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MADISON

BME 300: Side Car Design

Handicapped Accessible Bicycle

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Team -

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Overview

- ▶ Problem Statement
- ▶ Background
- ▶ Project Design Specifications
- ▶ Design Options
- ▶ Design Matrix
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Problem Statement

- ▶ Design a sidecar attachment for TBI patients
 - ▶ Needs to cater to their limited mobility
- ▶ Market has limited options
 - ▶ Cost is too high
 - ▶ Mostly for kids and/or non-disabled adults



Background

- ▶ **Traumatic Brain Injuries (TBIs)**
 - ▶ About 1.7 million people in the U.S. sustain a TBI each year
 - ▶ Levels of Brain injury range from mild to severe and can create different mental and physical problems
- ▶ **Physical Therapy and exercise**
 - ▶ Patients with physical impairments can improve their abilities through physical therapy and exercise
 - ▶ Not all are able to return to a preinjury status



Background

- ▶ **Handicap accessible bicycles/sidecars**
 - ▶ Available in a variety of styles
 - ▶ They are passive products
 - ▶ Most sidecar designs are built onto the bicycle
 - ▶ Current market price ranges mainly between \$1000-4500



<http://bethebestsport.org/wp-content/uploads/2015/11/bike.jpg>

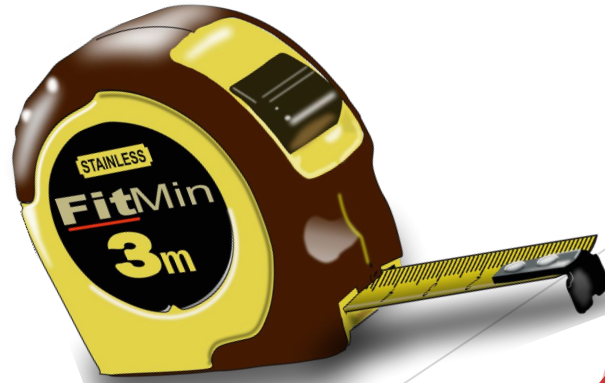


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Product Design Specifications

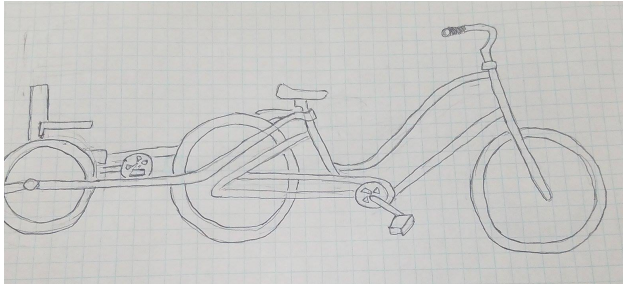
Client Requirements:

- ▶ Sidecar/Trailer cost must stay under \$1000
- ▶ Height should be similar to client's wheelchair
- ▶ Preferably detachable and containing storage
- ▶ Must fit in trunk of clients minivan
- ▶ Attachment can't be in the front of bike
- ▶ Needs to be a stable design
- ▶ Preferable will have pedals



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Design One (Trailer)



- ▶ Will be detachable
 - ▶ Will allow for independent use of the bicycle
- ▶ Will prevent the vehicle from taking up a great deal of space on bike paths.



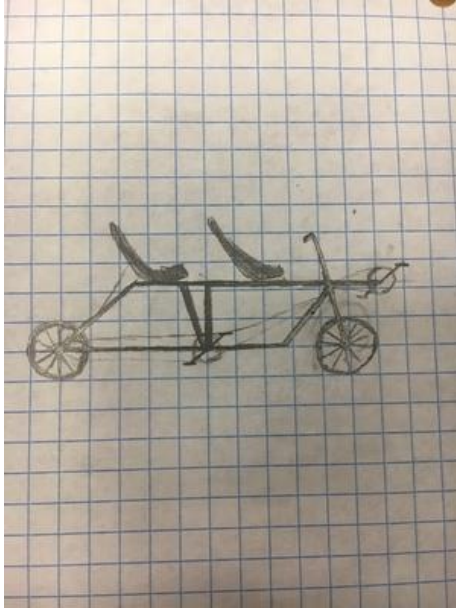
Design Two (Sidecar)



- ▶ Would be the most stable design.
- ▶ Would allow the passenger to ride next to the driver.
 - ▶ Is much more personal.



