1. Optimal Design Exercise Bike

Introduction

This device is meant to aid Elysa in strengthening her legs. This is a typical recumbent exercise bike that will be modified to fit Elysa. Also for motivational purposes an LED display will light up when the bike is being operated. The exercise bike has 8 different resistance levels and will be well suited to any level of strengthening she can try. A handle will be added to the pedals to allow Elysa’s parents to spin the pedals to assist her. This device will securely strap her into place and the chair will be modified to be more comfortable. The A20 model is lightweight and small to be moved into any room and stored easily.

the full frame design was best as compared to the pedals because the special seating will allow Elysa support and security while exercising. The simple pedal set up would make it more difficult for Elysa to have assistance while pedaling.

1.1 components

1.1.2 overall structure

A top down approach will be used to look at this machine. First we will examine overall appearance and desirability of the dimensions. This bicycle offers many interesting features. The display is easy to read and control (fig. 1.1). The housing shown in fig. 1.1 is plastic and lightweight. It can be easily painted or decorated to add more flare and fun for Elysa. The total weight of the machine is 60.1 lbs (27.3 kg). This is obviously lightweight and desirable. The weight capacity of the machine is 275 lbs (125 kg). The dimensions are as follows: 61” L x 16.5” W x 40.5” H (155 x 42 x 103 cm).

This machine is relatively small and is optimal for in-home fitness. This recumbent bicycle is more than capable of handling Elysa’s weight and is large enough for her to use this machine for as long as she wants. This machine will be able to adjust to her full adult height.
1.1.2 Wheel and Pedals

The machine has wheels to allow it to be moved into any room. The Wheels are part H.
One modification we are making is using normal bicycle pedal with cages. These will keep Elysa’s foot most securely in place. They will replace part I. Also the handle will be added to the pedals to allow Elysa’s parents to guide her through the motion.

### 1.1.3 Seat and Track

The seat and track sliding will be modified. In figure 3 below part H clearly shows the knob that allows the bike to slide and lock into the holes to lock into place. Also in the figure it is clearly shown how the track (part 4) and seat pieces are placed together to have the seat slide down the track. Holes will be machined closer to the pedals to allow the seat to move farther forwards for Elysa to reach the pedals.

![Diagram of seat and track](image)

**Figure 1.3**

The largest modification to the seat will be a piece securing her head looking forward. This will be attached by adding it to the metal components of the seat back pictured in figure 1.3. Two pads will be added to either side of her head. The same EZ on adjustable vest (model 103z) used for the eating chair will be used to hold Elysa securely into place. It will also attach and be held in place by straps that connect to the metal rods in the back of the chair.
1.1.4 Electrical components

Just recently we changed the design for the display for the toy. An LED display will now light up when Elysa operates the bike. RGB LEDs will be placed on the printed circuit board so it forms the shape of a horse. The LED circuit board and all electrical components will be housed in a specially made plastic case and mounted on the bike attached to the display. Three different horse shaped LED displays will show a horse in 3 separate stages of galloping. We will program the display to flash between all 3 to make it appear as though the horse is running. RGB LEDs can be programmed to cycle through all the colors of the rainbow. We think this will be visually stimulating and fun and will incorporate her love of animals.

1.2 realistic constraints

The weight capacity of this chair is well above 5 times Elysa’s weight. The safety precautions of the strapping system are meant for a car and are well above standards for use in a simple chair harness. The chair comes with all the parts needed for assembly. Also this machine sells for an average of 200 dollars and is one of the least expensive exercise bikes available. This will be easy for the group to decorate to be visually pleasing to Elysa. All of these considerations were taken into account and met. It is lightweight small in size and portable so this makes it ideal as a home workout machine. The Electrical components are all safely housed in the plastic. As well as moving parts like the fly wheel. Other exercise chairs have these pieces visible and would not be well suited to use by a child.

1.3 safety precautions

By using electrical components with low voltage chances of causing damage to the machine or any person who might touch them is reduced. Also, by specifically creating plastic casing for all electric components there is no worry of any user getting shocked. Elysa’s safety is paramount and the harness and strapping system are certified to be used to keep her safe in a car so their use as a strapping device for the chair is sufficient.