Test Plan

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The following test plan outlines the tests that will be performed on our product as a whole as well as the individual units. Various tests will be issued on each component to ensure functionality, durability, and proper data generation.

1. Unit Testing

1.1 Force sensitive resistor (FSR)

Component	Test	Purpose/Test Description
FSR	Sensors must be able to withstand high pressures such as the average person's body weight of 150-200lbs.	Show that the sensors can measure pressure appropriately for the average body weight.
	Sensors must be durable enough to withstand a cyclical force.	Shows that sensors will be able to withstand constant stepping while under the foot.
	Apply body weight to sensors, sensor values will be consistent when a consistent weight is applied.	Shows that there is no drift in pressure values, a single pressure value is directly related to a certain weight.
	Sensor values must be repeatable when a repeatable weight is applied.	Shows that the sensors are precise and that the same value will read when the same amount of weight is applied.

1.2 Microcontroller Unit (MCU)

Component	Test	Purpose/Test Description
MCU	Turning on the MCU and observing the LED power light is on.	Verify that the MCU powers on correctly.
	The analog outputs of the FSR are read properly in the MCU. Values are read in a range from 0-1000.	Ensure that the FSR integrates with the MCU.
	The outputs of the MCU are sent properly to the Bluetooth chip.	Ensure that the MCU integrates with the Bluetooth chip and makes proper use of the buffer.

1.3 Battery

Component	Test	Purpose/Test Description
Battery	Apply appropriate power to circuit and all parts of device must turn on.	Device powers on successfully and functions properly with an external power source.
	Apply high weight to all the sensors which will draw maximum power usage and measure with time how long device will be powered.	Shows longevity of systems power, must be powered for 1-2 hours.
	Device must remain on when battery loses power until the low limit of 7V.	Shows that the device can take unregulated power to function.
	Battery weight must be under 100g.	Lightweight so that it won't be uncomfortable for the user.

1.4 Bluetooth Chip

Component	Test	Purpose/Test Description
Bluetooth	Bluetooth module powers on.	Verify that the Bluetooth chip is properly connected to the MCU and operates in the intended manner.
	Bluetooth device is broadcasting and discoverable.	Check that the MCU properly sets up the Bluetooth module and sets it to the broadcasting state.
	Bluetooth device connects to Android device.	Verify that a stable connection can be made between the Bluetooth module and the Android device.
	Data transmitted from MCU to Bluetooth module.	Check whether data can be successfully sent through the UART interface on the MCU to the buffer of the Bluetooth module.
	Data transmitted from Bluetooth module to Android device.	Check whether data can be successfully sent over-the-air from the Bluetooth module to the Android device.

1.5 Data Processing

Component	Test	Purpose/Test Description
Data processing	Validate code using controlled dataset.	Produce pedobarograph using normal walking data by acquiring 4-5 normal walking steps. Markers are used to control cadence and

		stride length.
	Validate code using extreme dataset.	Simulate over-pronation and over-supination in the same subject for 4-5 walking steps controlling cadence and stride length using markers.
	Produce an average normal step.	Ensure that the system is able to determine when the user is initiating and ending a step and produces an average over all of the steps.
	Ensure data processing is consistent over a range of normal subjects.	Produce pedobarograph for population of normal subjects and ensure accuracy of product.
	Ensure data processing can discriminate between gait pathologies.	Collect data from subjects with differing gait pathologies (eg. over-pronation, over-supination).

1.6 Application

Functional Testing (White Box)

Component	Test	Purpose/Test Description
Bluetooth	Connect to Pods	Check whether Bluetooth scanning and connection between the application and Pods work properly.
	Receiving data from Pods	Determine if data is being sent properly from the Pods to the smartphone.
Data Decompression	Reconstruct data from Pods	Verify that received data is the expected and correct data from the pods.
Data Storage	Store data with timestamp	Ensure data is stored in database with the correct timestamp.
Pedobarograph	View stored data	Verify that the stored data is mapped properly in a pedobarograph.
	Interact with stored data	Check that multiple instances of the data can be viewed with respect to time.
Profile	View user profile	Ensure the user profile is displayed correctly.

System Testing (Black Box)

Component	Test	Purpose/Test description
Application	Sanity Testing	Determine if the application meets the most basic requirements and whether it is reasonable to proceed with further testing.
	Smoke Testing	Determine with minimal attempts and resources if individual components of the application is functioning or if there are basic problems preventing it from working at all.
	Integration Testing	Find out if individual modules work properly when combined together. Allows for end-to-end testing.
	Monkey Button Push Testing	Automated testing using UiAutomator to produce repetitive execution and test the application under load.
	User Acceptance test	Done it two stages to test if the solution works for the user. A controlled stage will be used with specific tasks given to the user and interaction monitored. A second stage allows the user to interact freely with the device and interaction is monitored.

1.7 System Testing

Component	Test	Purpose/Test Description
System Testing	Wearability/Comfort	Subjects insert the insole into their shoe and walk with it to ensure that it doesn't affect normal gait.
	Apply pressure to generate force	Ensure that when any force is applied to a localized area on the insole, the pedobarograph will register that force in real-time.
	Heavy weight	Apply large amount of force to the insole, and see that the pedobarograph can still differentiate at key areas (for heavier patients).
	Insole usability	Accommodate different foot sizes.
	Mobile application usability	Ensure that the application is user-friendly.