

The Role of Torque in Shoulder Joint Position Sense

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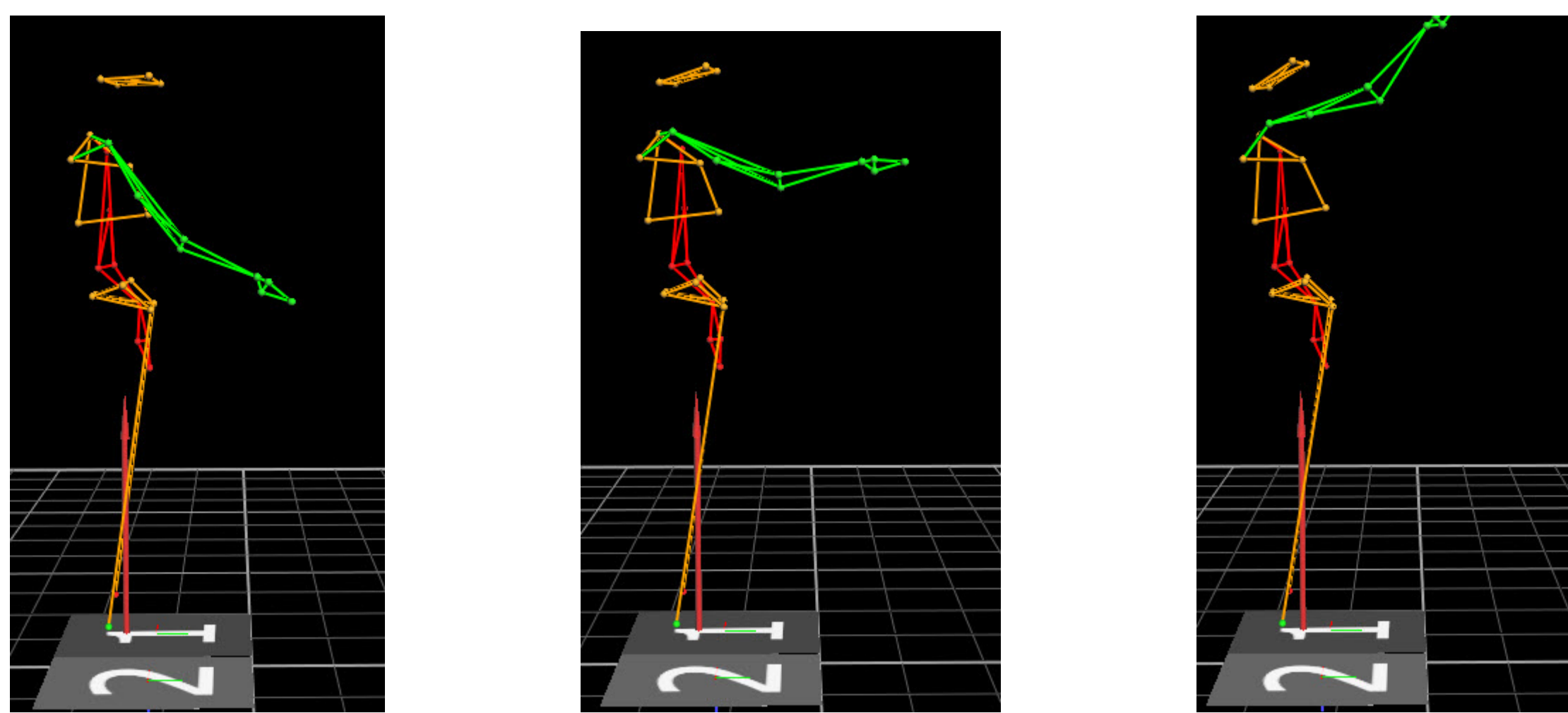
Introduction

- Proprioception is known to be diminished following shoulder injury¹.
- The underlying mechanisms involved are not fully understood. By developing on the current level of understanding the quality of screening in athletes can be enhanced.
- Evidence suggests that increased torque around the shoulder enhances joint position sense (JPS), quantified by joint angle **matching error**².
- Joint angle matching error is reduced when torque is increased, either by adding external load or by changing the angle of the upper limb².
- The effect of manipulating these factors simultaneously is yet to be investigated.

The aim of this study was to investigate the role of torque in shoulder JPS when both limb angle and external load were experimentally modified.

