a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA

REDUCING TRUNK MOVEMENTS IN STROKE THERAPY THROUGH THE USE OF TECHNOLOGY

BULMARO VALDÉS
PHD CANDIDATE, BIOMEDICAL ENGINEERING
SUPERVISOR: DR. MACHIEL VAN DER LOOS

RREACH Lab
Robotics for Rehabilitation Exercise and Assessment in Collaborative Healthcare

Collaborative Advanced Robotics and Intelligent Systems Laboratory

WHO ARE WE?

Collaborate

- **Engineers**
- **Therapists**
- **Stroke survivors**
- **Kinesiologists**
- **Neuroscientists**

STROKE

Major cause of disability

Most stroke survivors return home

Weakness on one side of their body

COMPENSATORY MOVEMENTS

Negative effects:

- Difficult to unlearn
- Could lead to pain
- Could reduce range of motion

Compensation might be the only option for certain stroke survivors

TRUNK RESTRAINT

- Common strategy to reduce trunk displacement

However:

- Only passively prevents trunk displacement
- Not ideal for unsupervised therapy

NEED

Need for rehabilitation programs that:

- **Provide information to correct movement**

SOLUTION

Repetitions

=

Robots

Track movement

=

Motion tracking cameras

PHASE 1

How do people reach forward and use their trunk?

PHASE 1: RECRUITMENT

10 No Stroke

10 Stroke

PHASE 1: EXPERIMENTAL SETUP

PHASE 1: TASK

PHASE 1: RESULTS

- Stroke = more trunk movement
- More trunk movement = knee height
- Harder to move up

PHASE 2

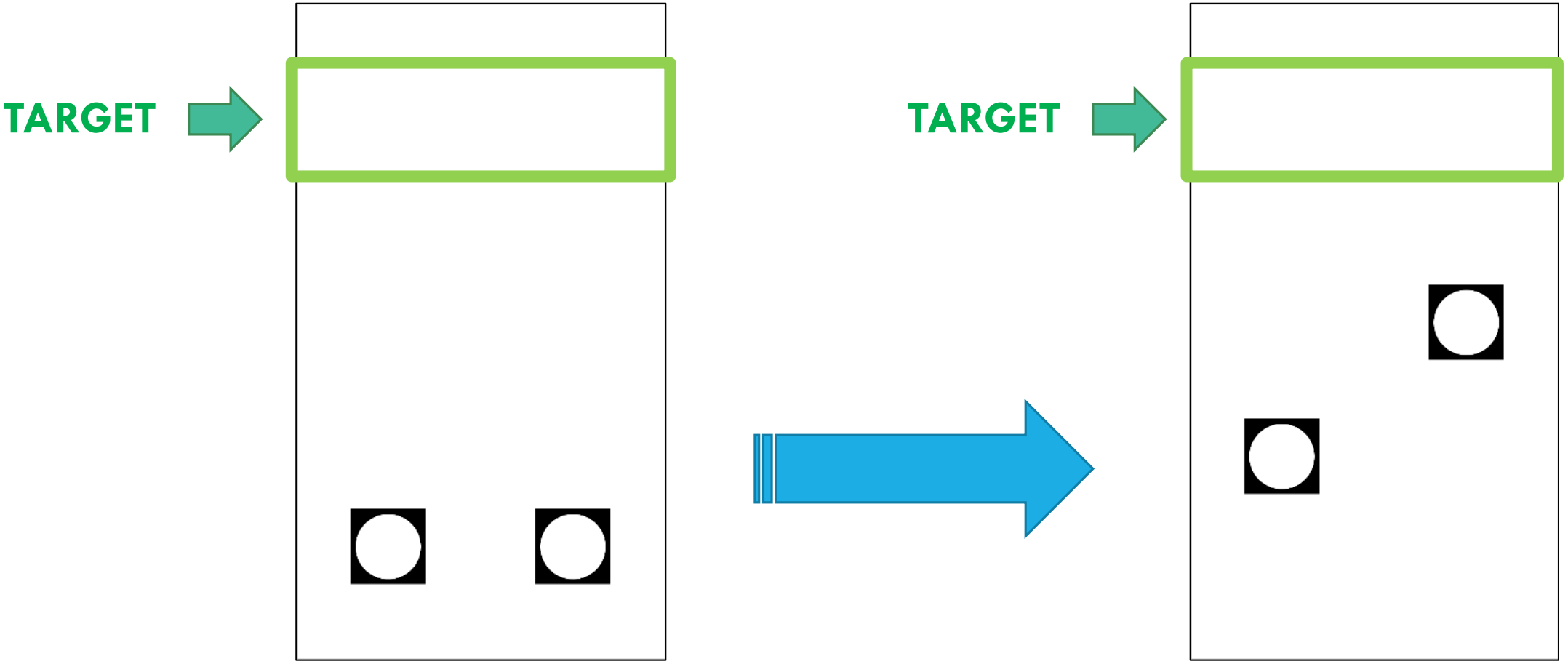
Can we reduce trunk movement using visual or force information?

