FLEXTENSION
TECHNOLOGY FOR DUCHENNE

Technologie in ontwikkeling voor Duchenne

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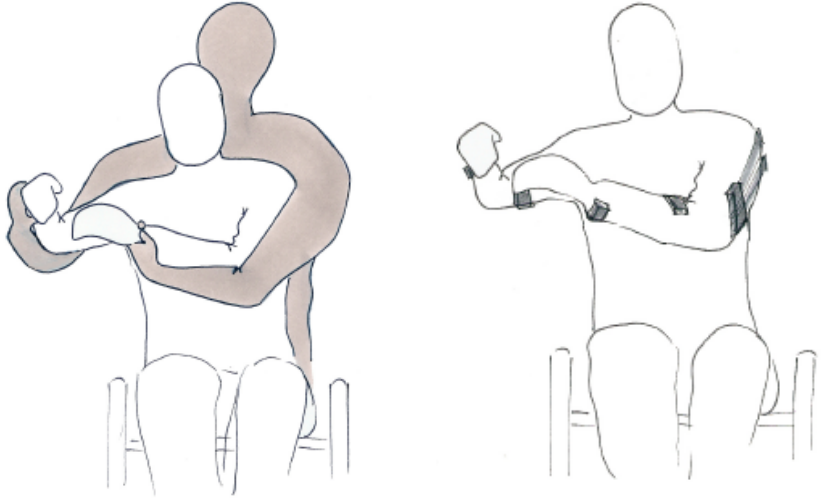
Duchenne congres, 18 May 2019

Goal of Flextension

- To find technological solutions for people with Duchenne to improve their quality of life.



