

# iMup: A Body Position Tracker for iOS

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# One-Thing-Straight (1TS)

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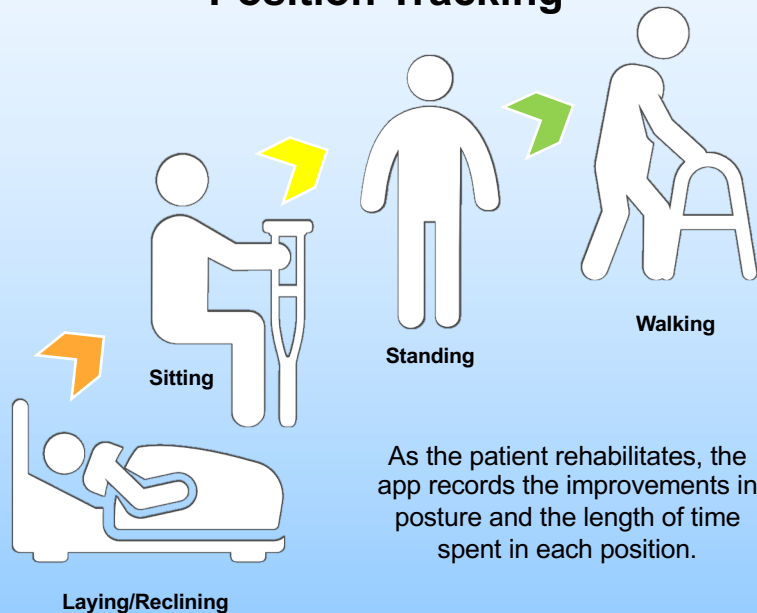
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## Background

- Hospital stay duration is shortened by increased movement and posture improvement. Any angle increase is an improvement.
- Sensors and Machine Learning can be used to detect and record body angle.

## Position Tracking



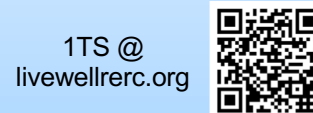
## Operation

One or more sensors are attached to the patients' bodies. The sensors stream accelerometer data to an iPad or iPhone. The device analyzes the input or saves the data, which can be downloaded and processed after collection.

## More Info



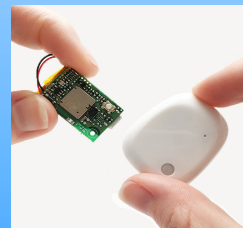
iMup @  
[livewellrerc.org](http://livewellrerc.org)



1TS @  
[livewellrerc.org](http://livewellrerc.org)

## Mbient Sensors

Commodity BluetoothBLE are used in both iMup and One Thing Straight.

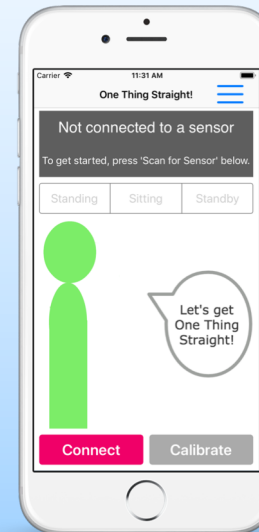


MetamotionR by Mbient

## Background

- Parkinson's Disease (PD) patients can lose postural awareness resulting in a forward flexed posture.
- Can lead to dangerous conditions such as falls.
- PD patients can correct their posture with cueing.

## Screenshot



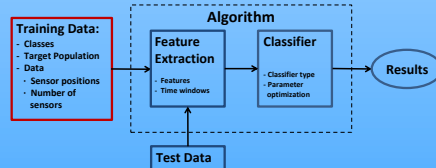
## Software

- 1TS is an iOS application that uses a microcontroller-based sensor to track postural movements.
- The sensor is worn on the user's collar or in their front pocket. The accelerometer data is streamed to the user's iPhone via Bluetooth.
- The app on the phone uses a trigonometric algorithm to detect flexed or forward leaning posture. If a flexed posture is detected, the iPhone sends a notification to the user.
- An animated display on the app shows the live angle of flexion and helps train the user to straighten their posture.

## Machine Learning Algorithm

		Subject 05: 96.3%				
Truth	Laying/Reclining	92.1	7.9	0	0	(38)
	Sitting	0	100	0	0	(18)
	Standing	0	0	100	0	(19)
	Walking	0	0	0	100	(15)
		Laying/Reclining	Sitting	Standing	Walking	

Confusion Matrix of Patient's Results



Random Forest Classifier Labels Data with Positions

## Assistance and Collaboration

1TS was developed in collaboration with Mike Revoir from the Duke Institute for Health Innovation and Jack Livingston from the Rapid Health App Prototyping Center. Additional support was provided by the Duke Claude D. Pepper Older Americans Independence Center

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