PHASE 2: RECRUITMENT

15 Stroke

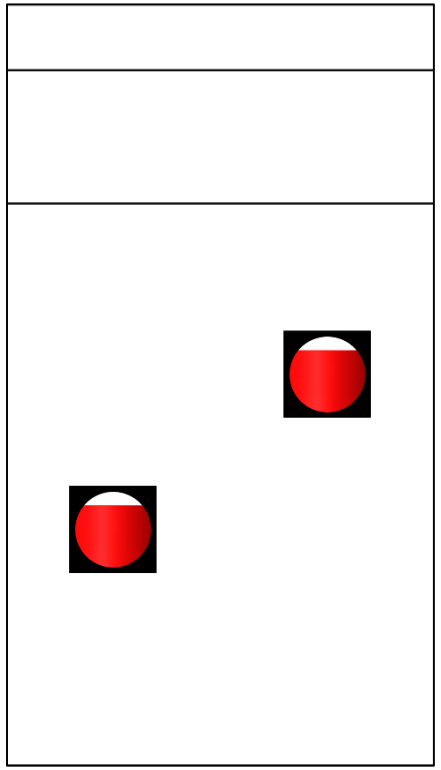
PHASE 2: EXPERIMENTAL SETUP

PHASE 2: TASK

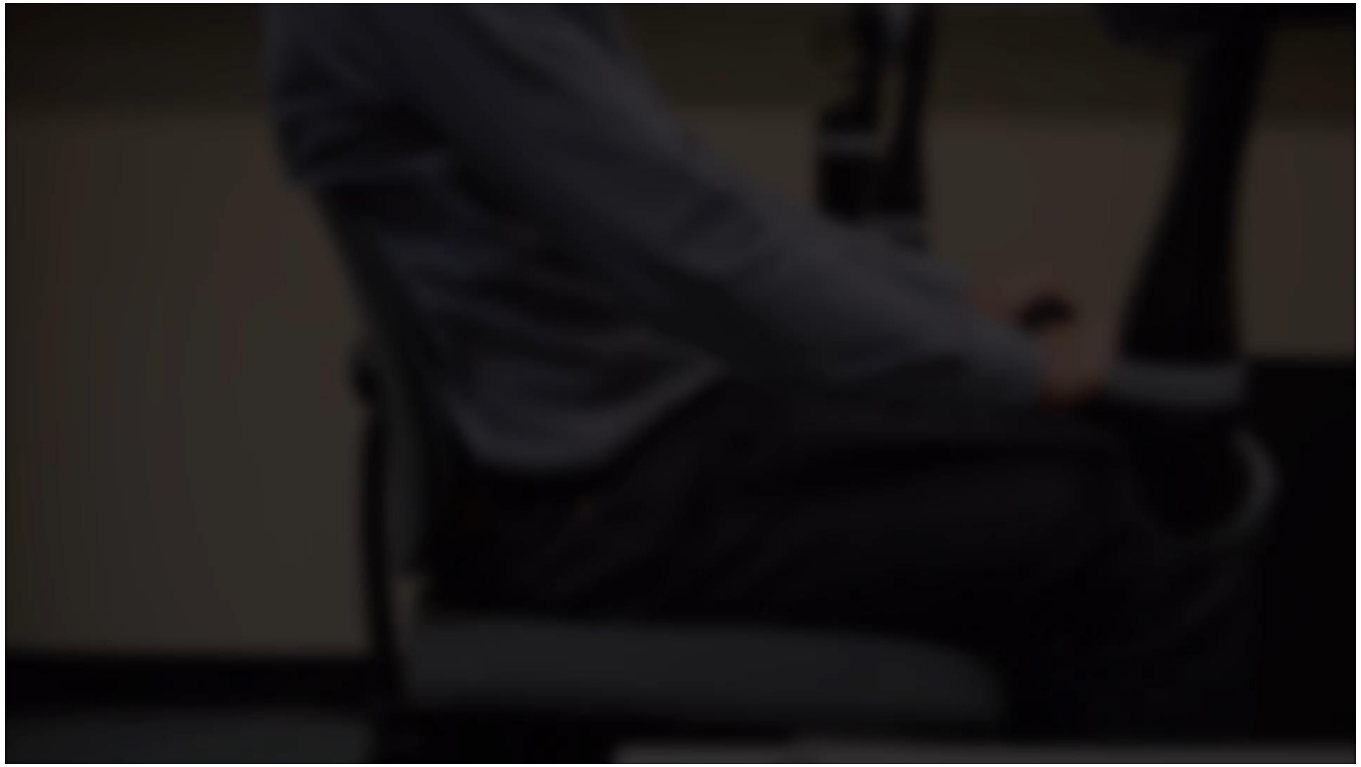


PHASE 2: FEEDBACK

VISUAL



FORCE



PHASE 2: RESULTS

- Visual and force information works
- No information is better than the other one
- People wanted Visual+Force

PHASE 3

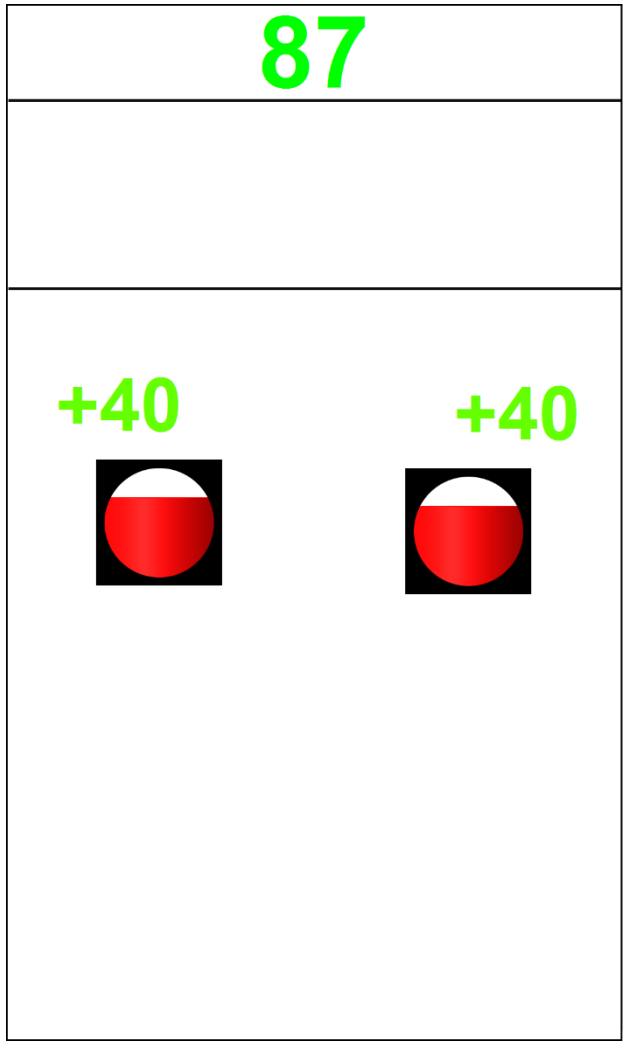
Do we get better results when giving game scores?

PHASE 3: RECRUITMENT

14 Stroke

PHASE 3: EXPERIMENTAL SETUP

SCORES



PHASE 3: RESULTS

- Visual+Force and Scores+Visual+Force work
- No information was better than the other one
- People prefer to receive scores

LIMITATIONS

- Small number of participants
- We only had 1 session
- We need larger groups + weeks of rehabilitation

SUMMARY

Background:

- Stroke is a major cause of disability
- Stroke survivors compensate

Need:

- Need to correct movements

Solution:

- Robots + motion tracking cameras

SUMMARY

- Giving information about trunk movement can reduce compensation
- Technology can be used to provide this information
- Participants prefer to receive scores
- It is really important that people participate in research studies