

**Table S1. Wearable Motion Capture Sensor Specifications**

Sensor	Producing Company	Measurement Capability	Sampling Rate	Battery Life (hrs)	Weight (g)	Dimensions (L x W x D cm)	Memory	Range	Resolution
<b>BioStampRC</b>	MC10	Accelerometer Gyroscope ECG EMG	<b>Accelerometer/ Gyroscope</b> 15.625 - 250 Hz <b>ECG/EMG</b> 125 - 1000 Hz	36	7	6.6 x 3.4 x 0.45	32 MB (Flash)	<b>Accelerometer</b> ± 16 g <b>Gyroscope</b> ±2000 °/s <b>ECG/EMG</b> ± 200 mV	<b>Accelerometer</b> 5 mg <b>Gyroscope</b> 0.2 °/s <b>ECG/EMG</b> 0.006 mV
<b>MotionNode Bus</b>	MotionNode	Accelerometer Gyroscope Magnetometer	<b>Accelerometer/ Gyroscope</b> 50 Hz	7	190	3.5 x 3.5 x 1.5	4 GB	<b>Accelerometer</b> ± 2 g or ± 6 g <b>Gyroscope</b> ±2000 °/s <b>Magnetometer</b> ± 100 µT	<b>Accelerometer</b> 190 µg ± 5% <b>Gyroscope</b> 0.07 °/s <b>Magnetometer</b> 0.1 µT
<b>Colibri Wireless</b>	Engineering Systems Technologies	Accelerometer Gyroscope Magnetometer Static Pressure Temperature	<b>Accelerometer/ Gyroscope</b> 100 Hz	16	41	5.6 x 4.2 x 1.7	1 KB	<b>Accelerometer</b> ± 6 g <b>Gyroscope</b> ± 2000 °/s <b>Magnetometer</b> ± 1.3 Ga	<b>Accelerometer</b> 13 bit <b>Gyroscope</b> 16 bit <b>Magnetometer</b> 12 bit
<b>Opal</b>	APDM Wearable Technologies	Accelerometer Gyroscope Magnetometer	<b>Accelerometer/ Gyroscope</b> 20 - 128 Hz	12	25	4.8 x 4.0 x 1.4	1 GB	<b>Accelerometer</b> ±16g, ± 200g <b>Gyroscope</b> ± 2000 °/s <b>Magnetometer</b> ± 8 Ga	<b>Accelerometer</b> 14 bit, 17.5 bit <b>Gyroscope</b> 16 bit <b>Magnetometer</b> 12 bit
<b>Embrace2</b>	Empatica	Accelerometer Gyroscope Temperature	<b>Accelerometer/ Gyroscope</b> 32 Hz	48	17	3.8 x 3.0 x 1.0	1 MB	<b>Accelerometer</b> ±16g <b>Gyroscope</b> ± 500 °/s	<b>Accelerometer</b> 16 bits <b>Gyroscope</b> 16 bits
<b>Shimmer3 IMU Unit</b>	Shimmer	Accelerometer Gyroscope Magnetometer Altimeter Temperature	<b>Accelerometer/ Gyroscope</b> 10 - 1000 Hz <b>Magnetometer</b> 250 -1000 Hz	70	24	5.1 x 3.4 x 1.4	16 KB	<b>Accelerometer</b> ± 2 - 16 g <b>Gyroscope</b> ± 250 - 2000 °/s <b>Magnetometer</b> ± 49 Ga	<b>Accelerometer</b> 14 bits <b>Gyroscope</b> 16 bits <b>Magnetometer</b> 16 bits