Evolution of Flextension research

Idea

2007

2009

2011

AGEAR

2014

SHELLMECH

SYMBIONICS
MANIPULATION • BODY SUPPORT • FORM ADAPTATION

2015

ENHANCE

Wearable Robotics

2018

Flextension Foundation

Overview of assistive devices

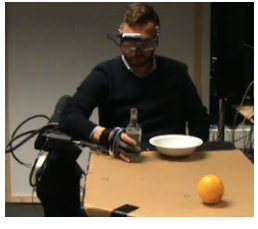
Passive arm support

Passive arm support

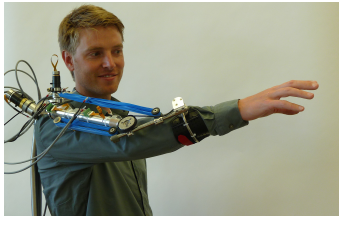
Trunk orthosis

Head support

Planar Active Arm Support



Active arm support controlled with Gaze

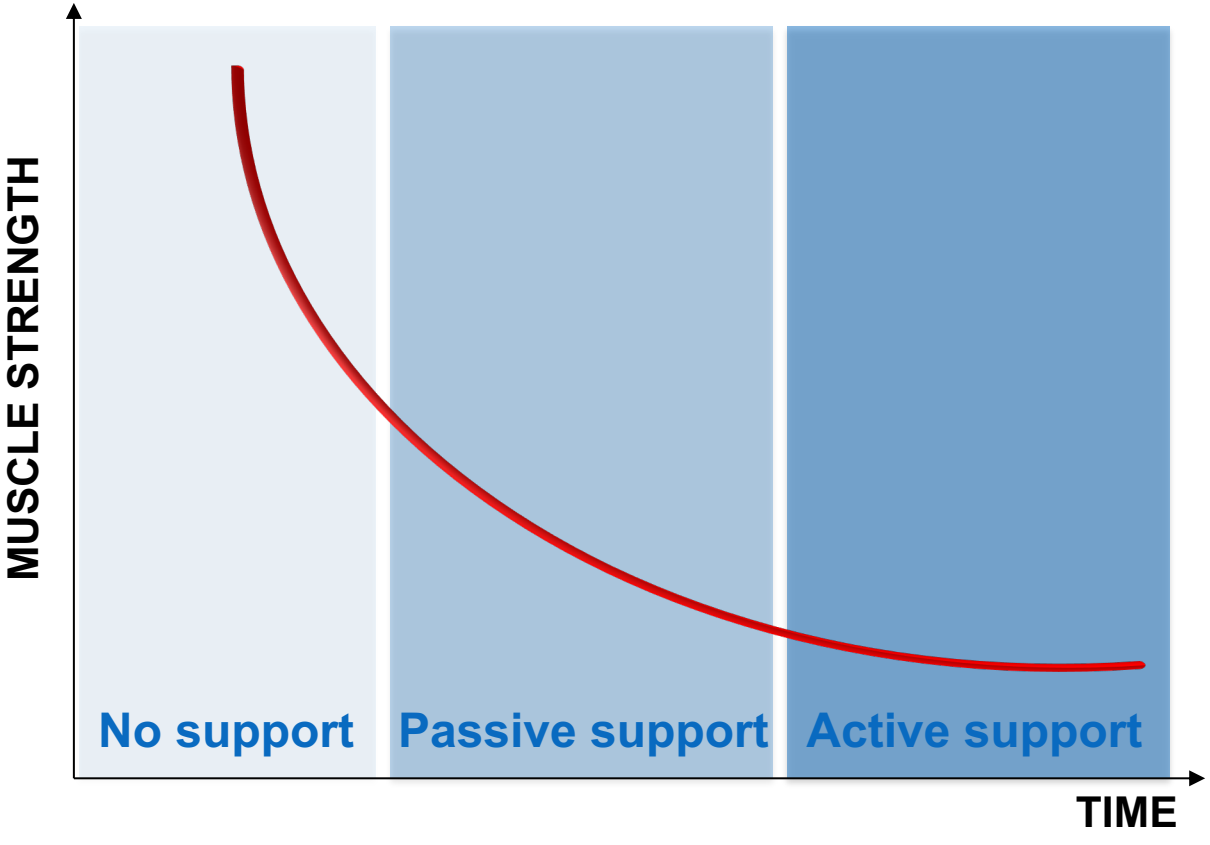


Active arm support

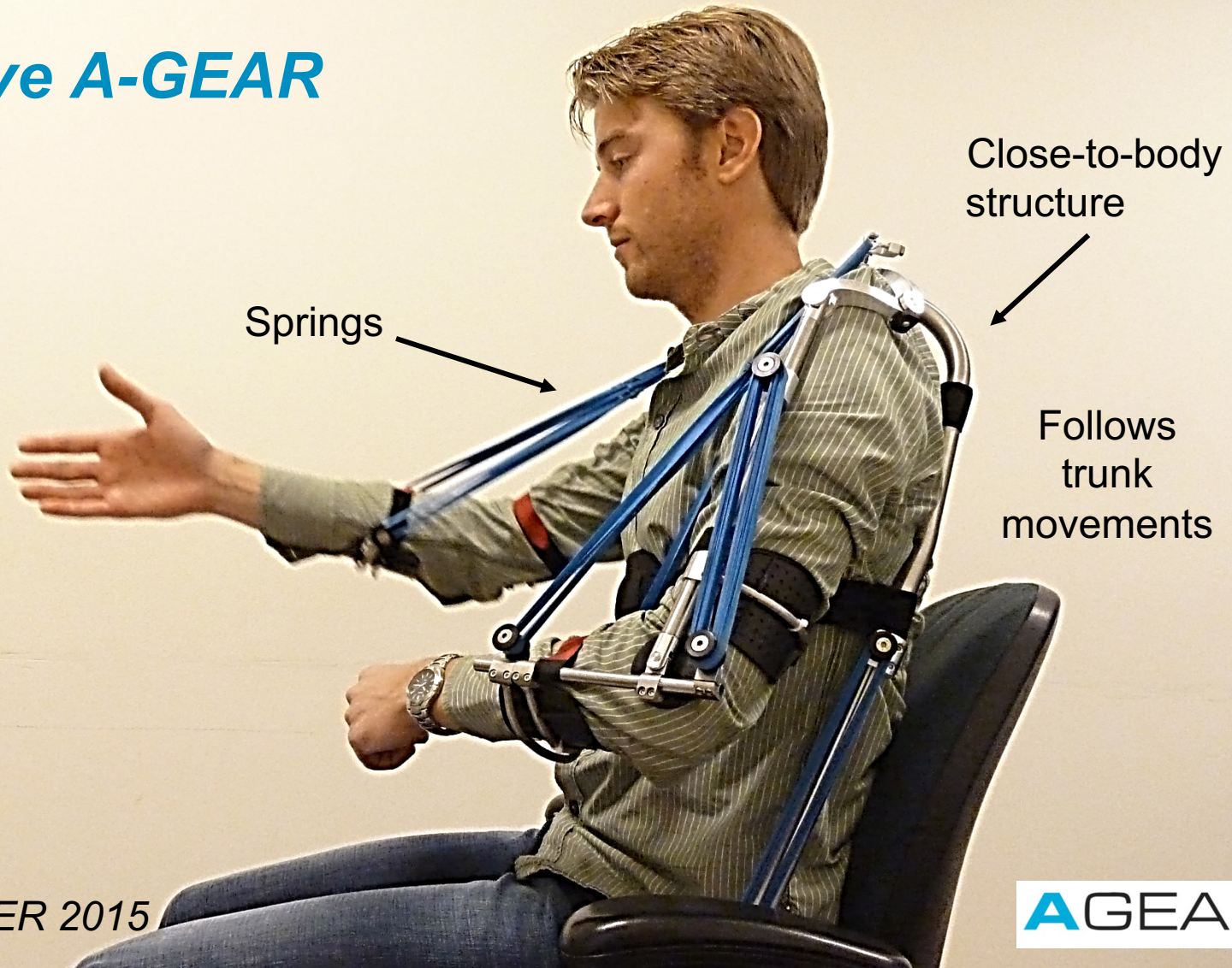
Hand orthosis

Head support

Strategy: Adaptive Support



Passive A-GEAR



Kooren et al. JNER 2015

AGEAR

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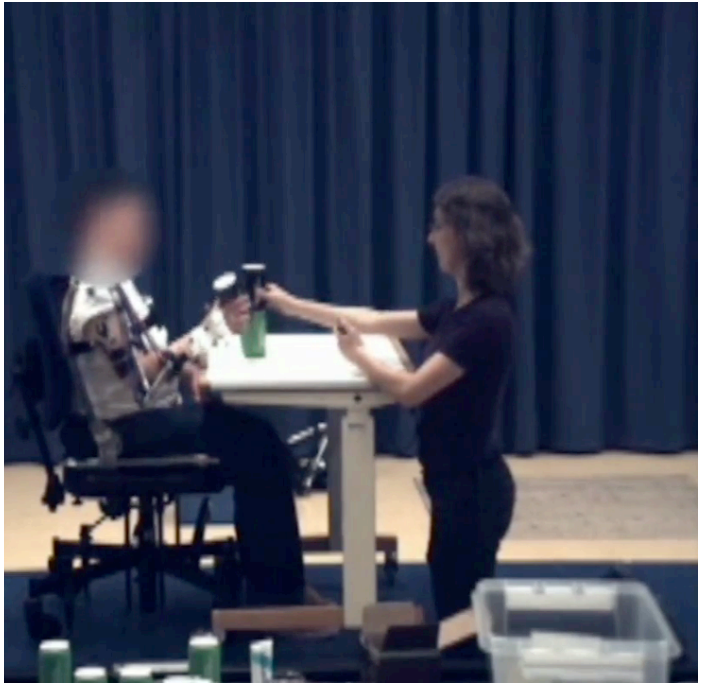
AGEAR

