

301-25-Tong-Sidecar-Executive Summary **Handicapped Accessible Bicycle**

Morgan Kemp, Tianna Garcia, Shelby Mochal, Emmy Russell

Individuals who have been affected by a disability such as a traumatic brain injury often have limited mobility, coordination difficulties, and several long term cognitive challenges. Unfortunately, these effects limit an individual's opportunity for leisure activities like cycling using traditional products currently on the market. According to the CDC, 1.7 million people suffer from a TBI each year, but we believe a product like this could be used to benefit people with Autism, Cerebral Palsy, and Angelman's Syndrome. Our client is one such individual who would like to cycle with her husband and daughter. Her limited mobility prevents independent cycling, but she has some use of her lower limbs and already participates in physical therapy, our goal was to create a more engaging product that would not only heighten her experience of the ride but provide some additional physical activity to build her leg strength.

Although there are adult sized attachments and recumbent bikes on the market, none of them fit the need for that of an adult that lacks normal mobility, but has enough ability to still participate. Current market designs are mostly passive, do not provide adequate stability required for TBI patients, and are not cost effective with most ranging between \$1000-4750 for basic models. One example of these current designs is the Walk & Bike Company's extra large special needs bicycle trailer currently available for \$980. This is a passive trailer that is large enough for an adult rider, but does not allow the rider to pedal along. Another example currently on the market is The Duet Wheelchair Bicycle Tandem which is available for \$4,750 and is also a passive design. This product is attached to the front of the bicycle, which is potentially very dangerous for the rider if any head-on collisions were to occur. Custom bicycles are extremely expensive, but we believe that our design would provide the same benefits to a larger population at a more affordable cost.

Our final design improves upon these current products to reduce cost as well as increase safety and rider participation. It consists of a double framed trailer attachment that attaches to the seatpost of a separate bicycle using any standard Burley Travoy hitch which was chosen to prevent jackknifing. The frame was constructed from steel tubes welded to support a seat as well as a complete drive train. The frame is also low to the ground, only slightly more than a standard step to facilitate entry to the seat and reduce the potential to rub on any slopes during travel. The seat is an outdoor tractor style seat with a foldable back, armrests and a seatbelt the same height off the ground as a wheelchair. The pedals are modeled after a paddle boat, which like a bicycle, only turn when force is applied, rotate freely backwards, and power on the the two independent wheels. The pedals are attached to outdoor shoe like gloves that fit over the client's own shoes to provide both stability and safety. Other safety features include a mirror for the front driver, a bell for the passenger, fenders to prevent splash back, and shock absorbent tires.

Though our product is being made for our clients' own personal use, our team is confident that the attachment has potential for more than just traumatic brain injury individuals to participate in something physical and engaging, such as people with autism who also struggle with limited mobility, coordination, balance, and strength. Aside from a physical benefit for these individuals, the use of the trailer will promote outdoor recreation as a therapeutic outlet. It has been shown that aerobic exercise can decrease the frequency of negative self stimulating behaviors without affecting the current positive behaviors.