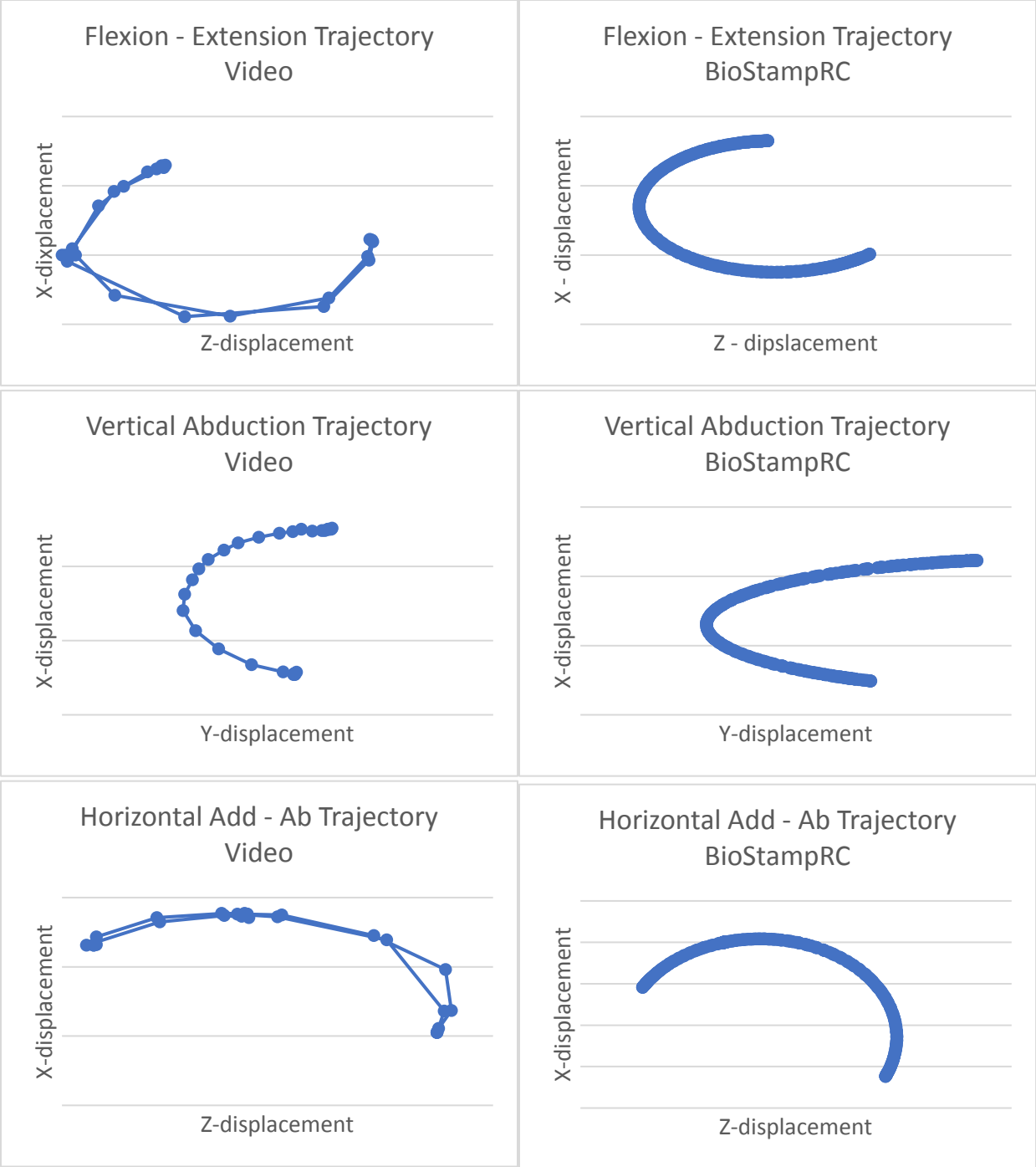
<b>BioHarness 3.0</b>	Zephyr	Accelerometer ECG Temperature	<b>Accelerometer</b> 100 Hz <b>ECG</b> 250Hz	24	89	2.8 x 2.8 x 0.7	--	<b>Accelerometer</b> ±16g <b>ECG</b> 0.25 – 15 mV	<b>Accelerometer</b> ±12mg <b>ECG</b> 12 bit
<b>Physilog 5</b>	GaitUp	Accelerometer Gyroscope Barometer Temperature	<b>Accelerometer/ Gyroscope</b> 128 Hz	21	11	4.8 x 2.7 x 1.0	8 GB	<b>Accelerometer</b> ± 16 g <b>Gyroscope</b> ±2000 °/s	--
<b>EQ02 LifeMonitor</b>	Equivital	Accelerometer ECG Temperature	<b>Accelerometer</b> 25 – 250 Hz <b>ECG</b> 250Hz	24	38	7.8 x 5.3 x 1.0	8 GB	<b>Accelerometer</b> ±2g - 16g	--
<b>MTw Awinda</b>	Xsens	Accelerometer Gyroscope Magnetometer Barometer	<b>Accelerometer/ Gyroscope</b> 1000 Hz	6	27	3.0 x 4.7 x 1.3	--	<b>Accelerometer</b> ± 16 g <b>Gyroscope</b> ± 2000 °/s <b>Magnetometer</b> ± 1.9 Ga	--

