Sample 1

Results

Many of the variables that we tested were significantly different between the TD and PIGD subgroups (differences were significant if p-value was below a certain constant). Of the non-motor variables tested, the ones where the two groups were significantly different were disease duration, the subtest derived from a part of the MoCA (F-Words MoCA Score), the dose of levadopa needed to achieve a certain effect (Levadopa Equivalent Dose, or LED), the Hoehn and Yahr stage, and two measures from other cognition tests, stroop interference and trails (Stroop Interference Correct and Trails Time B minus A). For the motor variables, all the variables tested had at least two sub-variables that were significant out of the four that were tested, (single task and dual task measures, along with their respective standard deviations, abbreviated ST, DT, std ST, and std DT) as shown by Figure 2.

Non-Motor Variables ($p<0.05$)	**TD** mean(std)	**PIGD** mean(std)
Disease Duration (yrs)	7.07(4.97)	9.87(6.08)
F-Words Moca Score	15.80(4.99)	14.38(4.58)
LED	380.27(385.18)	704.47(585.73)
Modified Hoehn Yahr	1.30(0.96)	2.17(0.63)
Stroop Interference Correct	37.32(8.58)	32.43(10.62)
Trails Time B minus A (s)	44.71(26.69)	63(49.43)

Figure 1: Mean and standard deviation for both groups on all significant non-motor variables

As can be seen in both figures, we compared the two groups based on mean, with the standard deviation also listed for reference. Starting with the non-motor variables, the PIGD patients had longer disease duration, lower f-words scores, higher LED, a greater Hoehn and Yahr stage, less stroop interference correct, and a longer trails time; this is shown in detail in Figure 1. For the motor sub-variables, many sub-variables were significant, so they were listed by parent variable. For angle the

patient's foot hit the ground, the PIGD patients had a smaller striking angle in both single and dual task, with a higher standard deviation in dual task. With the duration of their gait cycle, they had a larger standard deviation in both single and dual task. For gait speed, PIGD patients were slower in both single and dual task and had a larger standard deviation in dual task. For steps in a turn, PIGD patients took more in both single and dual task, with larger standard deviations for both as well. They had shorter stride lengths in both single and dual task, and a larger standard deviation in dual task. And finally, PIGD patients had lower turn velocity in both single and dual task. Further detail on these differences can be found in Figure 2.

Sample 2

Results

In my research, I found that the RS4i+ was cheaper than 91% of the opioids that I researched. Only the average price of methadone, which came out to $0.62/day, was cheaper than the $4.04 daily price of using the RS4i+. The opioids Oxycodone/Acetaminophen, Meperidine, and Codeine sulfate were relatively close in price to the RS4i+. The other drugs were much more expensive than the device, with morphine being more than nine times the daily price of the RS4i+ (Figure 1).

I found that the RS4i+ was cheaper than 5 out of the 9 muscle relaxers that I researched. Orphenadrine, Methocarbamol, Dantrolene, and Baclofen were all cheaper than the RS4i+. Carisoprodol and Cyclobenzaprine, while more expensive, were within a $1.00/day of the RS4i+. Tizanidine, Metaxalone, and Chlorzoxazone were all significantly more expensive, with Chlorzoxazone being more than seven times more expensive than the device (Figure 2). In order to further solidify my results, my mentor encouraged me to create individual graphs including all the data from each drug to demonstrate how the average price was calculated (See Appendix D).