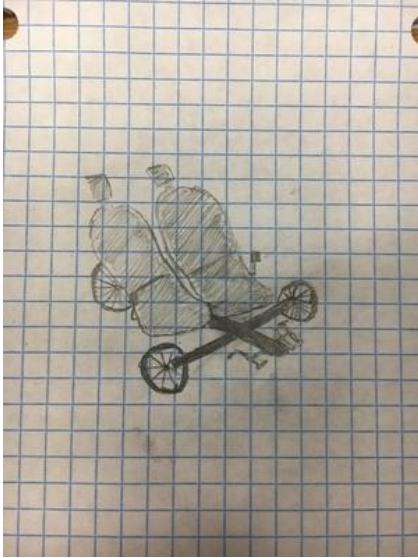
Design Three (Tandem)



- ▶ Would be relatively easy to modify a tandem and thus manufacture.
- ▶ Is not very stable.
- ▶ Passenger would not be next to driver.



Design Four (Recumbent)



- ▶ Difficult to manufacture
- ▶ Expensive given the price of recumbent bicycles
- ▶ Allows the passenger to be next to the driver



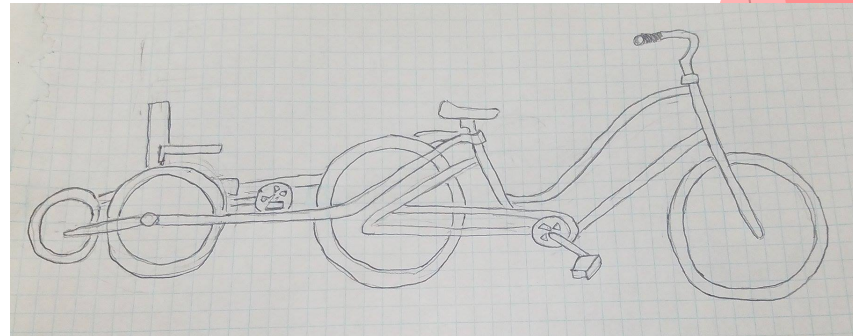
Design Matrix

Criteria	Trailer		Sidecar		Tandem		Recumbent	
Safety (25)	4/5	20	5/5	25	2/5	25	3/5	15
Size (20)	4/5	16	3/5	12	1/5	4	2/5	8
Manufacturability (20)	3/5	12	3/5	12	4/5	16	1/5	4
Detachable (15)	5/5	15	4/5	12	0/5	0	0/5	0
Appearance (10)	4/5	8	3/5	6	4/5	8	2/5	4
Versatility (5)	4/5	4	3/5	3	4/5	4	2/5	2
Cost (5)	3/5	3	3/5	3	4/5	4	1/5	1
TOTAL (100)	78		73		46		34	



Final Design

- ▶ Design 1: double framed tricycle trailer
- ▶ Approximate height of wheelchair
- ▶ Addition of grab bars
- ▶ Wide tires operating at a low PSI
- ▶ Adding reflective attachments to increase visibility
- ▶ Looks like products already on the road
- ▶ Allows our client to pedal
- ▶ Addition of a third wheel



Future Work

- ▶ Purchase materials
- ▶ Prototype fabrication
- ▶ Prototype testing
- ▶ Challenges
 - ▶ Welding Manufacturing
 - ▶ Second Team
 - ▶ Finding Sponsors/Funding



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References and Acknowledgements

We would like to thank the following individuals and companies for their assistance thus far:

Dr. Ed Bersu

Budget Bicycles

The Elias Family

"Facts About Traumatic Brain Injury", *Brainline.org*, 2016. [Online]. Available: <http://www.brainline.org/content/2008/07/facts-about-traumatic-brain-injury.html>. [Accessed: 09- Oct- 2016].



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Questions?



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