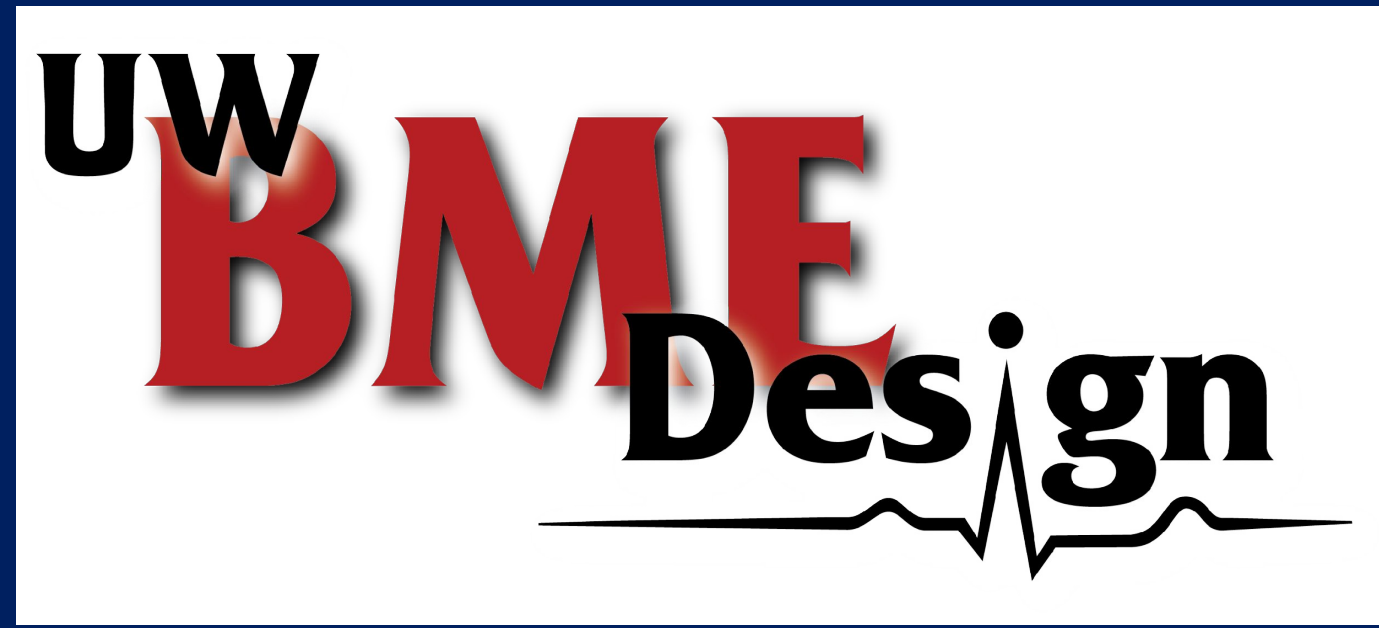


Tandem Bike for Person With Autism



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Abstract

Autism is a developmental disorder affecting one's nervous system resulting in social, cognitive, and behavioral challenges. Although individuals with Autism are cognitively challenged, therapies/strategies can be put into place to help one cope with these challenges. A local individual with Autism (Noah) and his care team found that riding a bicycle is beneficial to Noah's challenges. However, a normal bicycle will not suffice due to the balance, safety precautions, and cognition needed by the rider. Therefore, a bike must be built to accommodate Noah's needs. The bike must be a tandem e-bike allowing for Noah to exercise safely with his caretaker. It has been decided to split this task into three parts: frame, resistance mechanism, and user interface. The final frame will include a trike e-bike with a two wheeled trailer. The current resistance mechanism involves a series of magnets that resist the movement of the pedals. Finally, the interface is to be added and must excite Noah about exercising. As of now, there has been limited progress made in this area. Next steps of the design include finishing up the resistance mechanism design and adding the user interface.

Final Design

Fabrication Procedure- Magnetic resistance mechanism to Trike;

1. Obtain 1" Aluminum round stock
2. Use lathe to turn down to 0.585" and drill mounting hole at 0.400"
3. Use mill to make key slot then turn 180 degrees and drill the set screw hole at 0.138"
4. Obtain a long bolt and mount it to trike.