ECG = Electrocardiogram; EMG = electromyogram

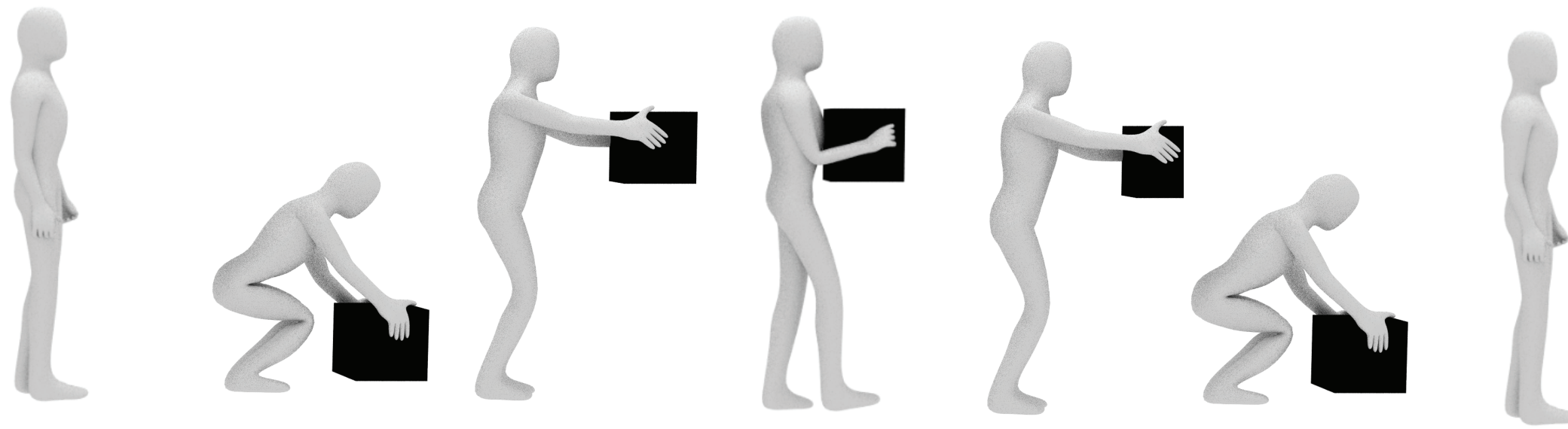
**Table S2. Wearable Fitness Tracker Capabilities**

Sensor	Producing Company	Measurement Capability	Weight (g)	Dimensions (L x W x D cm)	Memory	Data Output	Motion Capabilities
<b>BioStampRC</b>	MC10	Accelerometer Gyroscope ECG EMG	7	6.6 x 3.4 x 0.45	32 MB (Flash)	Raw data	6 DOF
<b>Charge 3</b>	Fitbit	Accelerometer Gyroscope Altimeter PPG HR	30	3.8 x 1.8 x 1.2	2 GB	Activity Calories burned Step count Distance Elevation change Heart rate	6 DOF
<b>Apple Watch Series 5</b>	Apple	Accelerometer Gyroscope Barometer ECG PPG HR	37	4.4 x 3.8 x 1.1	32 GB	Activity Calories burned Step count Distance Elevation change Filtered ECG Heart rate variability Heart rate	6 DOF
<b>Vivosmart HR</b>	Garmin	Accelerometer Barometer PPG HR	32	13.6 x 19.2	3 GB	Activity Calories burned Step count Distance Elevation change Heart rate	3 DOF

ECG = Electrocardiogram; EMG = electromyogram; PPG = photoplethysmography; HR = heart rate; DOF = degrees of freedom



**Fig S1. 2-D Trajectories of Human Arm Motion.** (Left column) 2-dimensional trajectory of arm from video motion tracking compared to (right column) trajectory calculated from BioStampRC gyroscope data.