Passive A-GEAR: Evaluation

No Support

With Passive A-Gear



Kooren et al. JNER 2015

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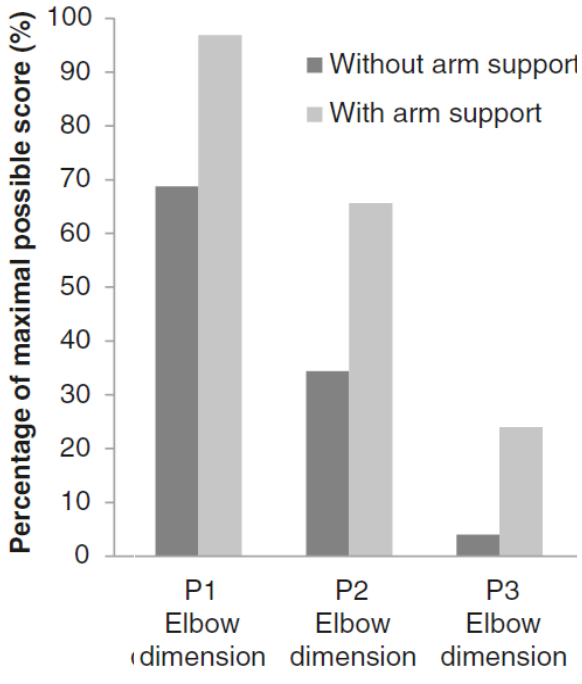
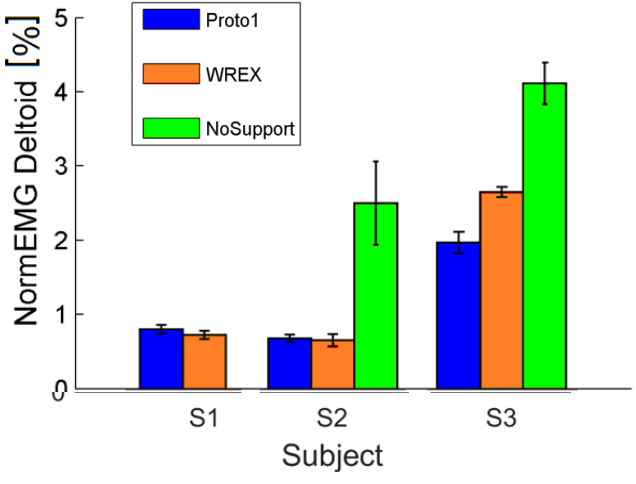
Passive A-GEAR: Evaluation

