

Technology, AI and the future of Physiotherapy Practice

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Dr Silvia Pfeiffer, Coviu

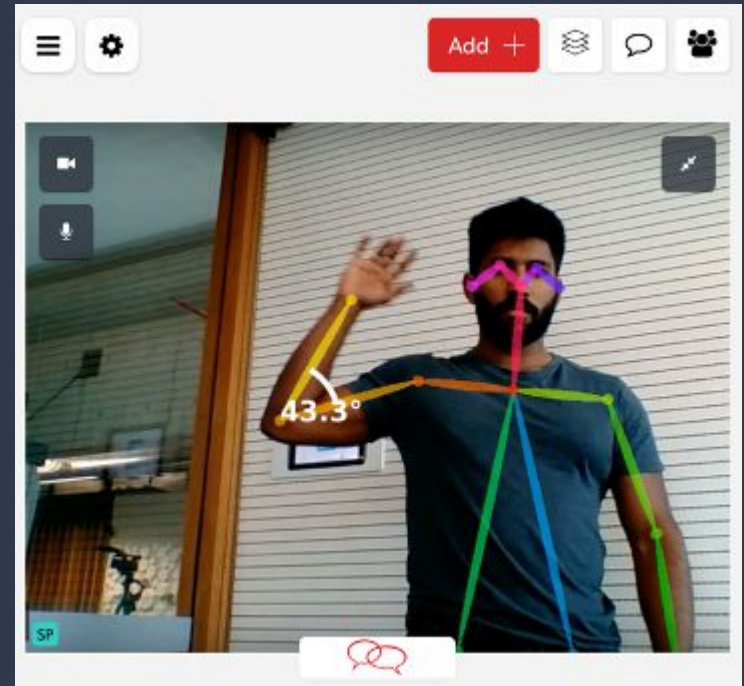
1st October 2022



Using AI to develop healthcare solutions is hot and is predicted to result in annual healthcare savings of \$150b by 2026.

<https://physiocouncil.com.au/data-the-future-of-physiotherapy/>

Physiotherapy Council, July 2019



Goals for today

1. Take a glimpse into the future of physical therapy using technology
2. What does it take to create AI tools for the future of physical therapy



Introduction



Dr Silvia Pfeiffer
Telehealth
Technology,
CEO @ CoviU

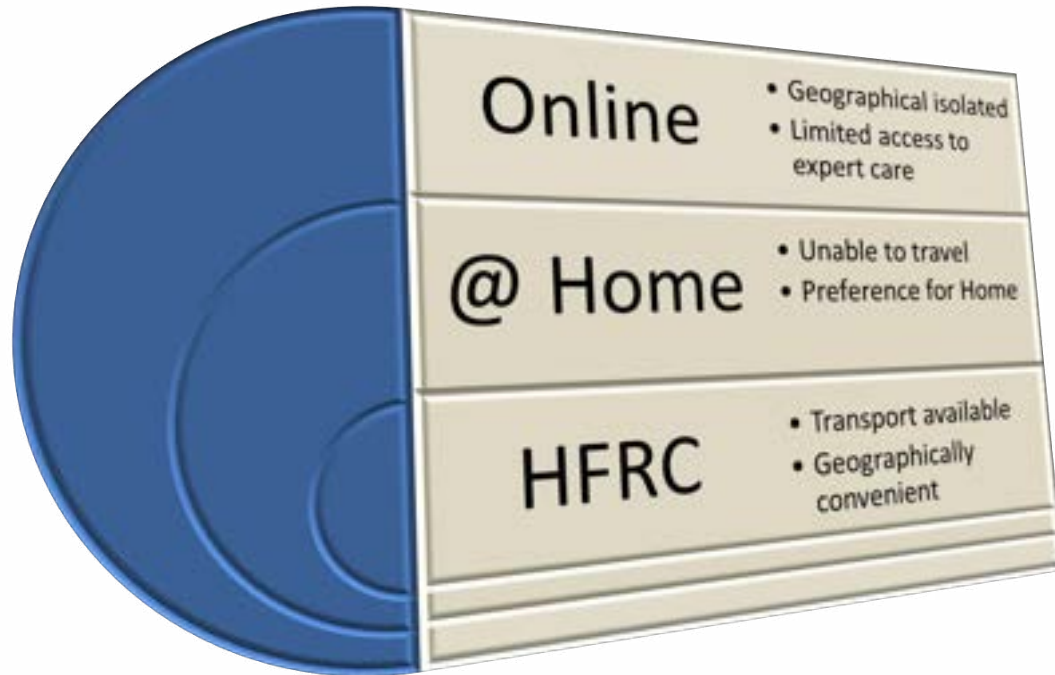


Dr Brendan Joss
Senior Exercise Physiologist,
MD @ HFRC

Why use technology?

Challenges in physical therapy

2016 Strategy



Makro level opportunity

Approx. 80,000 TKR in 2021

Growing 15-20% year-on-year

Huge waitlist, particularly post-pandemic

Australia:

- Patients stay in hospital 5-6 days on average

USA:

- Patients stay in hospital 2-3 days on average

Telerehabilitation has the opportunity to:

- Free 60,000 hospital beds annually
- Save \$1b+ to our healthcare system

Motivations for digital objective ROM measurements

Telerehabilitation works well

Exercise prescription works well

Subjective assessment of progress works well

=> Key outcome to reach is an early improvement of the patient's range-of-motion (ROM)



