

INNOVATION ROUNDS:

Sensors for Measuring Temperature and Muscle Contraction in Custom Made Orthotic Devices

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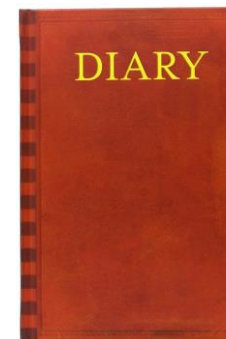
The Problem

- 3.5 million upper extremity injuries each year in the United States and 418,000 injuries each year in Canada.
- Splinting is a standard of care for many fractures, soft tissue injuries, repetitive strain injuries, and arthritis conditions
- Are they worn?
- How does wearing time correlate with outcomes?
- How well do these devices provide rest to tissue?

Current Work

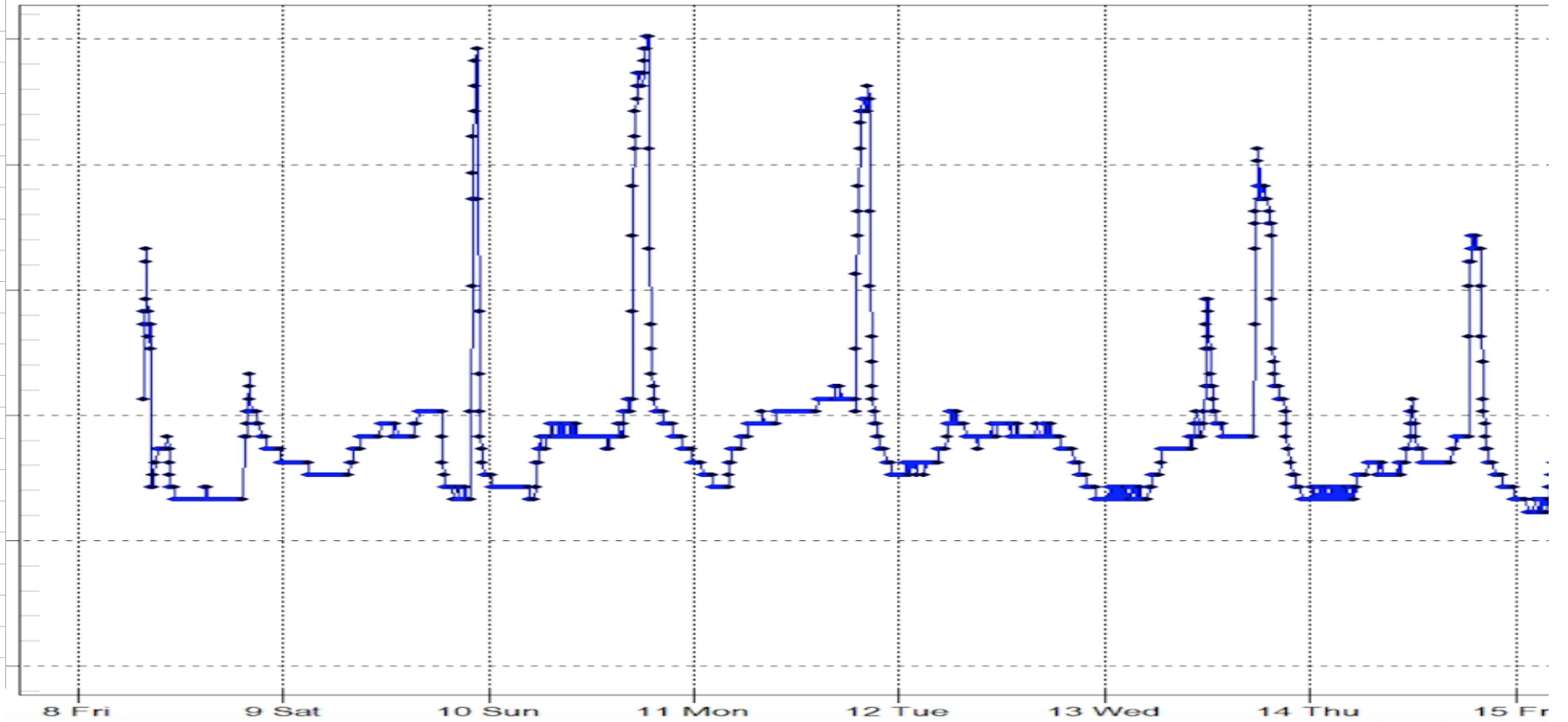


	tempmate,®-B1	tempmate,®-B2	tempmate,®-B3	tempmate,®-B5	tempmate,®-B4
					
	1-channel data logger for temperature ¹⁾	1-channel data logger for temperature ²⁾	1-channel data logger for temperature ³⁾	1-channel data logger for temperature ⁴⁾	2-channel data logger for temperature and humidity ⁵⁾
Temperature range	-40 °C to 85 °C	-40 °C to 85 °C	0 °C to 125 °C	15 °C to 140 °C	-20 °C to 85 °C
Accuracy	± 1 °C at -30 °C to 70 °C otherwise ± 1.3 °C	± 0.5 °C at -10 °C to 65 °C	± 0.5 °C at 20 °C to 75 °C	± 0.2 °C at 110 °C to 140 °C ± 0.5 °C at 80 °C to 140 °C ± 1 °C at 15 °C to 80 °C	± 0.5 °C at -10 °C to 70 °C ± 5 % RH ± 2 % RH (calibrated)
Power supply	Internal, permanently installed 3.0V lithium battery				
Battery life	10 years or 1 million samples	about 1 years at 80 °C and about 5 years at 30 °C (10 min sampling) see battery life calculator at our website © www.imec.de			
Sampling	1 to 255 minutes	2 seconds to 24 hours			
Memory size	2048 readings	8192 measured values with 8 bits (4096 RH) or 4096 measured values for 11bit (2048 RH)			
Resolution	0.5 °C (8 bits)	0.5 °C (8 bits) or 0.07 °C (11bits) / 0.64 % RH (8 bits) or 0.04 % RH (11bits)			
Response time	approximately 50 seconds (in the air)				
Dimensions	Ø 17 mm x 6 mm				
Weight	4 g				
Housing Material	305 stainless steel				
Protection class	IP55- splash proof; housing for higher protection classes are available				
Ex-fitness	Meets UL # 913 (4th Edit), Intrinsically Safe Apparatus, approval under Entity Concept for use in Class I, Division 1, Group A, B, C and D Locations				
PC Connection	USB interface				
Time, max. deviation	± 2 minutes per month				
Recording modes	Ring buffer or stop when full				