Materials Used:

1. Sun E3 recumbent trike
2. Magnetic bike trainer
3. 1" Aluminum round stock
4. 5/32" Set screw
5. 3/16" Key

Materials used in experimentation:

1. Under desk body cycle
2. Bike computer
3. Wind resistance bike trainer
4. Standard Bike

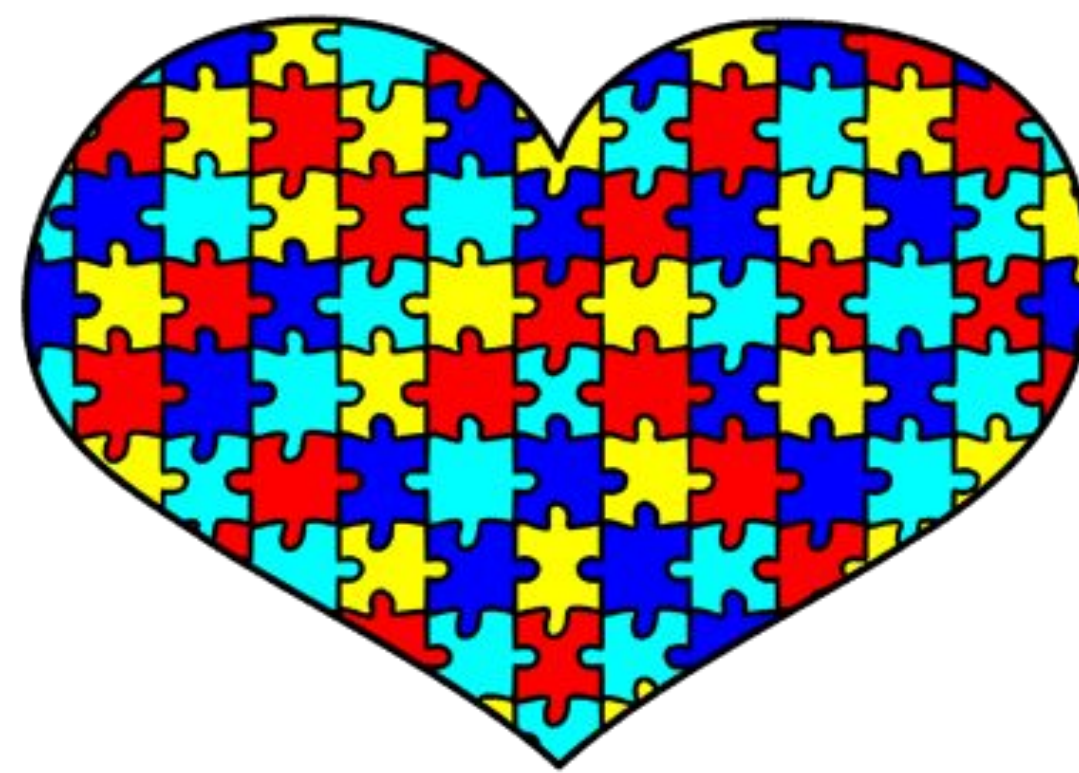
Figure 1 : Flow chart depicting the attachment of the magnetic resistance mechanism to the Sun E3 recumbent tandem tricycle.



Background

Motivation

- Client is a man with autism
- He is in need of exercise



Background

- Autism is a developmental disorder
 - Difficulty with social interaction
 - Some difficulty with motor functions
 - Different stages of severity of the disorder

Goal

- To create a tandem bicycle for him
 - Controlled by one of his assistants
 - Powered electronically
 - Allow Noah to exercise without controlling the actual movement of bike

Testing

Test Performed:

- Compared effect of riding bike normally vs. on a trainer
 - Analyzed the wattage output and speed of both
- Sources of Error
 - User consistency
 - Different bikes

Important Results:

- Speed correlated to wattage output
- The trainer and the actual bike portrayed similar trends in wattage outputs
- The trainer exhibited slightly less resistance compared to the actual



Figure 2: Representation of how the magnetic resistance training mechanism works with a bicycle.