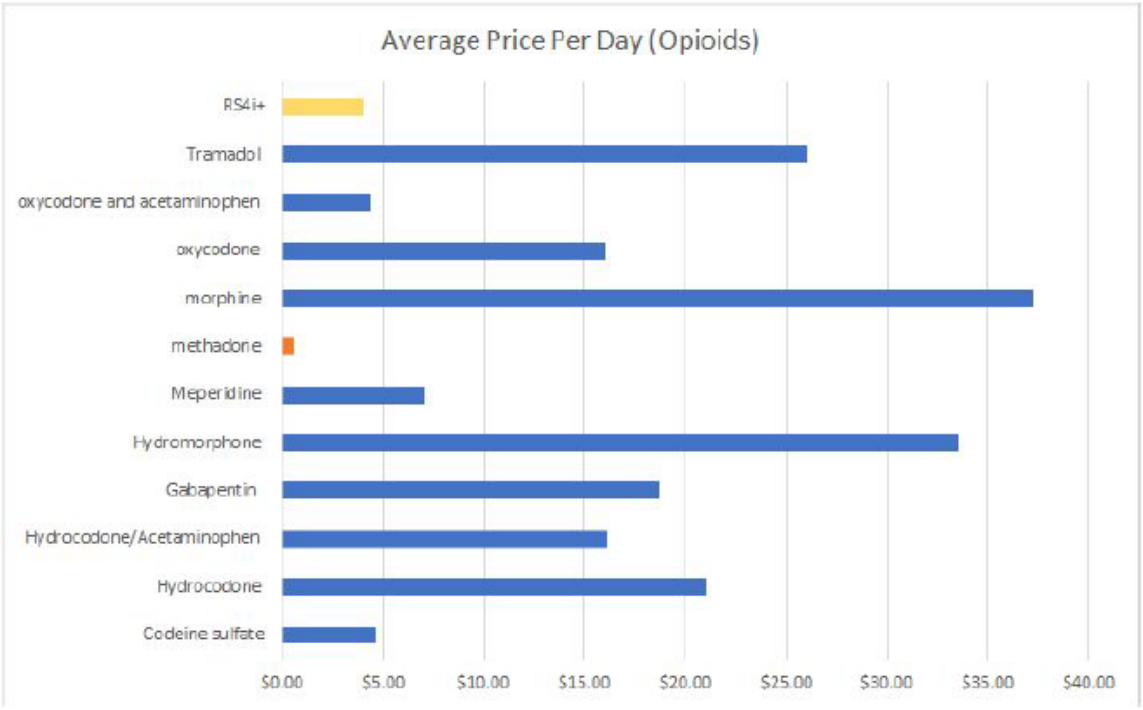

Figure 1: Average price per day of opioid painkillers vs the price per day of the RS4i+.