ROM needs to be measured objectively

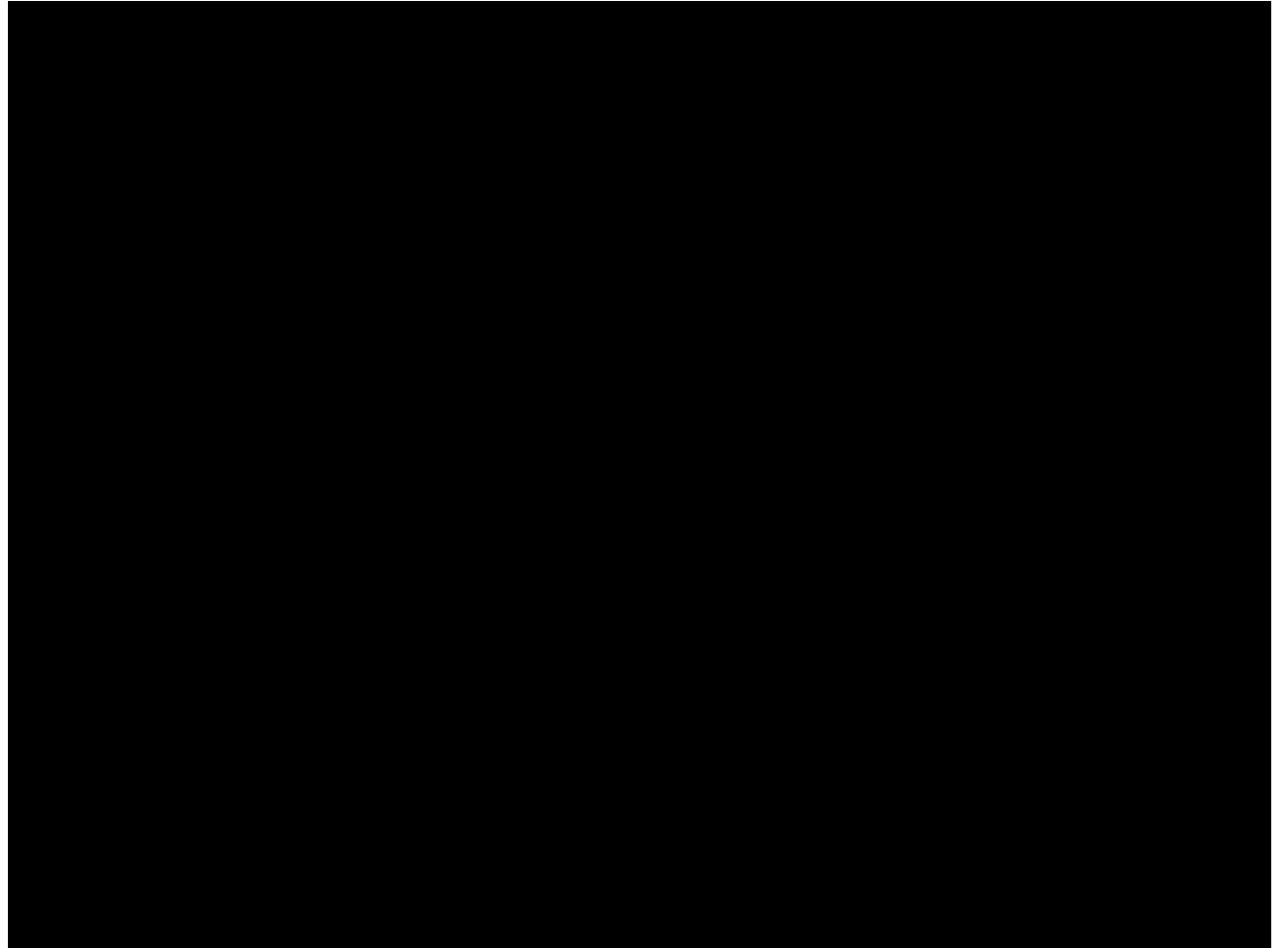
Identify reaching key milestones

Motivation for patients to see progress

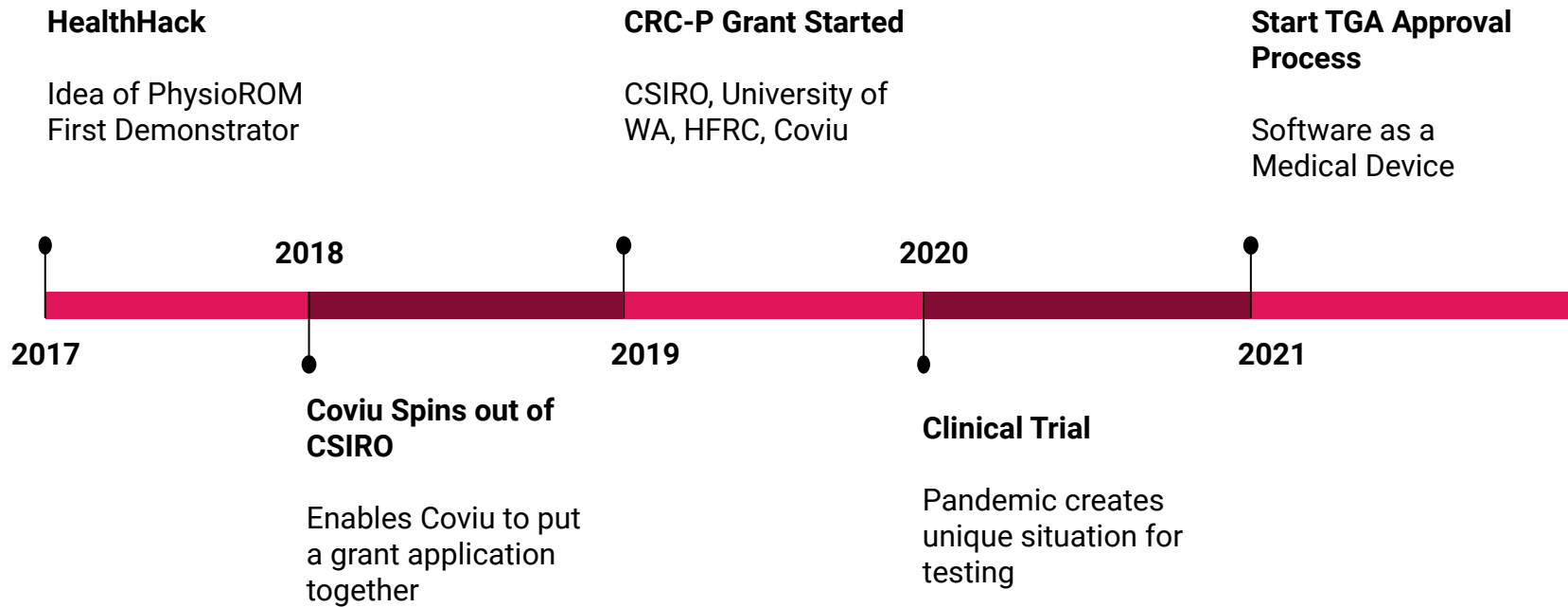
=> We need a way to measure ROM objectively in a telerehabilitation call