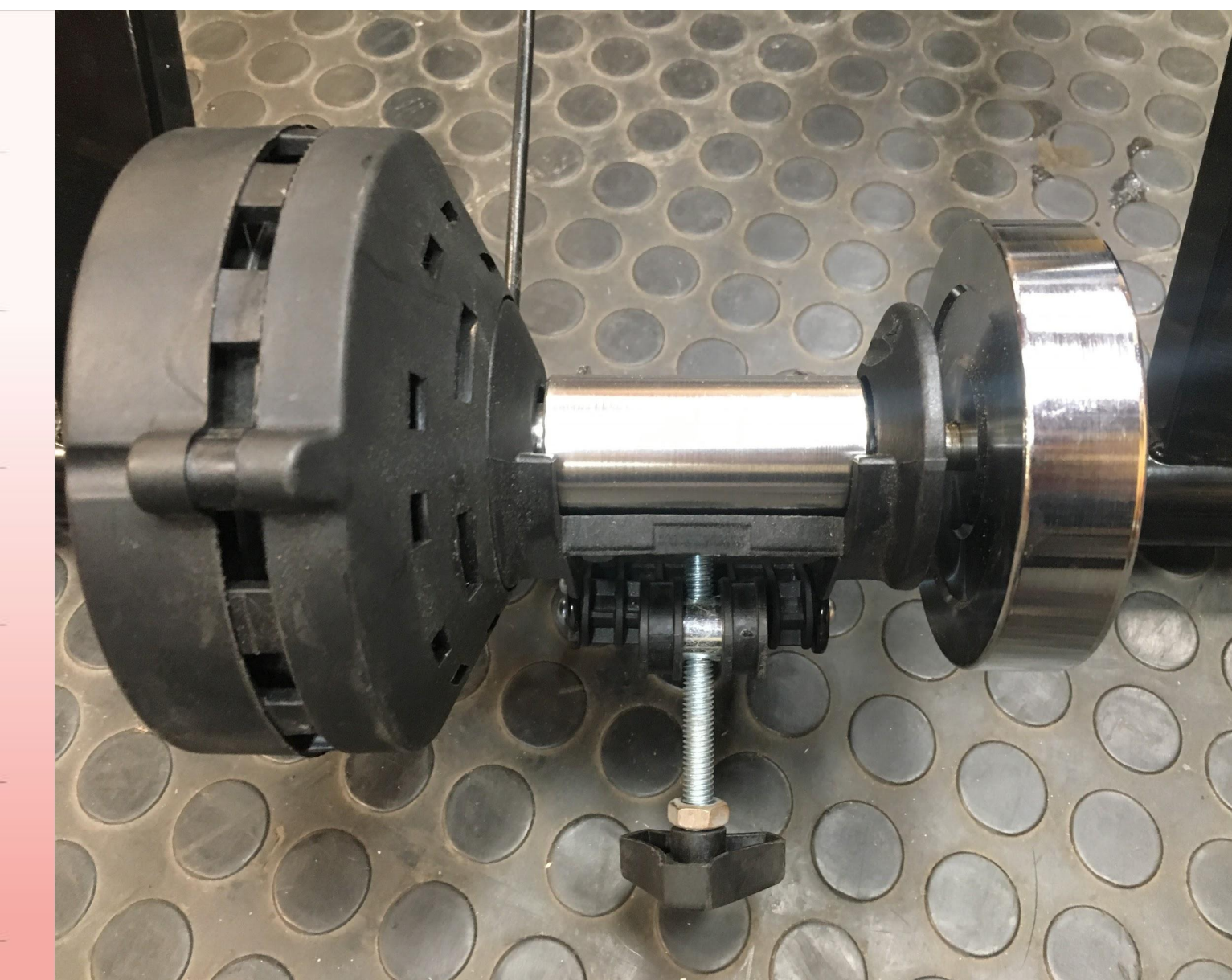