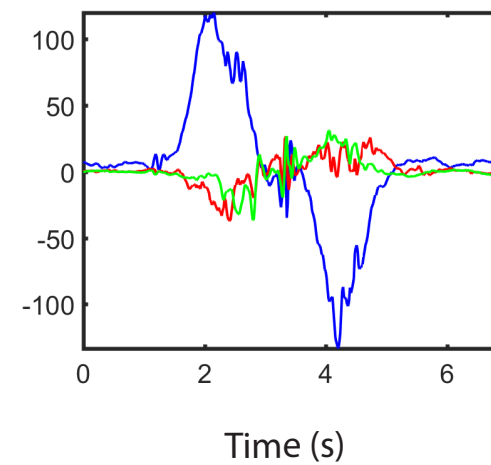
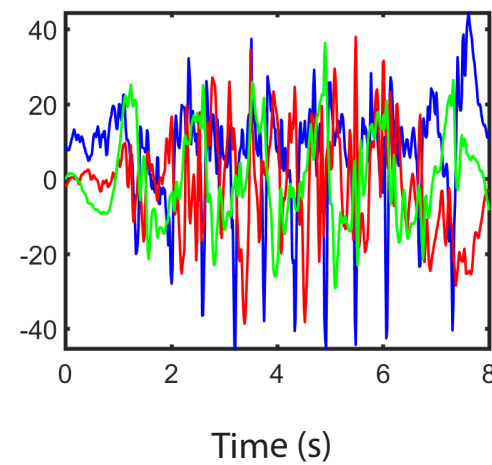
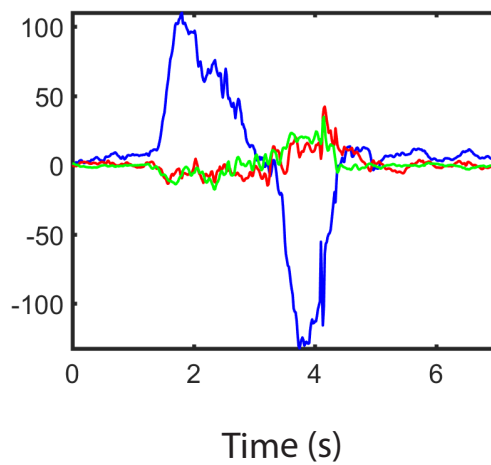
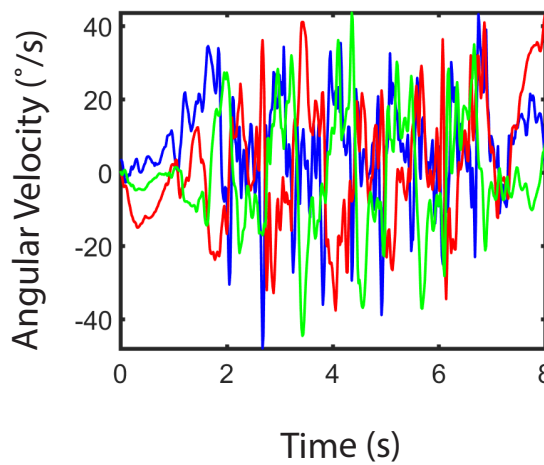