PhysioROM Demo



Steps of Development of the Technology



Timeline of development of PhysioROM

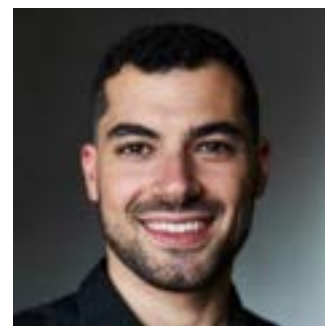
The HealthHack team

Developed the MVP



The CRC-P team

Developed the
Solution

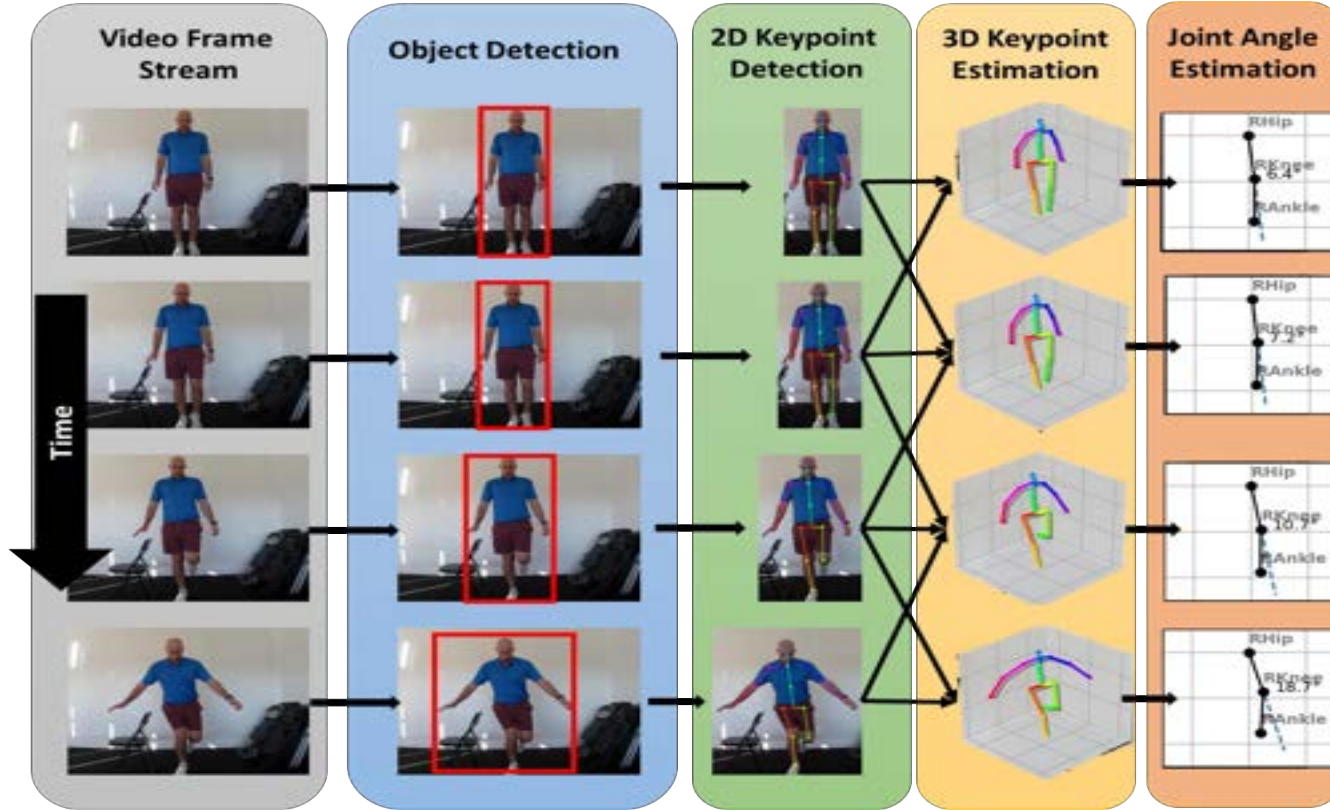


CRC-P Project Partners

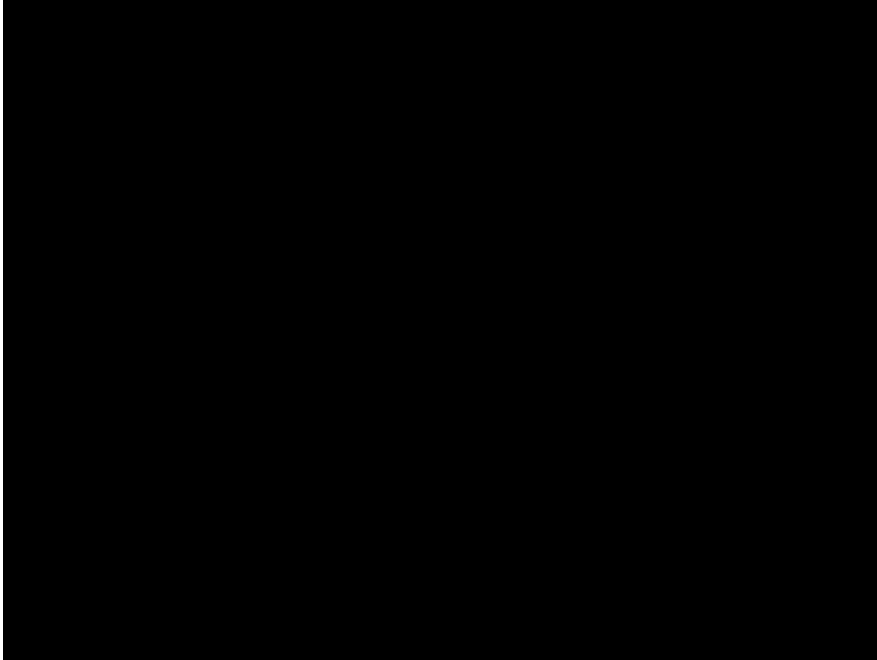
- CSIRO's Data61 - AI experts
- HFRC - allied health clinic
- School of Sports Science, Exercise and Health (SSSEH) at University of Western Australia - to validate the ROM results and publish the research
- Thaum - AI engineers
- CoviU - commercialisation partner



Development of Computer Vision and Machine Learning Algorithms



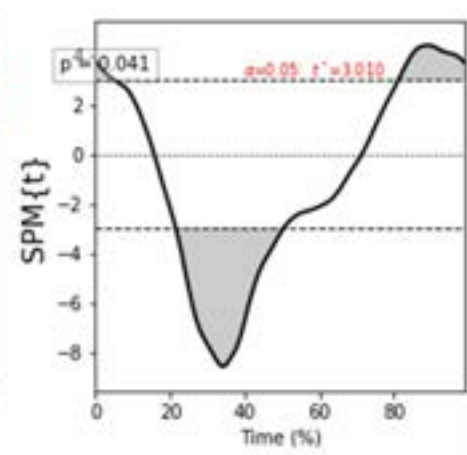
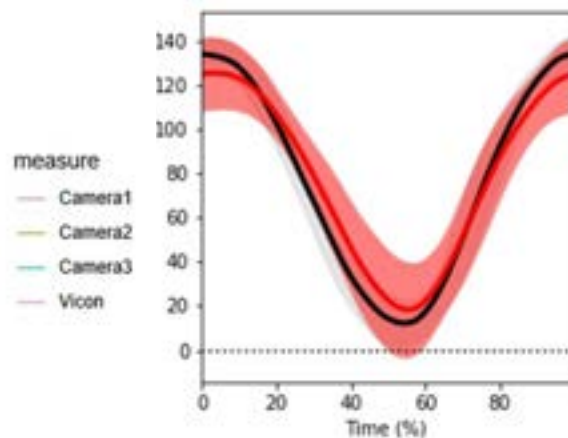
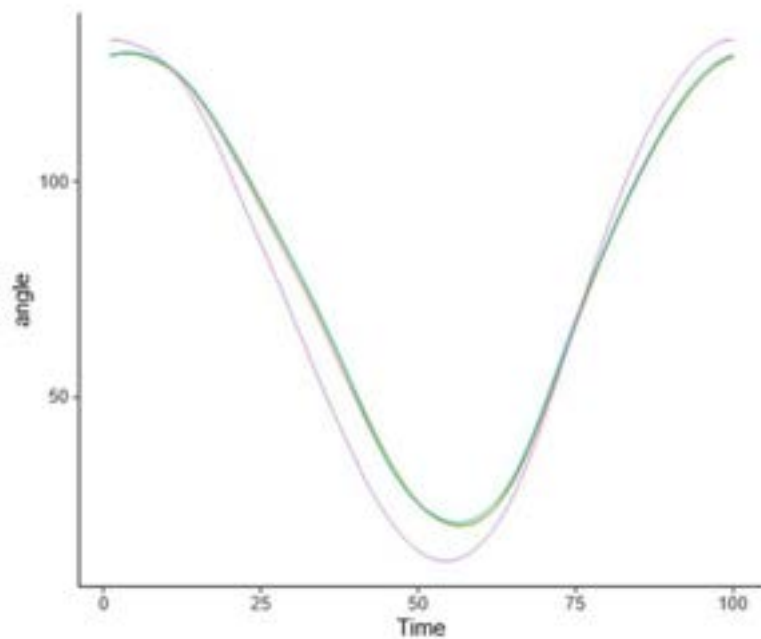
Validation of the Algorithms