PUL Score



Drinking task



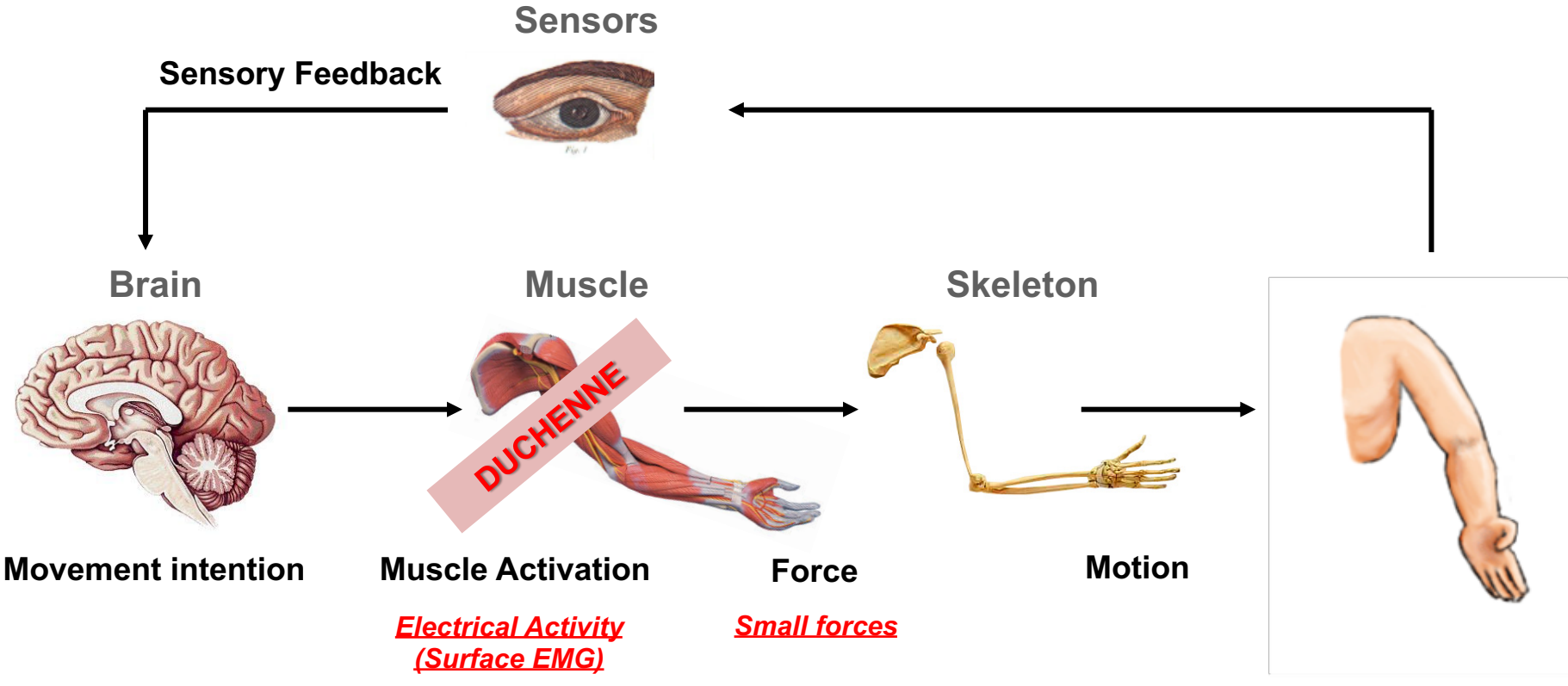
Control Interface

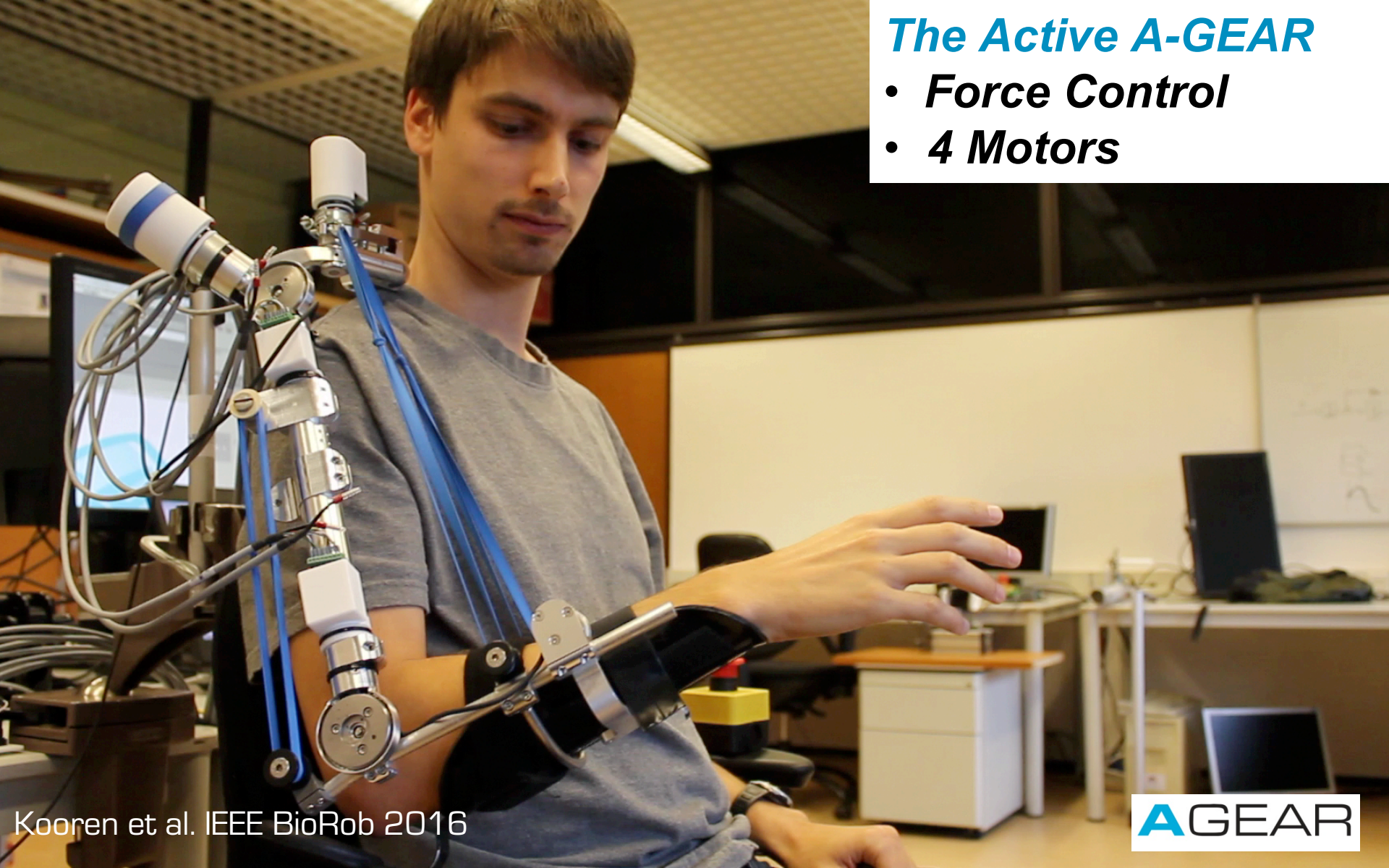
The user needs to tell to the active arm support what to do in an intuitive and natural way

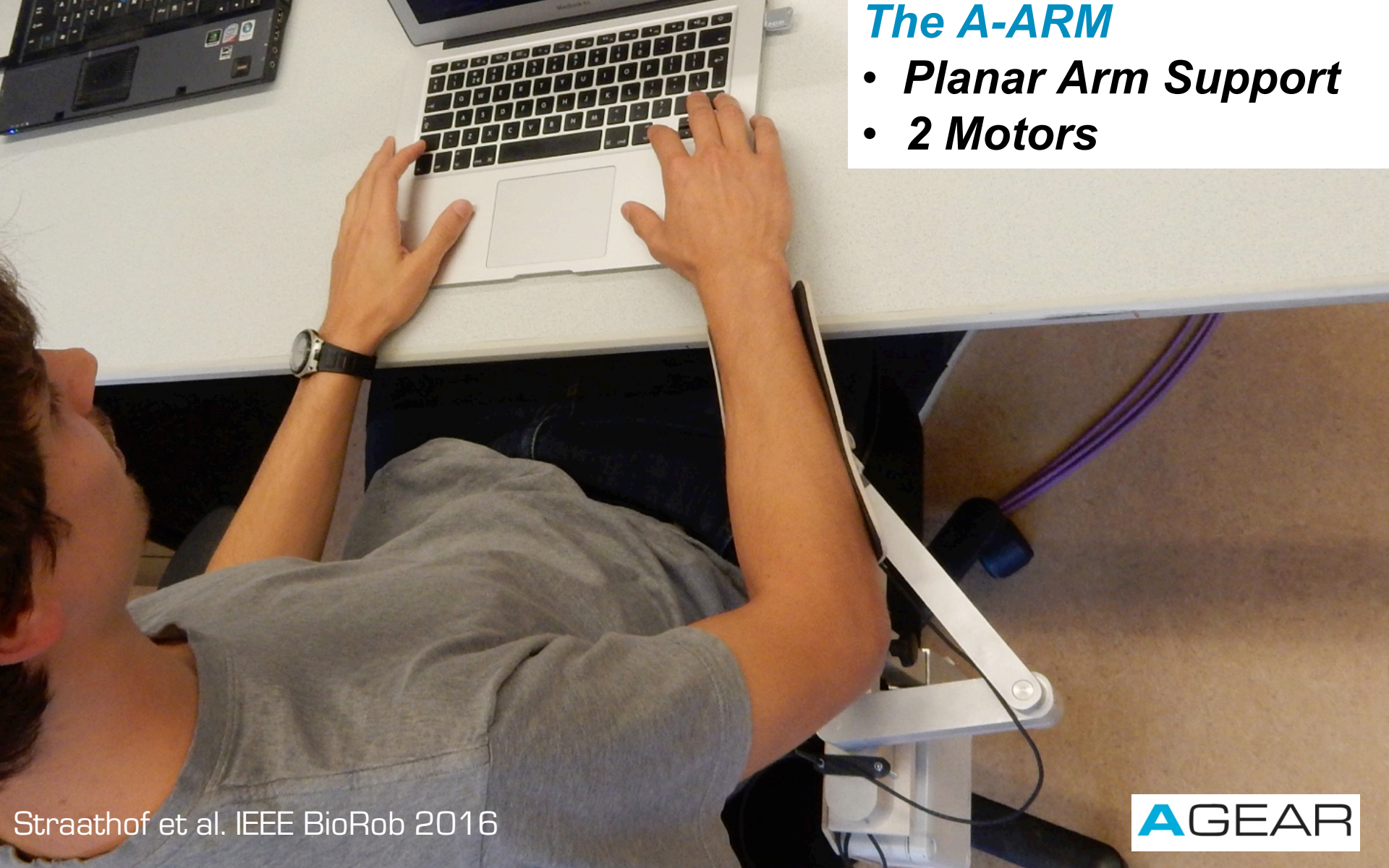
Kooren et al. IEEE BioRob 2016

AGEAR

Signals for detecting motion intention




The Active A-GEAR
• Force Control
• 4 Motors
Kooren et al. IEEE BioRob 2016
AGEAR


