

3D Motion Analyse used in Prehension Study: Interactions with Obstacle Properties.

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Introduction

The aim of the present work is to propose an experimental setup to analyze the effect of obstacle properties on human prehension. We investigated the impact of intrinsic and extrinsic obstacle parameters on transport and grasp components in an exclusive protocol without restrain movement or impose grasping.

Keywords: Human prehension; Vicon; Cyberglove; Obstacle avoidance.

Experimental Method

Population: 20 adults (means = 23.8 years)

Apparatus:

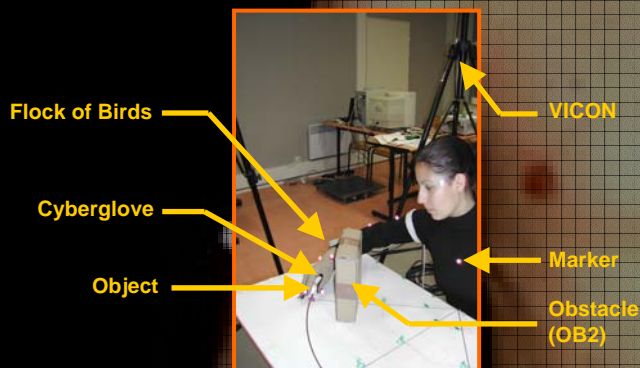
- CYBERGLOVE (Virtual Technologies, Palo Alto, CA)
- VICON 3D motion analysis system with 6 cameras (Oxford Metrics Inc.)

Conditions:

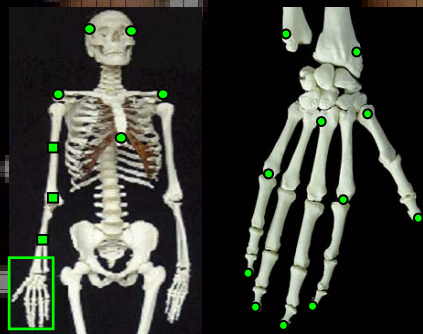
- Control (no obstacle)
- Obstacle OB1 (h=15 cm) & OB2 (h=20 cm)
- Position O1 (d=20cm) & O2 (d=40cm)

Procedure:

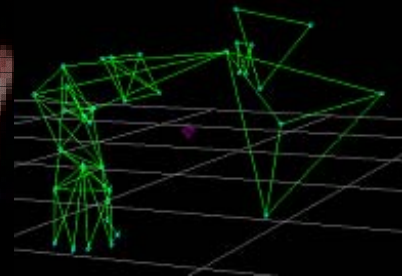
- Natural movement
- No grasping restriction



Marker positions:



Reconstruction:



Results

Movement time:

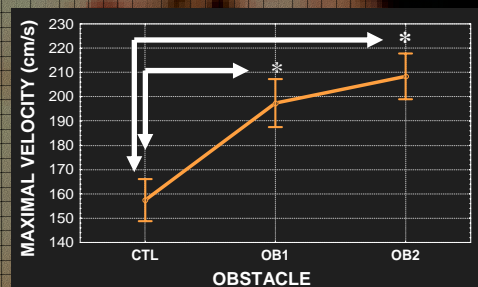
- \nearrow with object size ($p=0.002$), obstacle size ($p<0.01$) & position ($p<0.01$).

Transport component:

- Hmax & Vmax \nearrow to obstacle vs control condition ($p<0.01$).
- No differences between obstacle conditions.

Grasping component:

- Grip aperture \nearrow with object size ($p<0.001$).
- No differences between obstacle conditions.



Maximal velocity variations (cm/s) compared to control condition, OB1 obstacle (h=15 cm) and OB2 obstacle (h=20cm). * $p<0.01$.

Conclusion

Results from this study suggest that altering transport path produces no systematic changes in the formation of the grasp component. Reach seem influenced by obstacle conditions whereas grasp appear more dependant to object properties.