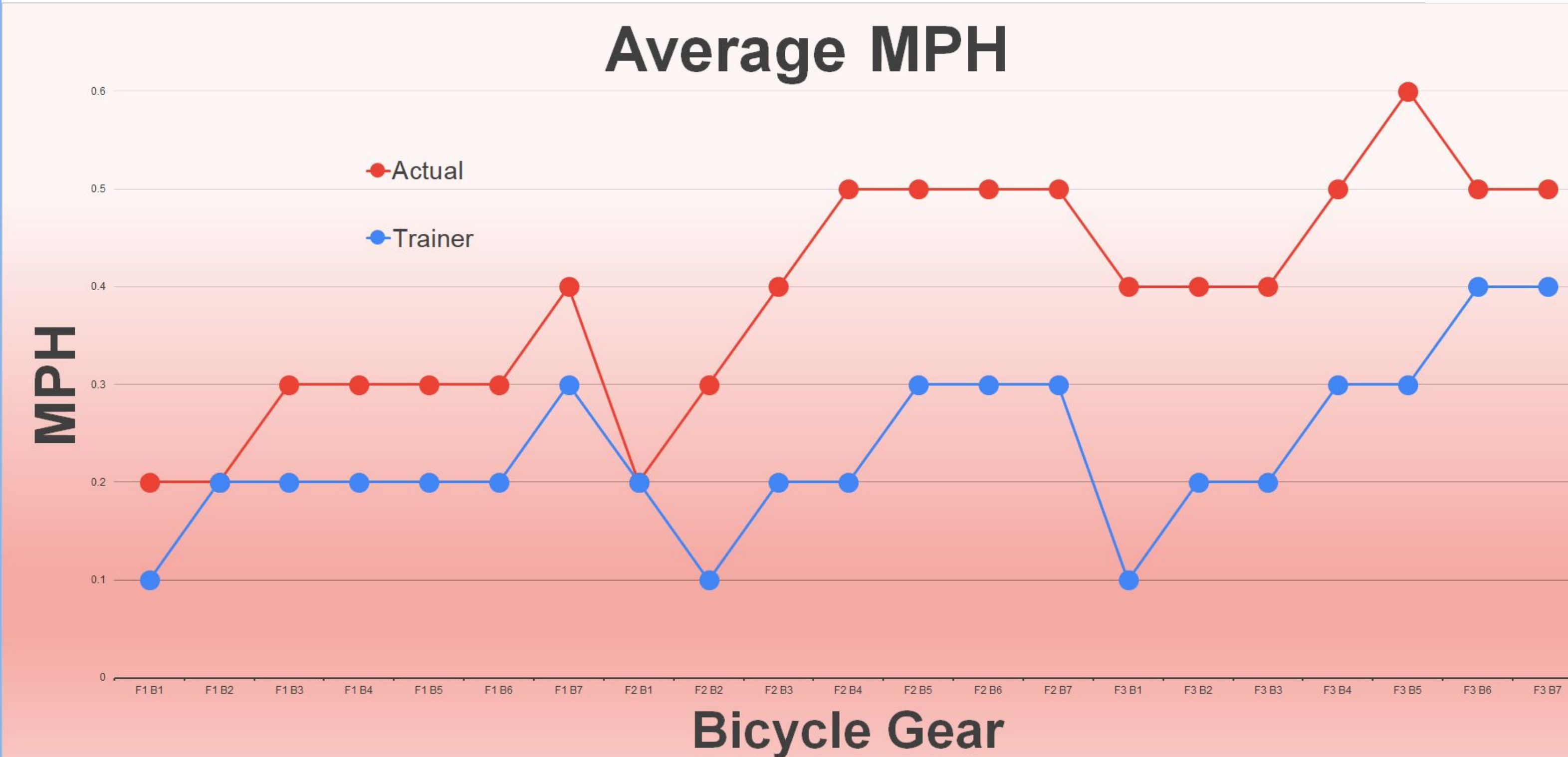