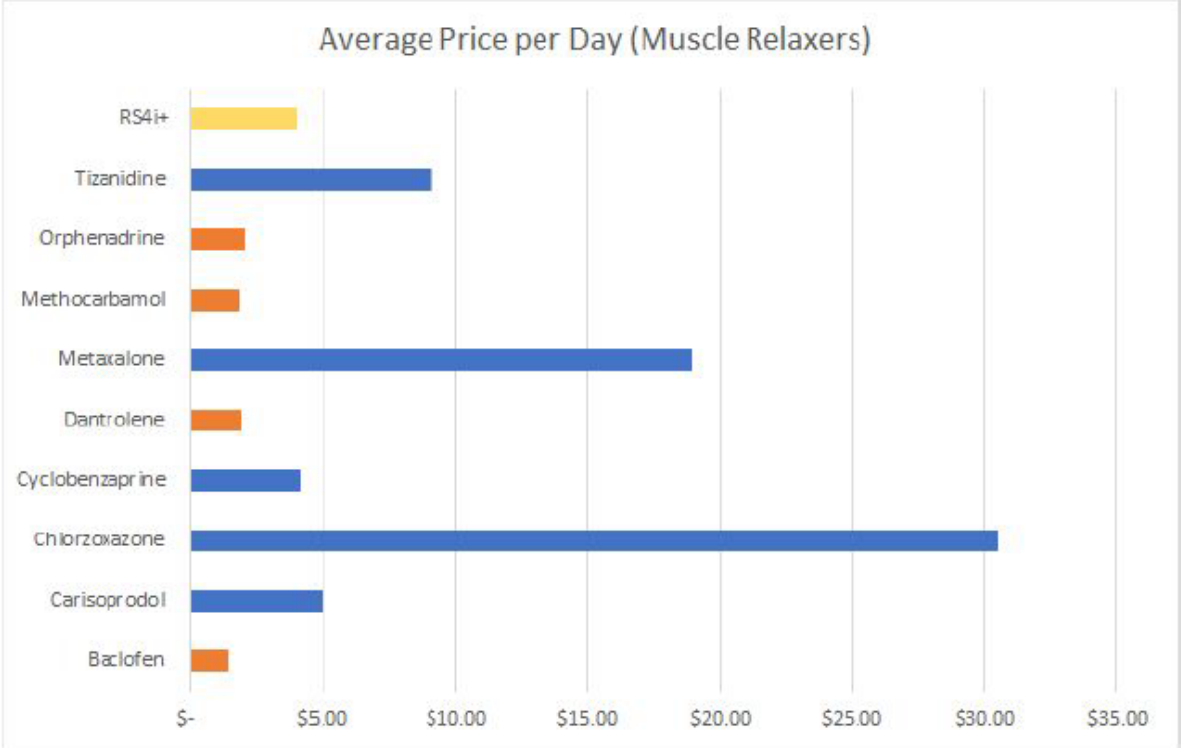

Figure 2: Average price per day of muscle relaxers compared to the RS4i+.

Sample 3

Results

F-901B

I was able to produce thirty-seven units of the F-901B successfully, completed with full firmware testing and gas sensor calibration. Most of the assembly and sensor calibration was completed with no issues, and the analyzers were eventually shipped out to consumers.

Figure 1. Completed F-901B device.

F-750 and F-751

I collected analytical dry matter data for many Hass avocados while also scanning them using the F-750 and F-751 under different conditions to make dry matter models for each device based on my analytical data and the reflectance spectra from the devices' spectrometers.

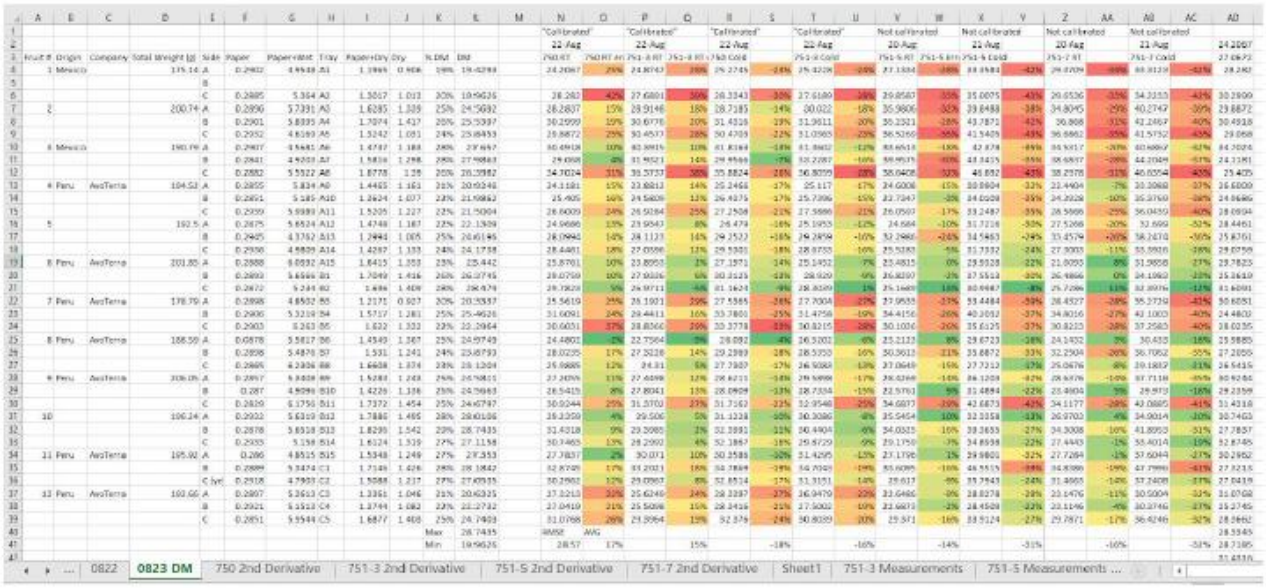

Table 1. Analytical dry matter data with F-750 and F-751 predictions.

Combining the analytical dry matter data with data collected on the impact of temperature on dry matter predictions on the F-750 and F-751, I created a temperature-adjusted model that more accurately predicted the dry matter of Hass avocados, regardless of temperature.

Figure 2. Temperature-adjusted model for dry matter.

By graphing the dry matter predictions for avocados at different temperatures, I normalized the predictions by adjusting the slope and y-intercept of each trend line to fit the analytical data.