The A-ARM
• Planar Arm Support
• 2 Motors
Straathof et al. IEEE BioRob 2016
AGEAR

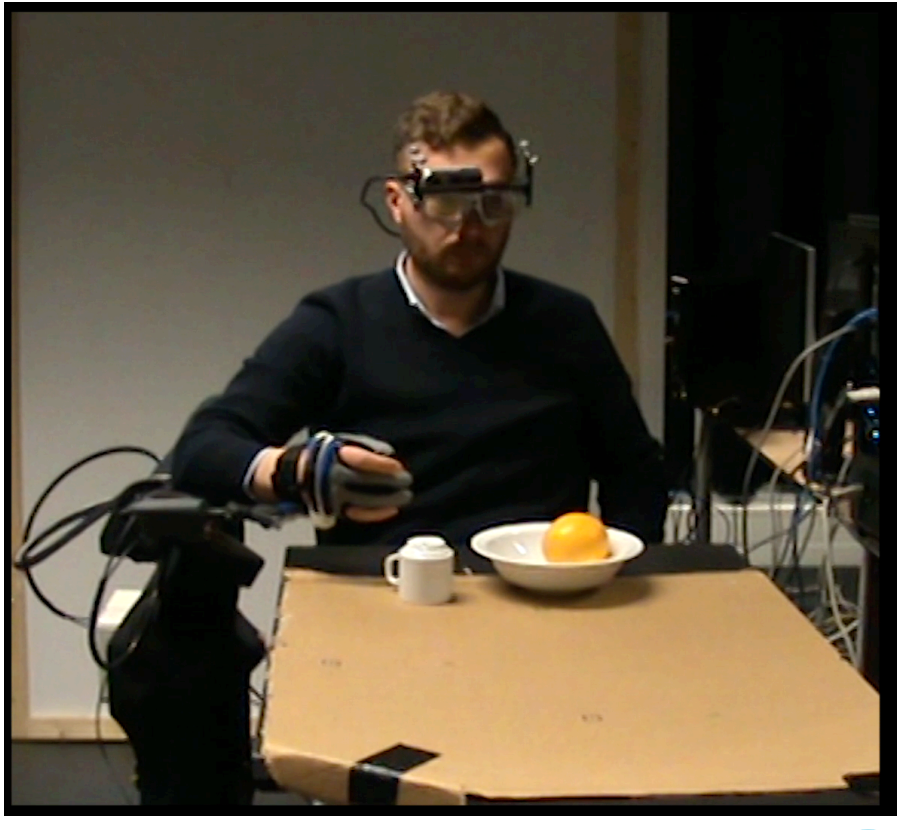
Straathof et al. IEEE BioRob 2016

AGEAR


inconspicuous!
O'NEILL
Straathof et al. IEEE BioRob 2016
AGEAR


Justus trying the A-Arm
The movement of the A-Arm is controlled using the electrical signals of the arm muscles
AGEAR

Enhance: Gaze-Based Control



- Eye tracking technology from Imperial College London
- Grasping assistance with SEM Glove from BIOSERVO
- Arm Reaching Assistance with Active Arm Support from FOCAL MEDITECH