Reclined Peak Knee ROM

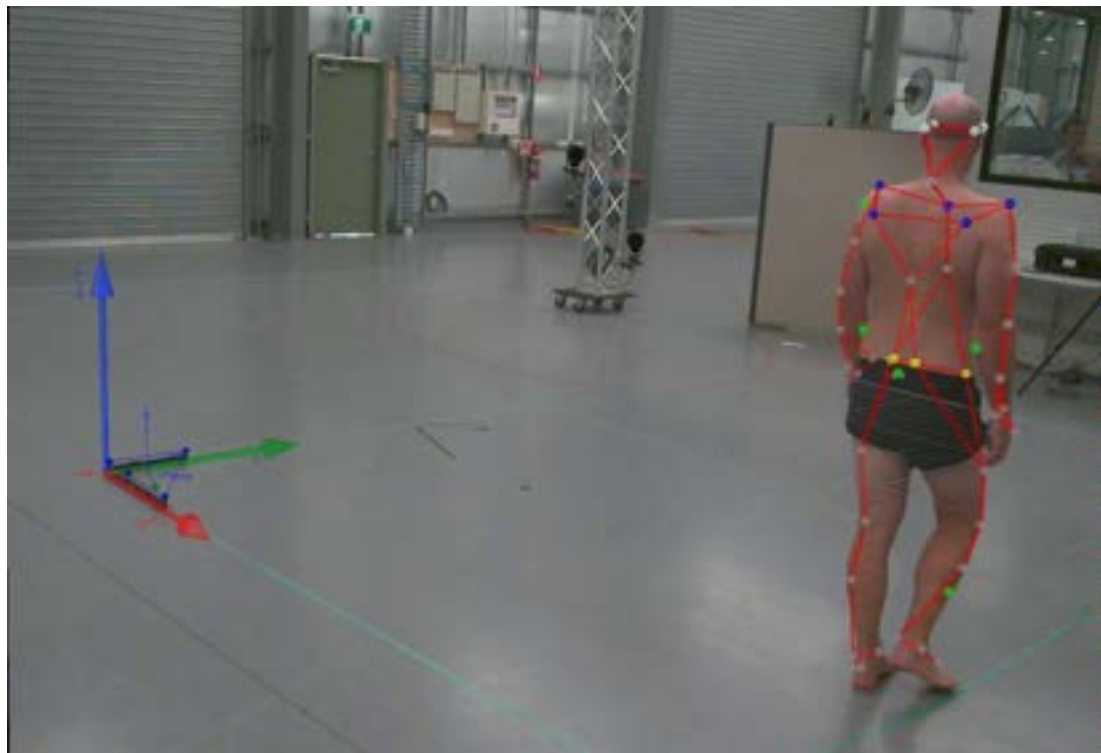
	Vicon	Camera 1	P value
Flex	133.1	129.9	0.345
Ext	12.1	20.2	3.788