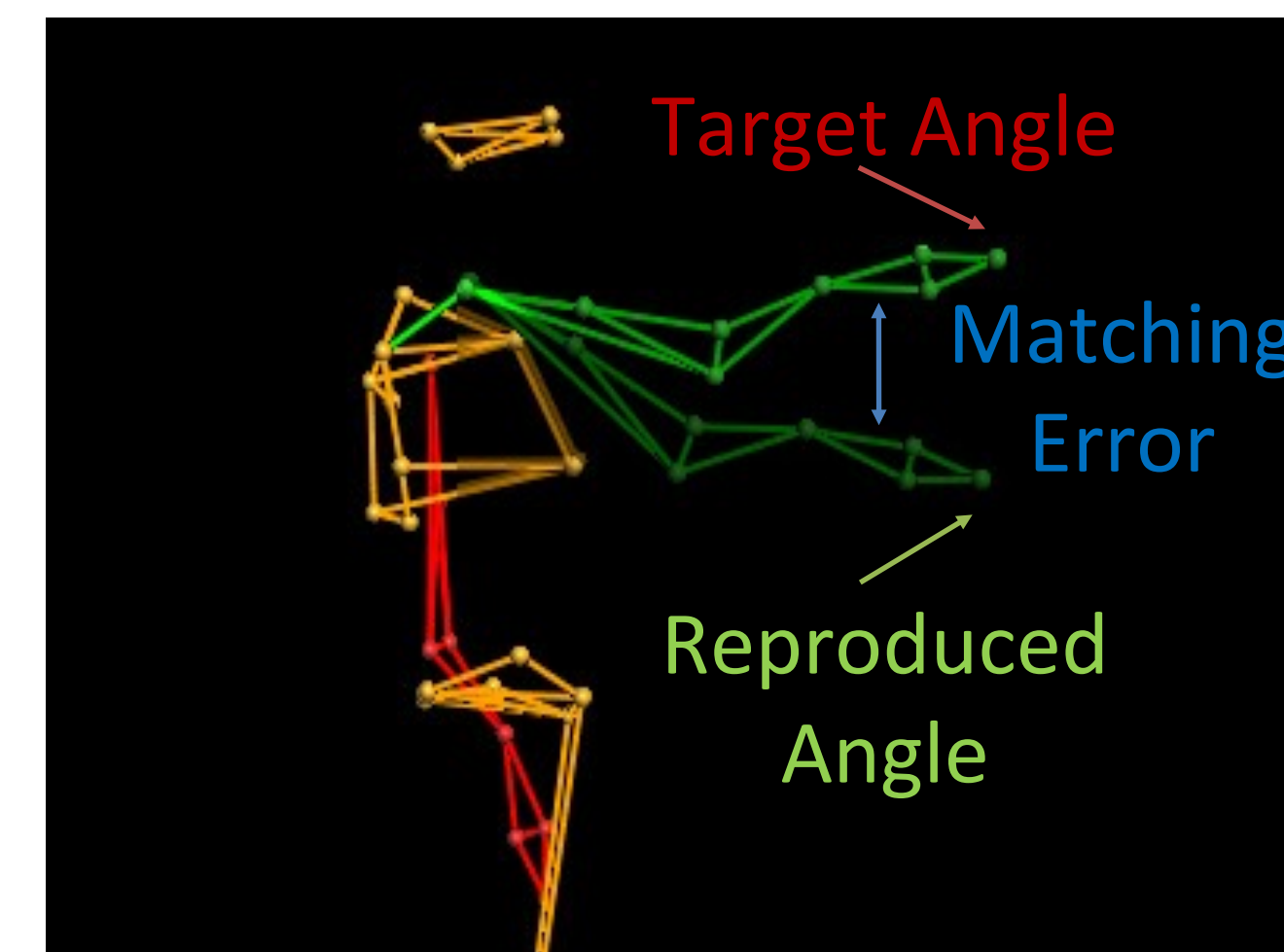
Methods

- N = 24 (17 males, 7 females), uninjured, aged 20-37 years.
- Participants performed an active shoulder joint position-reposition task at **55°, 90° and 125°** sagittal plane flexion.



- The participant produced the target angle, returned to the start position and then reproduced the angle with vision obscured using the ipsilateral limb.
- Three weighting conditions were used:
 1. *Unweighted*
 2. *Torque matched* - torque of unweighted limb at 90° was replicated at 55° and 125° using external load.
 3. *Increased mass* - 40% of arm mass was added to the forearm via a weighting cuff.
- An optical motion capture system (200Hz; Vicon Motion Systems Ltd, UK) recorded the trajectories of retroreflective markers on the trunk and upper limbs.

Methods cont.



Matching error

The absolute error of a reproduced joint angle, in comparison to a held target angle.

- Absolute mean matching errors were calculated for each loading condition at each target height.
- ANOVA and post-hoc comparisons (Tukey's HSD).

Results

- An effect of target position was found on matching error ($p < 0.01$).
 - Lower matching errors were found at 125° than at 90° ($p < 0.01$) and 55° ($p < 0.05$).
- No effect of external loading was found on matching error ($p = 0.30$).

Discussion and Conclusions

- Lowest matching errors were found at 125° and no significant effect of increased loading was found.
- As the results of this study contrast with previous findings^{2,3}, factors other than torque may dominate the determination of proprioceptive acuity when end range is approached.
- Results also appear sensitive to experimental design so caution must be made when comparing and contrasting research in the area.
- Repeat studies and further research is necessary to conclusively determine the effects of torque.

References

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2. Suprak, DN, et al. (2007). *J Motor Behav.* 39(6), 517-525.
3. Vafadar, AK, et al. (2016). *J Sport Rehabil.* 25(1).