Symbihand: ElectroHydraulic Hand Othosis

K. Nizamis, R. Bos 2018

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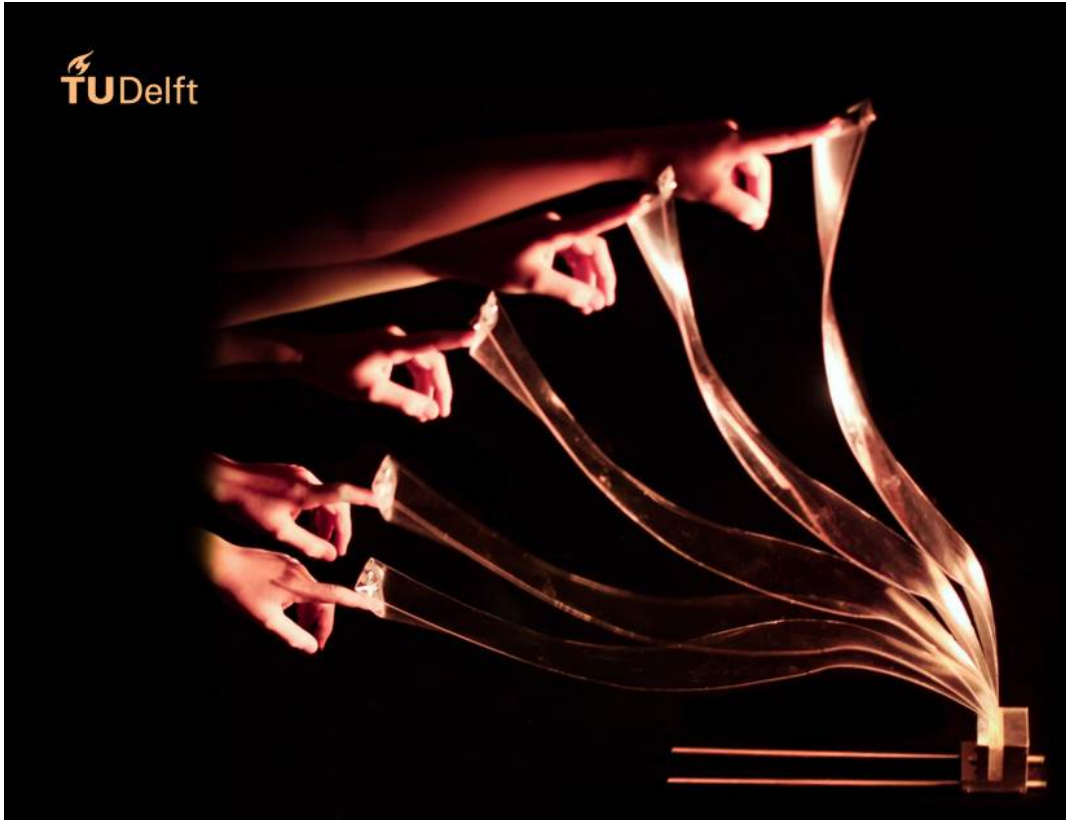
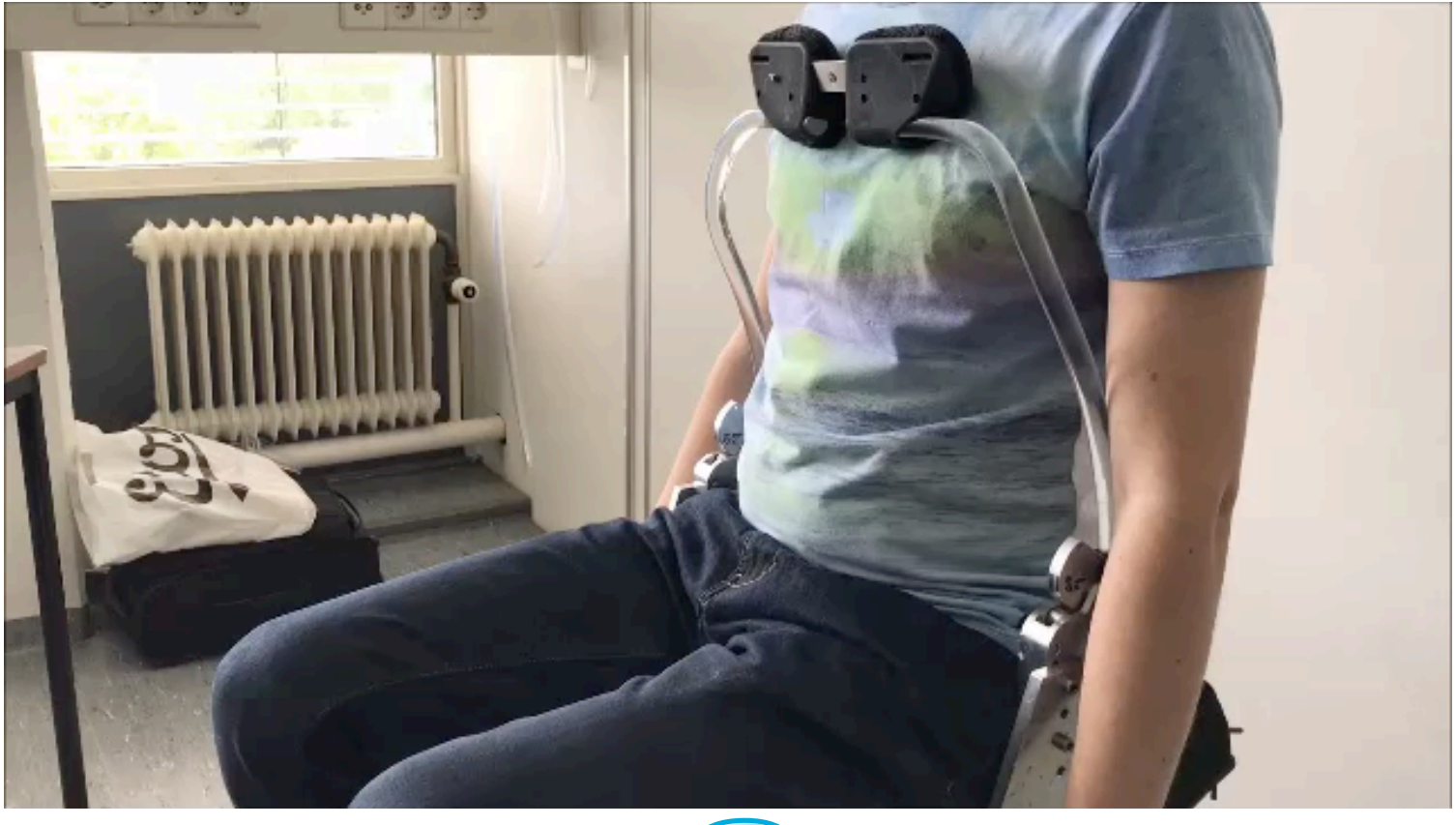
Shellmech

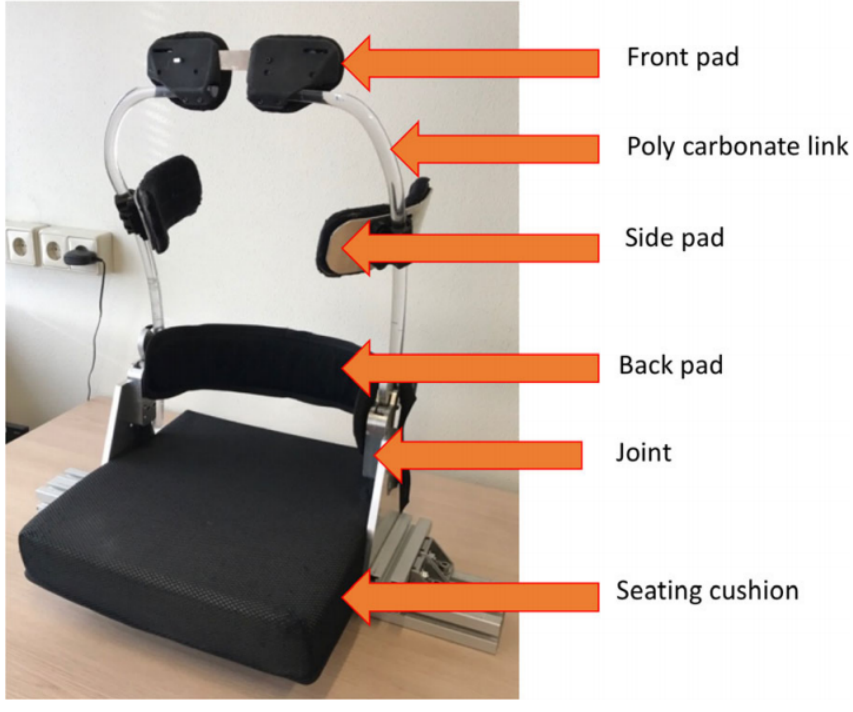
Shell Mechanisms: spatially curved compliant structures for large deflections, in this case carrying its own mass.

