Hand Driven Tricycle

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Figure 20. Prototype of Hand Driven Tricycle

INTRODUCTION
A hand driven tricycle was custom designed for a client to enforce the use of and thus exercise his weakened left hand and arm while providing the mobility. An assistive device taking into account such type of imbalance is in general not available on the market. To provide a solution, a standard tricycle was modified with a new hand crank mechanism that enforces the engagement of the user’s left hand and arm. The tricycle becomes drivable only when the left hand and arm applies sufficient force. In the way, the tricycle provides a rehabilitative function to the weak side of the user. While the tricycle is driven by hands, it is steered by feet.

SUMMARY OF IMPACT
Designed for the specific client, the hand driven tricycle will help to improve muscle mass and increase the strength of the user’s left hand and arm. It will help the client to recover from his weakness. This design can also be easily adapted to fit with people with right side weakness. It provides an effective and economic rehabilitative solution for this specific category of potential clients.

TECHNICAL DESCRIPTION
The entire system was designed and prototyped by modifying a Schwinn tricycle such that the client can use his arms and hands to pedal with a hand crank. The original pedals
were removed. A hand crank and sprocket-chain set is added to the frame of the tricycle in front of the user, which works with existing sprocket-chain set to transfer the power from the hand crank to the rear wheels. The hand crank has two handle grips for the user to hold. The input to the system will be the user rotating the hand grips. By turning the crank, the user will be producing the motion necessary to move the tricycle. This motion will be transferred in sequence from the hand crank to the rear wheels.

In order to enforce the use of the client’s left hand, left hand handle grip has been specially designed. For the left hand grip, the input will be the user pulling a slider to the left from its original position. This sliding motion will disengage the brake mechanism that acts against the driving system. The brake mechanism works by clamping onto the sprocket so that the friction safely slows the user down. Since this sliding motion alone does not exercise the users left arm, a spring is added to the slider, which constantly exerts a force to pull the slider back to its original position. In this way, the user will need to apply a constant force output which will help to build muscle strength. The spring constant is chosen so that the force required is substantial to the user but not so large that the user would be tired out.

The hand driven tricycle has a separate input for turning. A pair of foot rests are attached to the front fork where the user will put his feet on. The input to turn will be applied by the user pushing or pulling left or right foot.

The cost of the parts and supplies for this project was $400.