Validation of the Algorithms

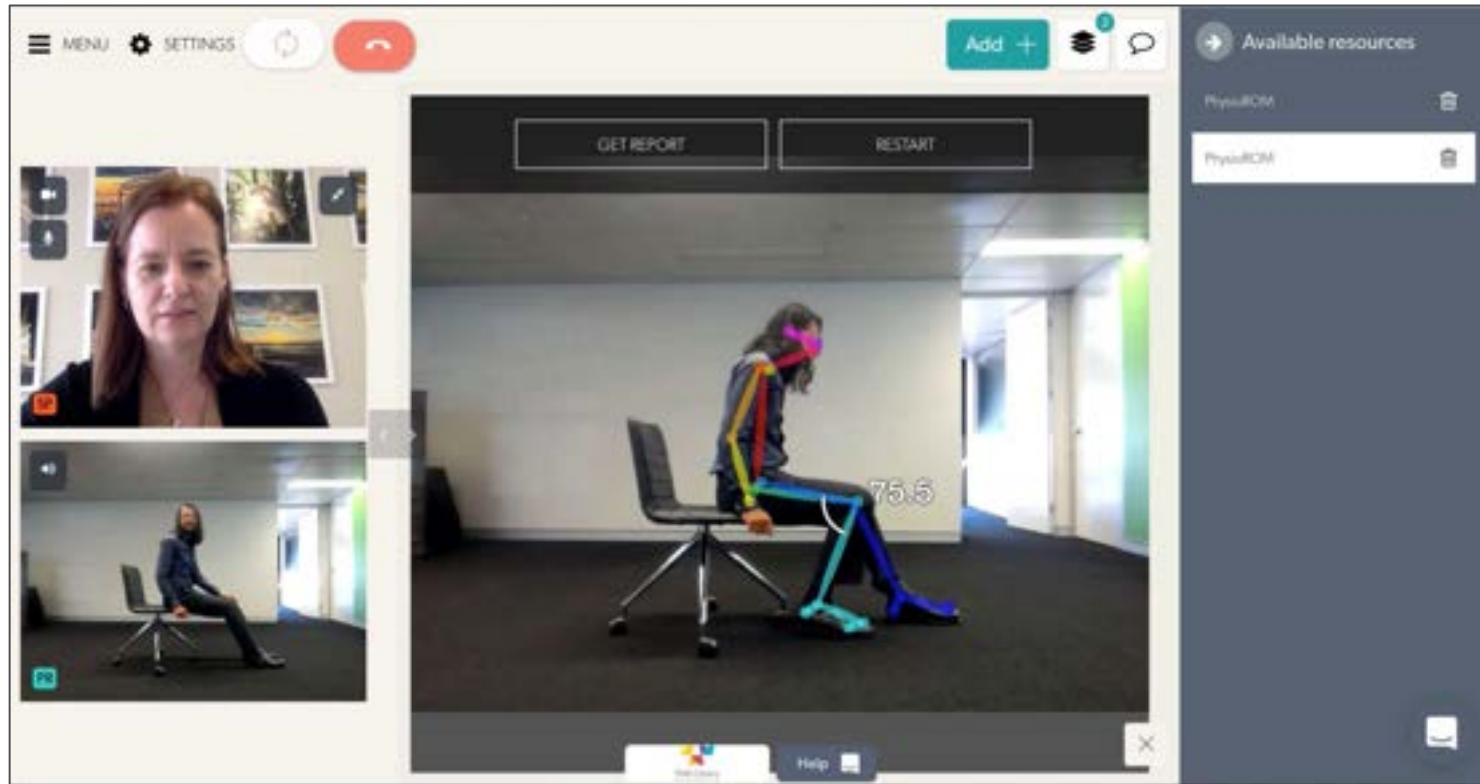


Time-varying SPM{t} statistics

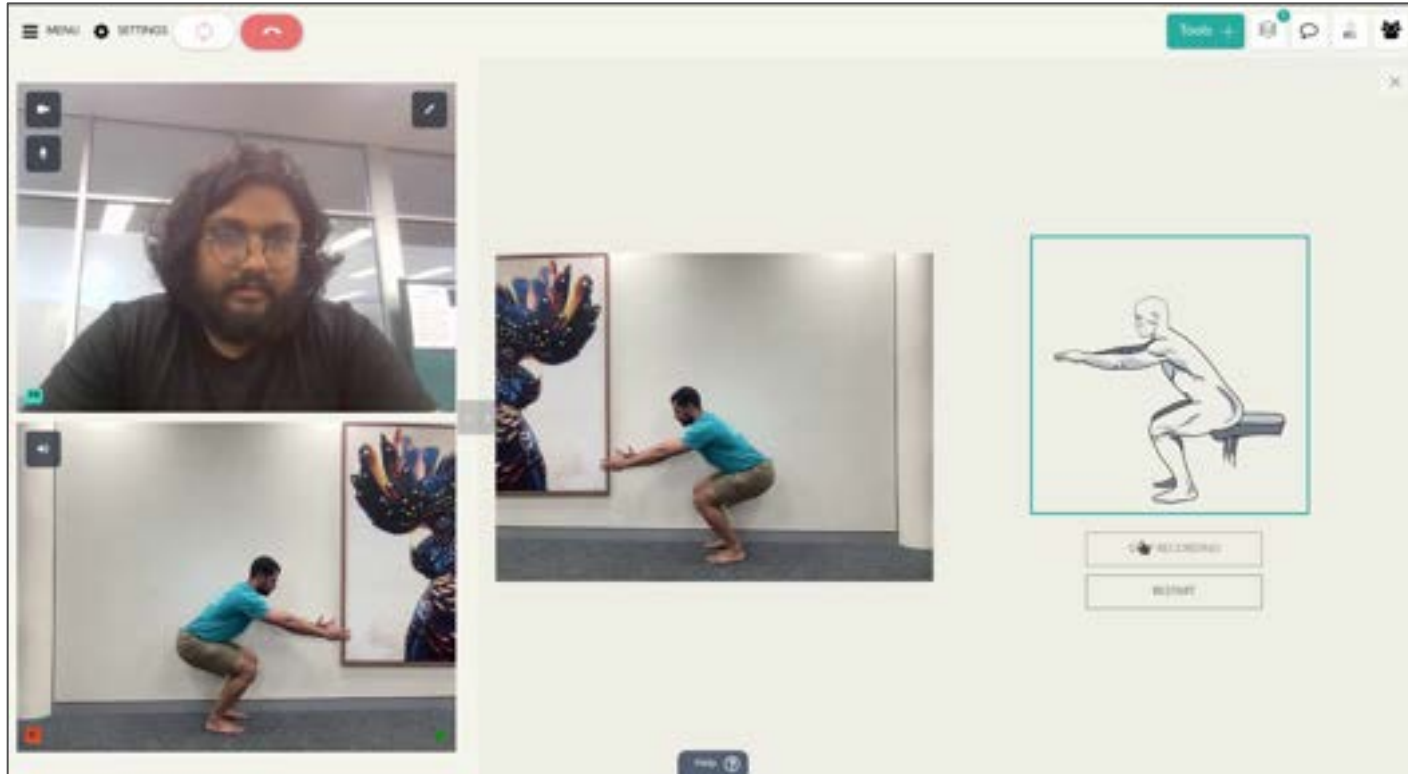