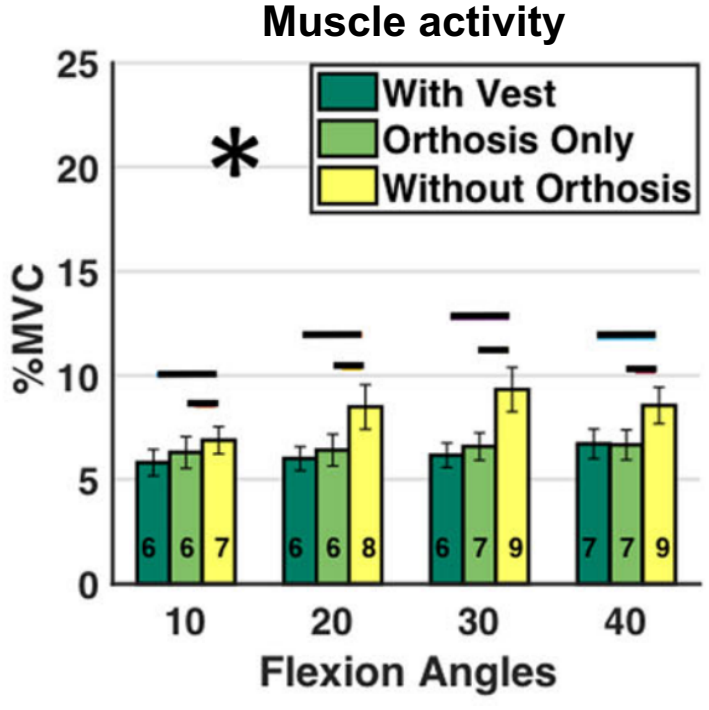


Trunk support



Trunk support





N. Mahmood, S. Verros, L. Peeters

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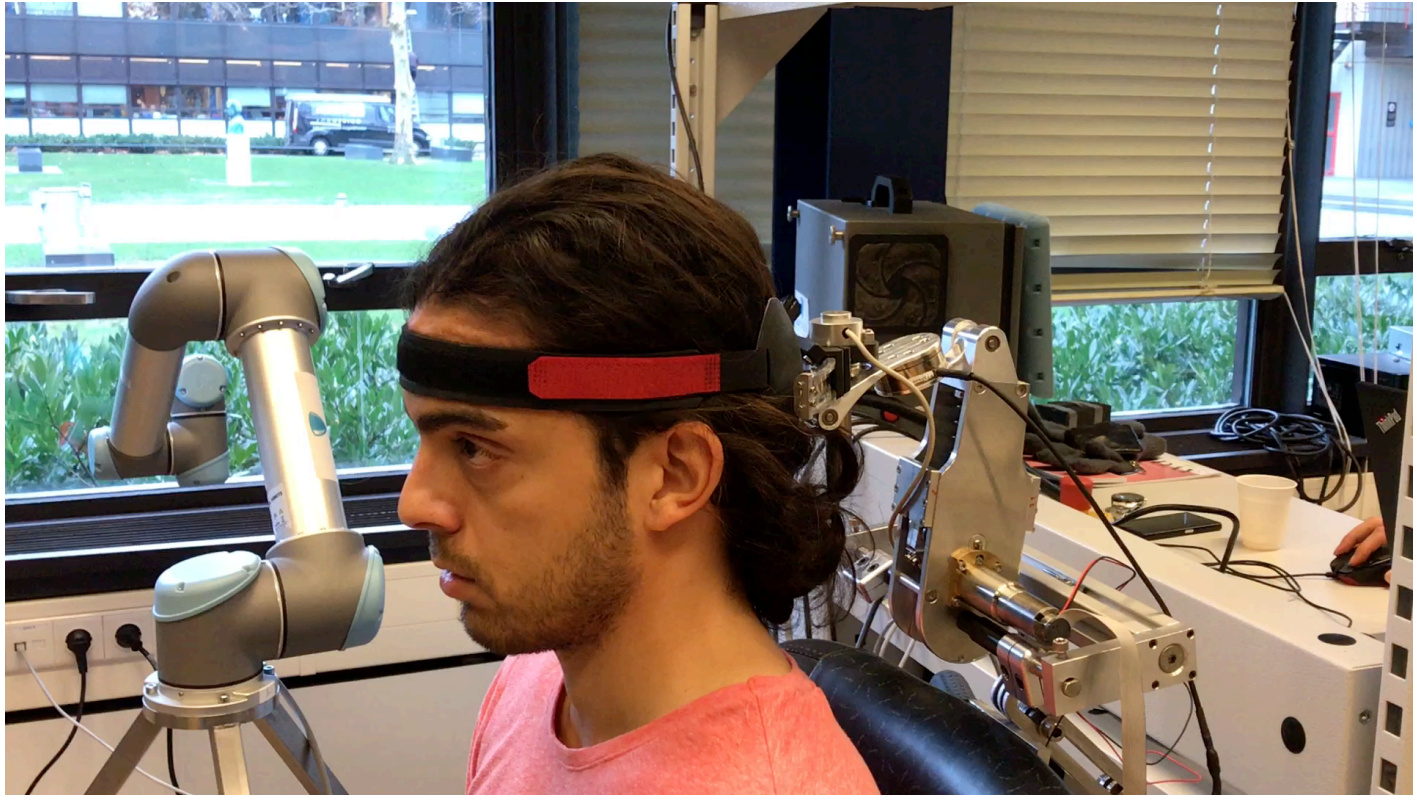
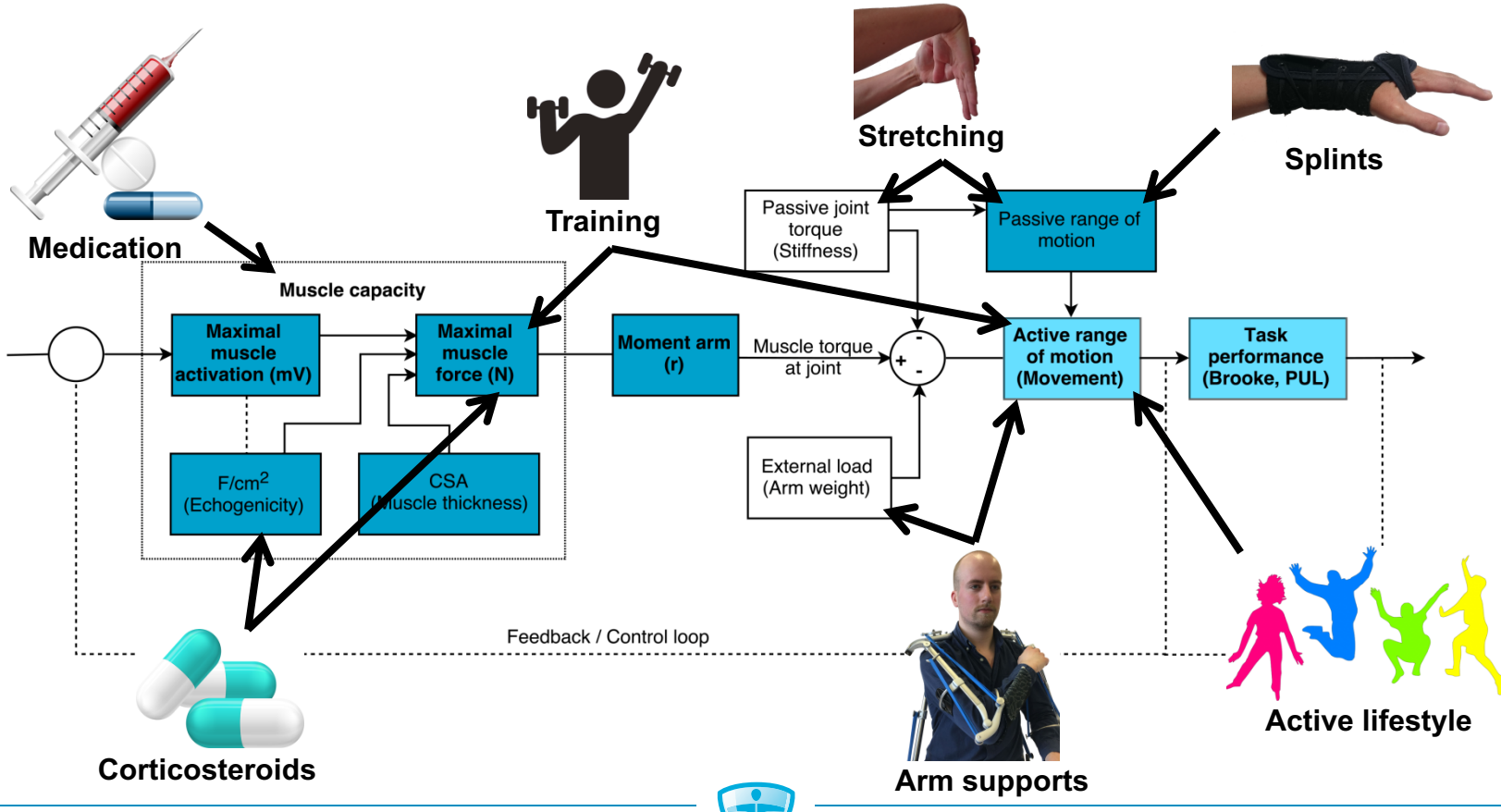
Head support design 1

