



*Wearable Soft Robotics for Independent Living*

**Newsletter June 2021**

## **Welcoming participants...!**

We are pleased to announce we are now recruiting physiotherapists and their patients to take part in our study! Our first clinical study for FREEHAB is to observe how physiotherapists assess and treat their patients with impaired mobility. **Physiotherapists will video record their assessment of patients whilst talking out loud their clinical reasoning.** These patients will have age-related mobility impairments or will have had a stroke. The analysis will allow us to determine the essential components of movement assessment and the context of the therapists' reasoning and subsequent actions. **The analysis of all this data will determine what the rehabilitation 'trousers' will look like!**

## **Practice makes perfect...**

**We will also collect quantitative clinical measures and patient participants' biomechanics during the movements of walking, standing and sit to stand.** We have kept busy despite a delayed study start date, and that is thanks to the efforts of keen volunteers. Our researcher, Leah, has been working with volunteers to test out the protocol for collecting biomechanical data in the Human Analysis Laboratory, UWE Bristol. With their help, Leah has ensured the protocol is ready for patient participants, this has included tweaks to make the study more enjoyable and manageable for patients, and she has learnt techniques for collection of high-quality data. Thank you to our volunteers!

## **Trousers, Gromit?**

The data collected will be utilised by the Freehab engineering team to design the assistive devices. Dr Richard Suphapol Diteesawat, Dr Nahian Rahman and Professor Jonathan Rossiter are continuously developing technologies based on our previous research. This includes pneumatic-driven and electrically-driven systems: [Bubble Artificial Muscles \(BAM\)](#)<sup>1</sup>, [Electro-ribbon Actuator \(ERA\)](#)<sup>2</sup>, and [Electro-pneumatic Pumps \(EPP\)](#)<sup>3</sup>, as well as other soft robotic technologies. Currently, we are exploring new materials (such as auxetic and metamaterial) and smart structures to create a compliant, high-force-transmitting wearable knee brace, which can easily fit a range of knees and not restrict or limit natural movement. The research involves mathematic simulation, design and prototyping of devices using 3D printers, assessment of devices, and finally testing on real subjects. Further research will explore adding assistance at the ankle and hip. We are open to collaboration; please contact

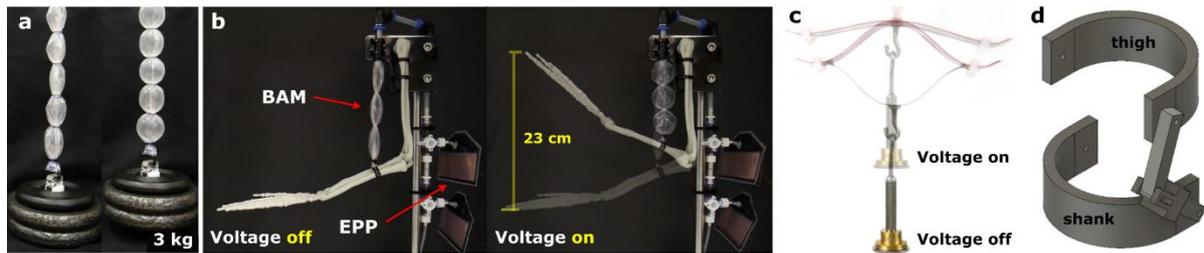
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<sup>1</sup> [Diteesawat, R.S., Helps, T., Taghavi, M. and Rossiter, J., 2021. Characteristic analysis and design optimization of bubble artificial muscles. \*Soft robotics\*, 8\(2\), pp.186-199.](#)

<sup>2</sup> [Taghavi, M., Helps, T. and Rossiter, J., 2018. Electro-ribbon actuators and electro-origami robots. \*Science Robotics\*, 3\(25\).](#)

<sup>3</sup> [Diteesawat, R.S., Helps, T., Taghavi, M. and Rossiter, J., 2021. Electro-pneumatic pumps for soft robotics. \*Science Robotics\*, 6, eabc3721.](#)

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(a) BAM actuation lifting 3kg weight. (b) Pneumatic system combining BAM (soft actuator) and EPP (soft pump) to lift an arm. (c) ERA actuation driven by electricity. (d) Our initial design of an unconventional knee brace.

## Introducing...

Every newsletter we would like to introduce you to a different member of the team. Up today: Dr Leah Morris, a full-time Freehab Research Fellow at UWE, Bristol.



*"I joined the Freehab team in January 2020 after completing my PhD, and I am a physiotherapist by background. I am ecstatic to be able to start collecting data with patients, as for me the most rewarding part of research is closely working with the people who the research will benefit – plus, meeting new people is a bit of a novelty after the past year! I also get to work alongside the Freehab engineering team at the University of Bristol; I enjoy discussing what the assistive devices might look like and offering my clinical perspective. My previous research was patient-focused, this is so important as what is right for one patient is not necessarily right for another. I hope to use my patient-centred skills in the project increasingly, as we have more data to inform the design of the assistive devices. There is a clear need for these devices, and I believe they could have such a fantastic impact on the lives of many people." – Leah*

If you would like to be removed from the newsletter database, please let Leah Morris know. *The Right Trousers Team*

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