Training the Algorithm



Development of the best user experience – v1



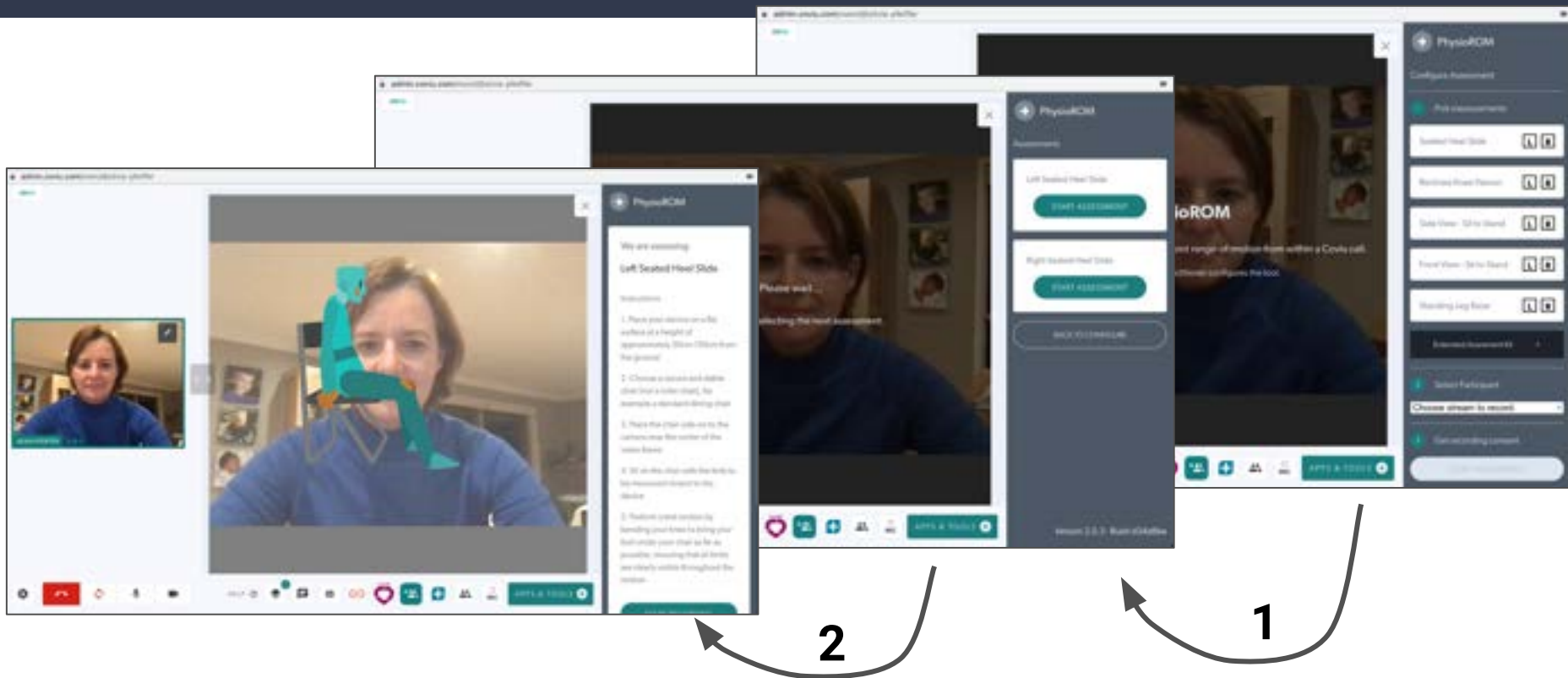
Development of the best user experience – v2



