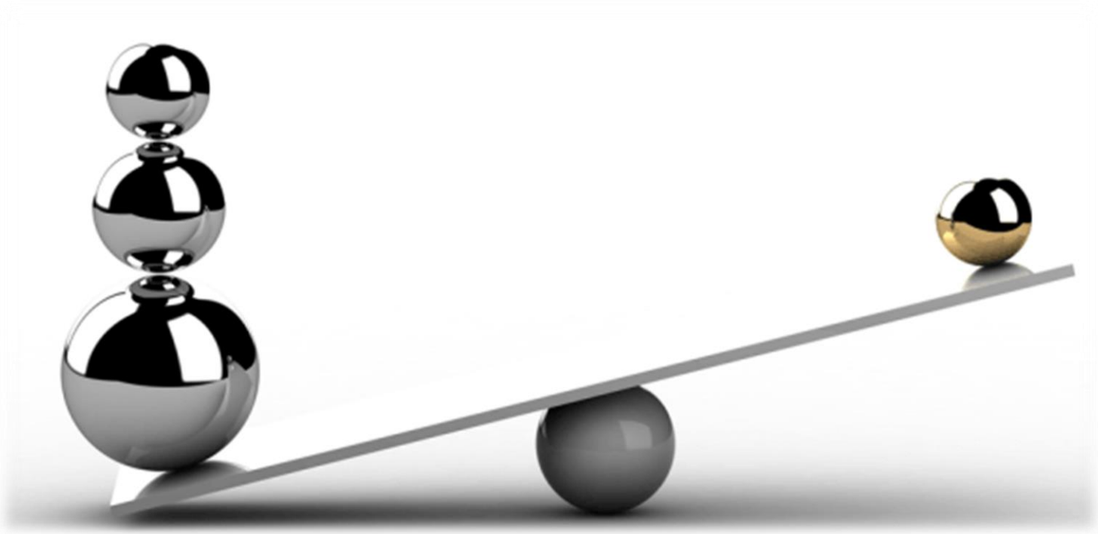
Throwing shoulders compared to non-throwing ones proved significantly better in EARJP external rotation at 30° and 60°

(2.6°±0.2° vs. 3.2°±0.2° and 2.3°±0.2° vs. 3.0°±0.2° respectively)

Results – Comparison between groups

Joint positioning (throwing vs dominant) proved significantly better among the athletes comparing to the control group at higher ranges of:

- Abduction (2.9°±0.3° vs. 4.1°±0.4°)
- Flexion (2.7°±0.2° vs. 3.2°±0.3°)
- Internal rotation (2.1°±0.1° vs. 2.6°±0.3°)
- External rotation (2.3°±0.2° vs. 3.1°±0.3°)



There were no significant differences between the non-throwing shoulder in the athletes and the non-dominant shoulder in the control group in any movement and angle

Conclusions

Throwing sport (as handball) affects neuromuscular shoulder control

Throwing athletes have a superior joint position sense in the throwing shoulder comparing to the opposite one

Throwing athletes have a superior joint position sense in the throwing shoulder comparing to the dominant shoulder of the non-athlete population

Joint acuity is increased in a higher level of shoulder movement

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Thank You

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