Head support design 2



Compensate loss of arm function



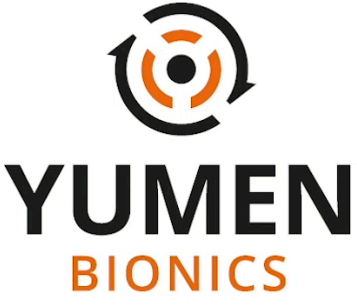
Take Home Messages

- **Assistive Technology can increase the quality of life of people with DMD**
    - Mild Weakness → Passive Support
    - Severe Weakness → Active Support

- **Both EMG and Force control are feasible to control assistive devices**
    - EMG control→ can be used until the last stage
    - Force control→ requires residual force

- **Other patient groups with muscle weakness can benefit from this technology**

Making this technology accessible to users



SYMBIONICS
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Wearable Robotics

SHELLMECH

ENHANCE

Supported by Companies and Patients' Organizations

FOCAL Meditech

oim orthopedie
saaf voor jou!

laevo exoskelet

Ultimaker

xsens

imSystems
Drive Innovation

Ambroise

FESTO

Hacker
Brushless Motors
Industrial Solutions

MAASTRICHT INSTRUMENTS

Motek

adelante
haal het beste uit jezelf

oceanz.
Your 3D printing professional

DEMCON

Roessingh
Research and Development

Hocoma

OPTEQ

TMSi

bw

Sint Maartenskliniek

TNO innovation for life

YUMEN BIONICS

Noldus
Information Technology

SUMMIT
REVALIDATIETECHNIEK

intespring

BAAT MEDICAL

SEM – Soft Extra Muscles for you
BIOSERVO

BOND
HIGH PERFORMANCE 3D

ottobock.

Hankamp Rehab
Innovatie in revalidatie

Roessingh Revalidatie Techniek

KFA

DWARSLAESIE ORGANISATIE NEDERLAND

FSHD STICHTING

Duchenne Parent Project

Johanna KinderFonds

PRINSES BEATRIX SPIERFONDS
KRACHTIG TEGEN SPIERZIEKTEN

SPIEREN VOOR SPIEREN
helpt kinderen met een spierziekte

LVO

Foundation to Eradicate Duchenne

SPIERZIEKTEN NEDERLAND

Parent Project Muscular Dystrophy
LEADING THE FIGHT TO END DUCHENNE

NWO Applied and Engineering Sciences

HORIZON 2020

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TU/e Technische Universiteit Eindhoven University of Technology

Thank you all for your attention!

http://www.flextension.nl/