Development of the best user experience – v2

The image displays a telemedicine interface with two video feeds on the left and a data visualization on the right. The top video feed shows a man with glasses and a beard, resting his head on his hand. The bottom video feed shows a man in a teal shirt with "COVIU" printed on it. The data visualization on the right features a video player at the top showing a person in a teal shirt and purple pants performing a physical task, with a score of "73.0" displayed. Below the video is a line graph with a teal line representing data over time. The graph has a y-axis labeled "Range (mm)" and an x-axis labeled "Time (s)". A red horizontal line is drawn across the graph at approximately 73.0. A vertical blue line is positioned at approximately 10 seconds on the x-axis. The graph shows several peaks and troughs, with the highest peak reaching approximately 90. Below the graph are two buttons: "DOWNLOAD DATA" and "NEXT ASSIGNMENT".

Development of the best user experience - v3



Telerehabilitation in clinical practice

Clinical validation of the final product



RCT comparing TKR outcome for rehab delivered via telehealth or usual care (in clinic)

PhysioROM vs Goniometry for AROM measures

Key Learnings for consideration

Clinical validation of the final product



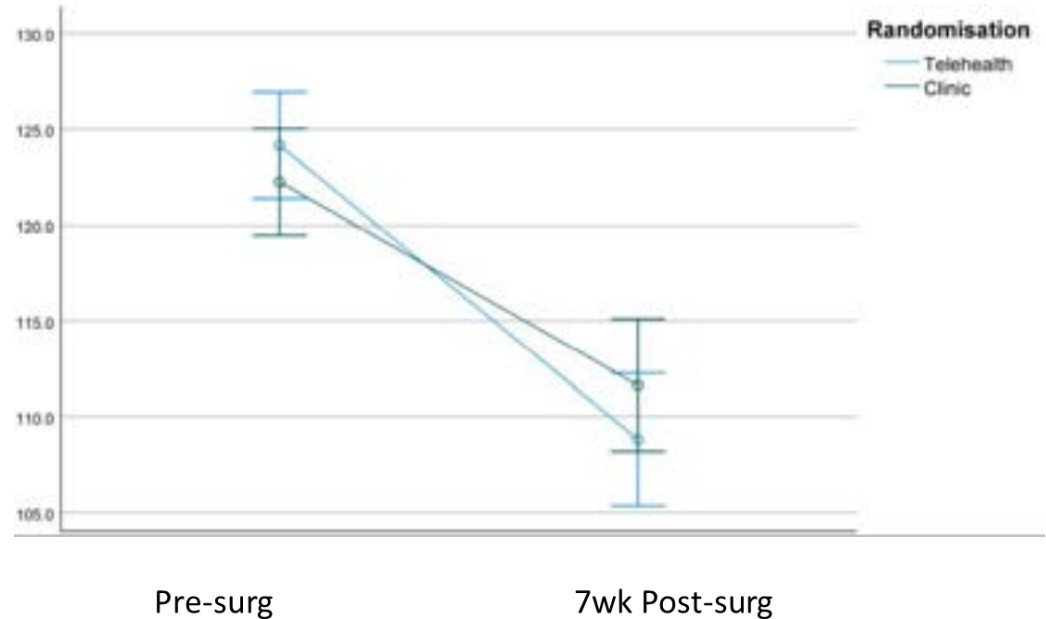
PhysioROM vs Goniometry - Knee ROM in degrees

	Mean	N	Std. Deviation	Std. Error Mean
Goniometer Knee Extension - Reclined	7.3	70	4.6982	.5615
PhysioROM Knee Extension - Reclined	5.6	70	5.30878	.63452
Goniometer Knee Flexion - Reclined	122.7	96	9.4721	.9667
PhysioROM Knee Flexion - Reclined	121.1	96	8.8319	.9014

Clinical validation of the final product



Knee Flexion ROM - Telehealth vs Clinic based rehab.