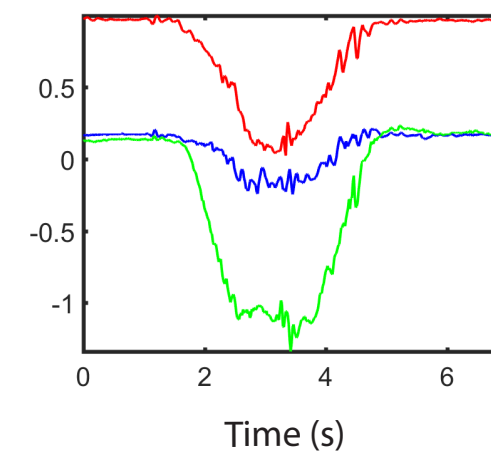
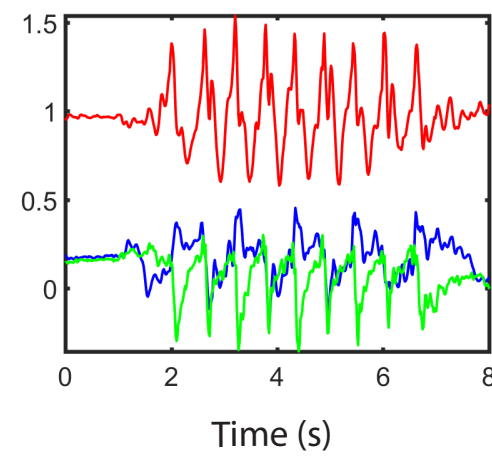
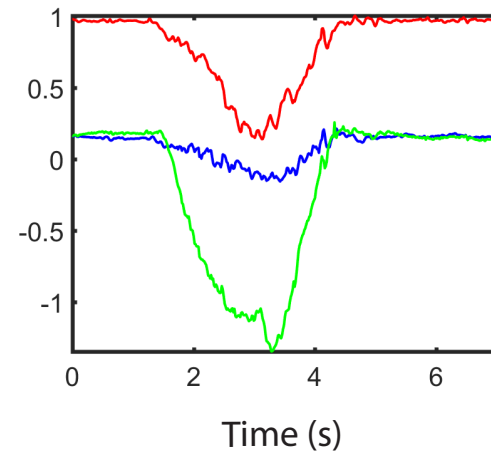
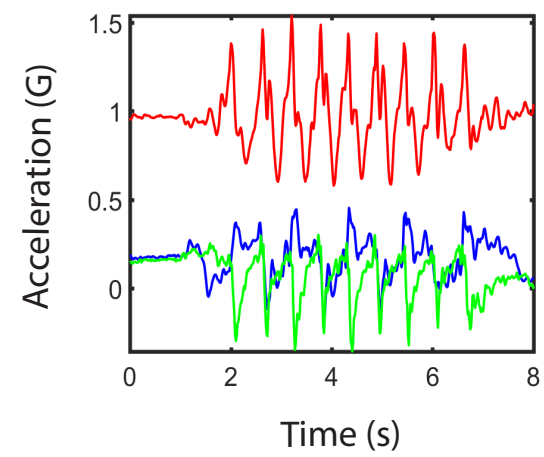