Figure 3: Magnetic resistance trainer used for testing.

Figure 4: Line graph comparing the average speed of the bicycle in MPH versus the bicycle gear. This graph is comparing the data from the actual bicycle and the data gathered from the bicycle when it was on the resistance trainer.

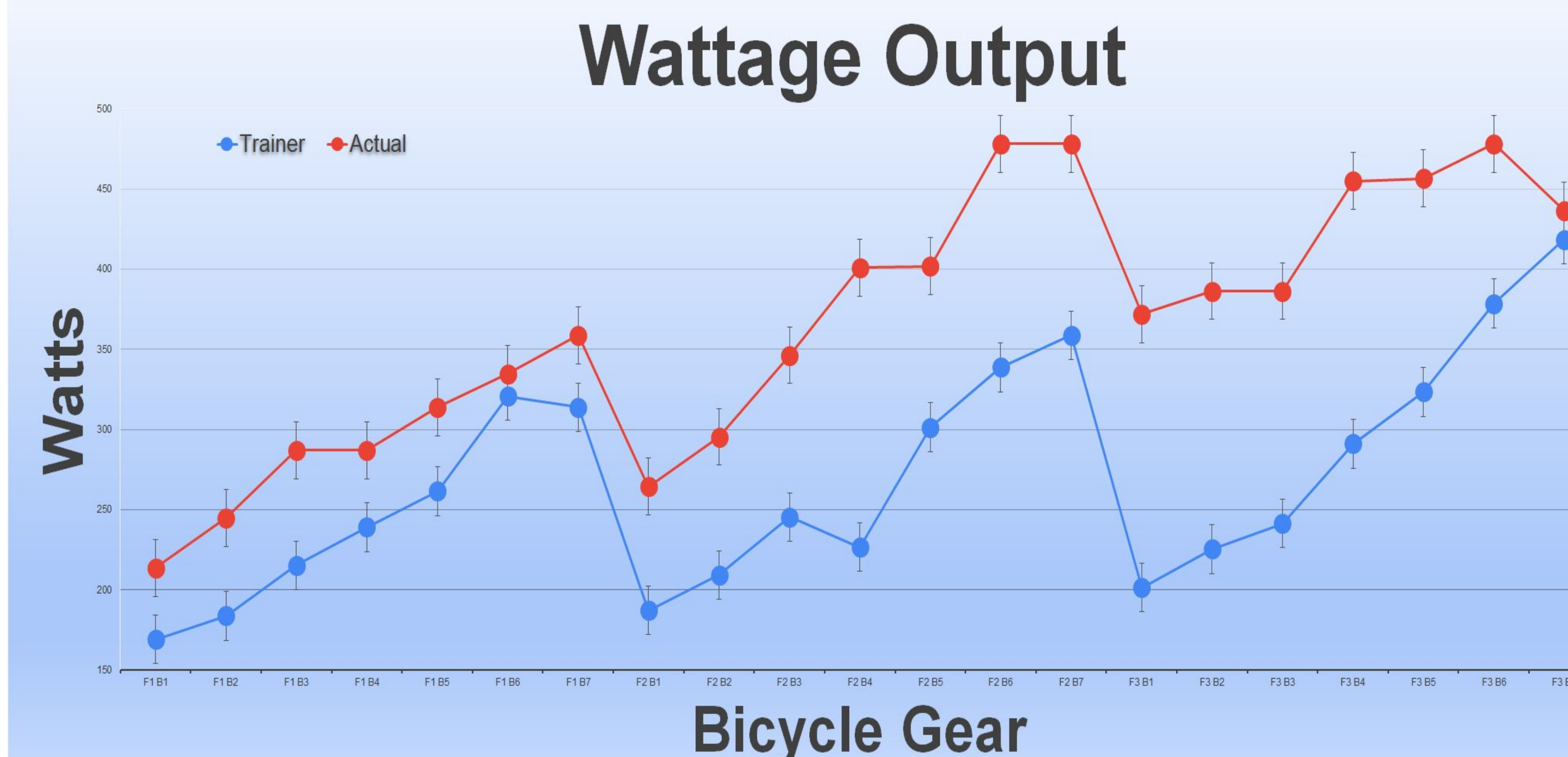


Figure 5: Line graph comparing the wattage output versus the bicycle gear. This graph is comparing the data from the actual bicycle and the data gathered from the bicycle when it was on the resistance trainer.