Start time delay	max. 45 days at 1 minute measurement frequency max. 12 months at 1 minute measurement frequency				



Current Work

319	2023-12-30 12:54:01	20.62
320	2023-12-30 12:59:01	20.62
321	2023-12-30 13:04:01	25.12
322	2023-12-30 13:09:01	28.12
323	2023-12-30 13:14:01	28.62
324	2023-12-30 13:19:01	29.11
325	2023-12-30 13:24:01	29.11
326	2023-12-30 13:29:01	29.63
327	2023-12-30 13:34:01	29.63
328	2023-12-30 13:39:01	30.12
329	2023-12-30 13:44:01	30.12
330	2023-12-30 13:49:01	30.12
331	2023-12-30 13:54:01	30.12
332	2023-12-30 13:59:01	29.63
333	2023-12-30 14:04:01	27.13
334	2023-12-30 14:09:01	24.61
335	2023-12-30 14:14:01	23.12
336	2023-12-30 14:19:01	22.11
337	2023-12-30 14:24:01	21.62
338	2023-12-30 14:29:01	21.12
339	2023-12-30 14:34:01	20.62
340	2023-12-30 14:39:01	20.62



The Problem



- The sensor is obvious – not full deception
- Not customizable in form factor
- Currently reliant on external manufacturers for sensors
- Currently only measuring temperature



Project Objectives

Development of 1-2 Prototype Sensors

These sensors will be of a form factor that easily allows them to be mounted to the underside of a customs splint, measuring temperature and surface EMG activity

Validate the Sensors

Compare data from prototypes to current commercially available sensors



Multidisciplinary Approach

- Partnerships across OT, PT, and orthopaedic/plastic surgery
- Clinical Partnership with Roth McFarlane Hand & Upper Limb Centre



Project Status

- Finalized the specification requirements for sensors
- In process of purchasing possible components



Challenges



Implementation Challenges

Acquiring meaningful data

Coordinating between surgical clinics, therapy visits, and clinical research laboratory



Patient Engagement Challenges

Enrolling study participants

Collecting accurate diary data

Reminders to wear orthosis



Technical Challenges

Form Factor

Battery Life

Data Memory

EMG

THANK YOU!

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How can I seek support from MSK-IF to develop my idea further?

Reach out to mskif@uwo.ca if you have an idea you would like to develop further!

Please feel welcome to reach out to Mike Szekeres if there is anything you would like to further discuss!



Any questions?

**Does this spark any ideas on how you might
use MSK-IF?**