Walk

Pick Up Box

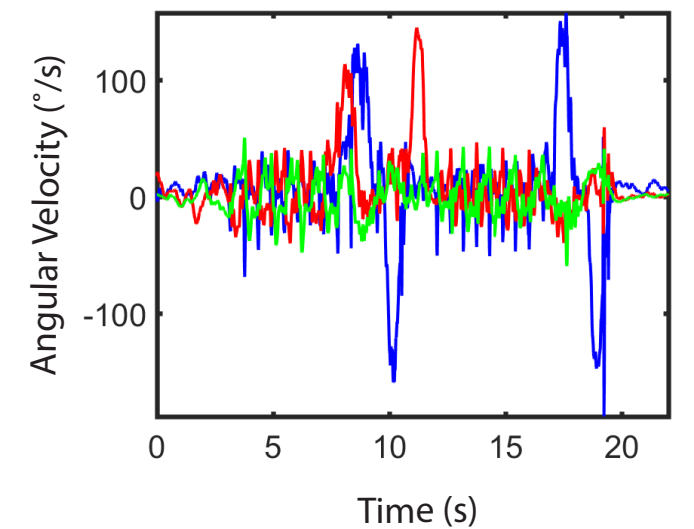
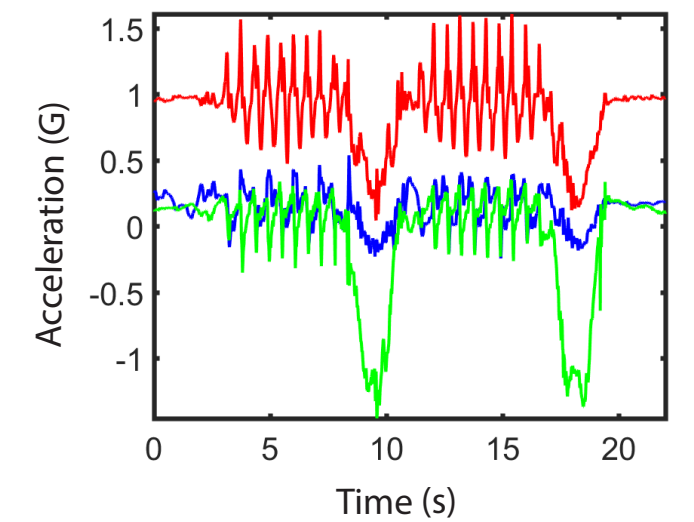
Walk

Put Down Box

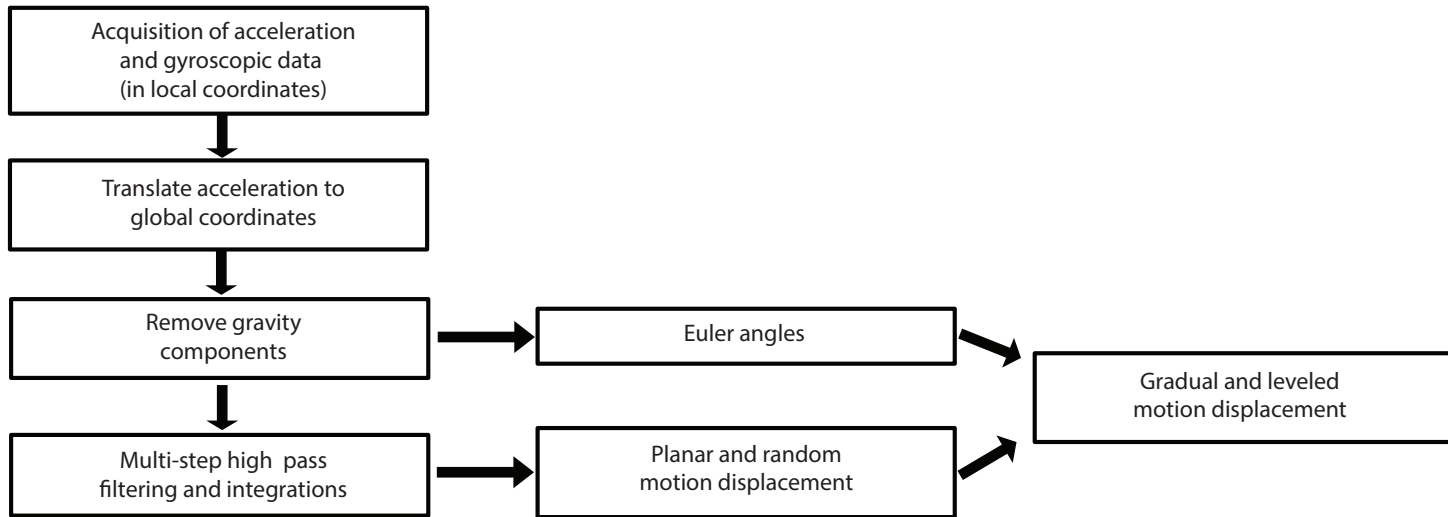


—X—Y—Z

Actions in Series



**Fig S2. Motion Signatures of Gross Human Activity Series.** (Top row) Tri-axial acceleration motion signature and (bottom row) tri-axial angular velocity motion signature of human subject performing basic motion activity separately and in series.



**Fig S3. Flow Diagram of Motion Data Processing.**