Clinical validation of the final product



Other Key Learnings

45 Patients declined participation in the study

Concerns regarding telehealth = 14

Concerns regarding transport to clinic = 23

Other = 8

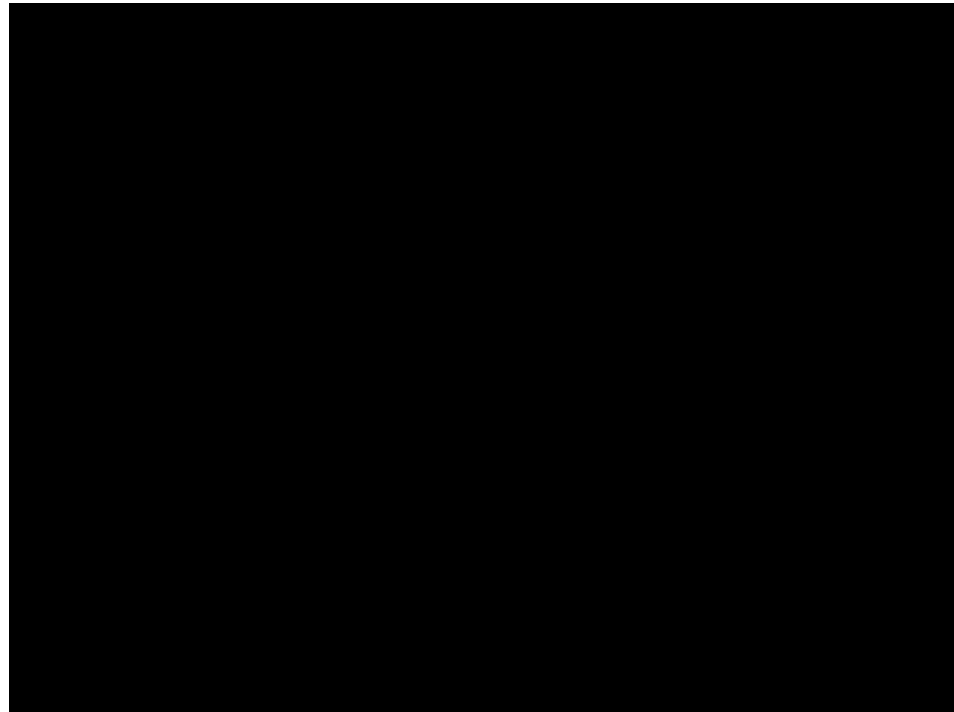
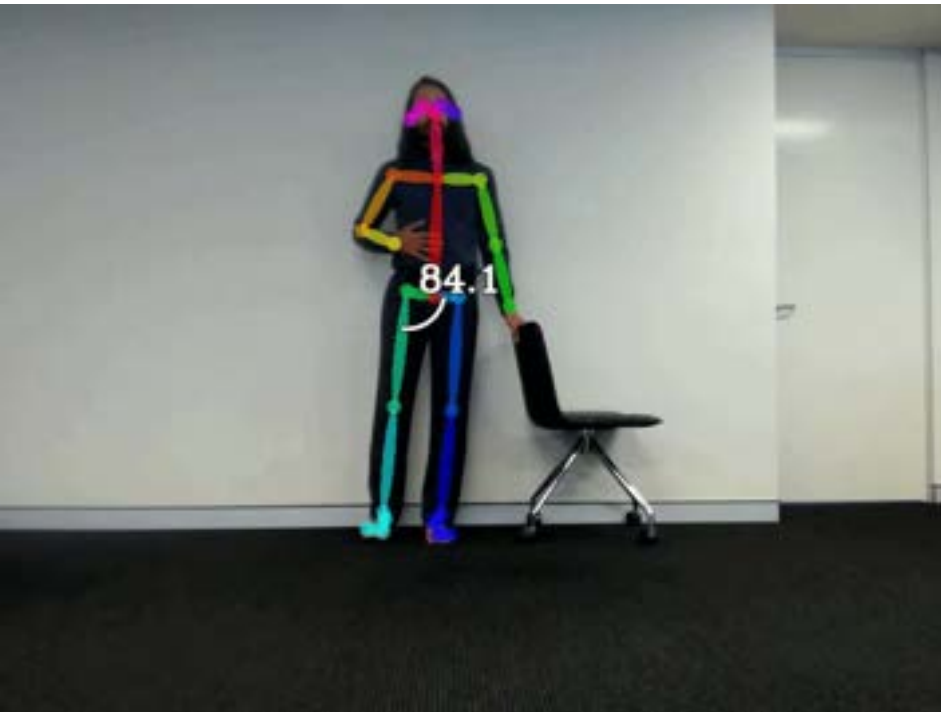
2 withdrawals due to telehealth randomisation

Patient experiences with Telehealth

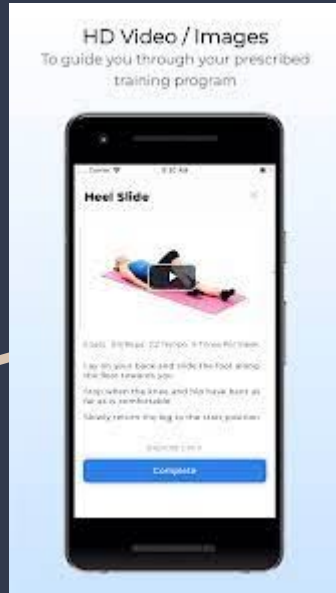
“Prior to participating, patient’s perception was face to face is the better option, but after experiencing telerehab, there was an overwhelming change in attitude, and telerehab became their preferred method of delivery going forward”

Also reduced burden on family, carers, etc.

Next opportunities



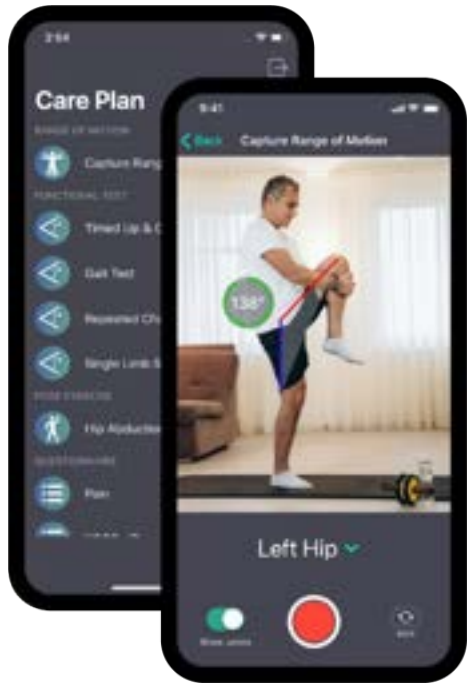
Can we fully automate rehabilitation in the future?



- Self-help applications
- Gamification of exercises

- Need for individualisation of rehabilitation prescription
- Multiple comorbidities require constant adaptation
- Human connection and empathy lead to compliance

Inspiration for the future



AI & ML

New Devices & Augmented/Virtual Reality



Robots



IOT Devices

Get Started Today

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