Future Work

Resistance Mechanism

- Add a wheel or rubber clamp to roller bar

Connecting to Electric Bike

- Universal Tandem Coupler

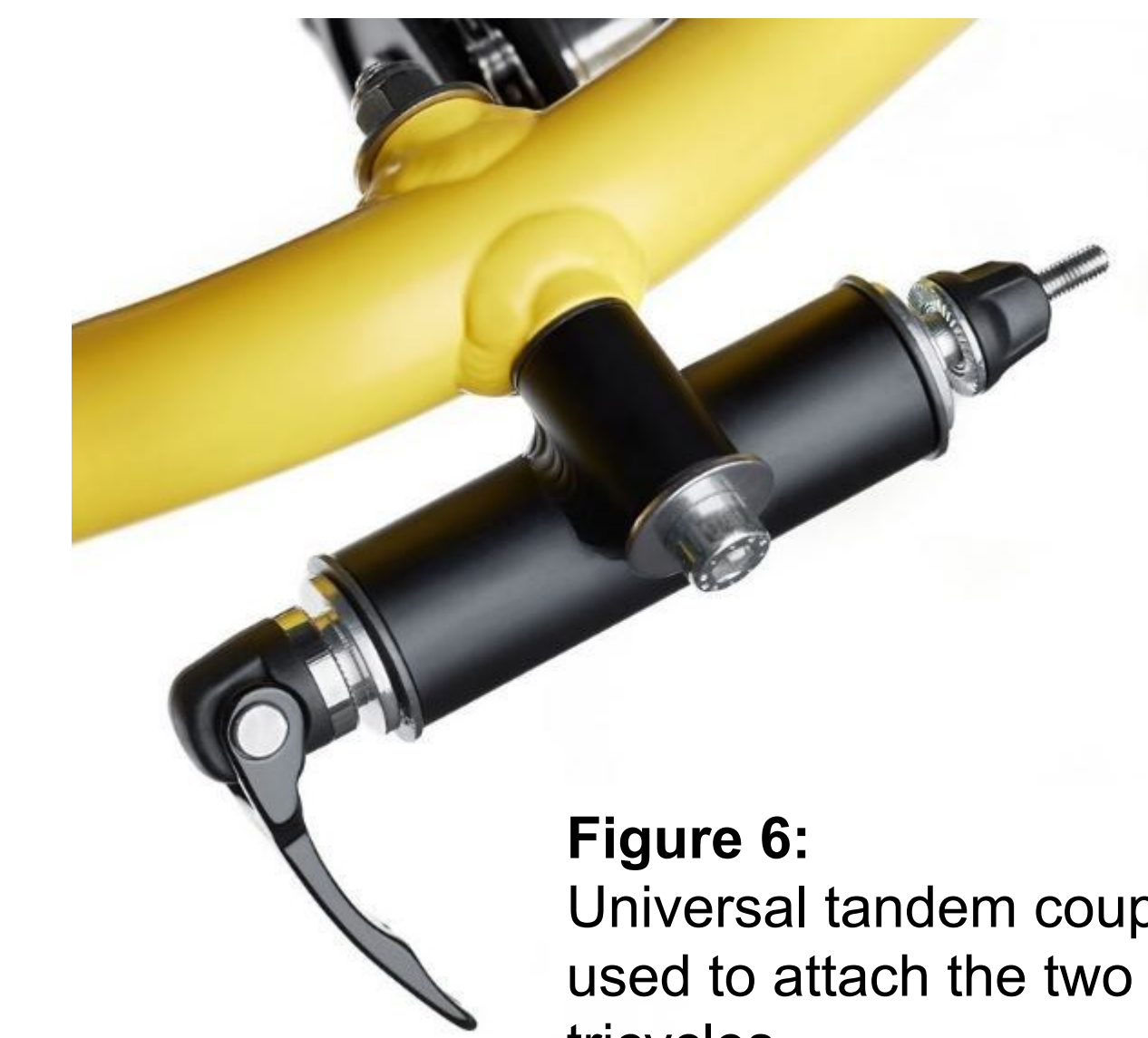


Figure 6: Universal tandem coupler that will be used to attach the two recumbent tricycles.

Miscellaneous Additions

- Canopy
- Wheel covers
- Baskets
- Speaker system feedback

Design Specifications

Client Requirements

- Bikers - Noah in the back and supporting staff in the front
- Noah
 - 25 years old male, 230lbs, 6' 1"
 - Loves biking - must utilize behavior to help him lose weight
 - In constant anxiety and can aggress towards self and others
 - Staying busy brings him comfort
- Safety
 - Make certain there is sufficient distance between Noah and staff
 - Noah should not have access to locomotion controls
 - No exposed chains
- Bike
 - Front staff bike should be an electric bike
 - Must maximize stability and comfort

Budget: \$5000 (Final cost \$557.52)

Acknowledgements

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DreamBikes, Motorless Motion, Rib Mountain Cycles

References

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