Alternative Designs

Assistive Jumping Device

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**Design 3: Trampoline Support with Overhead Pulley System**

This assistive jumping device (AJD) design utilizes self-tensioning pulleys to maintain tension in the ropes and offer constant support to the user. This design is intended for the use of people with disabilities. The ropes will be tensioned to stabilize the user and the pulleys will maintain this tension while the user is jumping.

The basic frame of the AJD will consist of a horizontal bar supported by vertical “V” shaped legs, in order to ensure frame stability. The frame will be constructed with thick metal rods to maximize strength. Also, telescoping poles will be incorporated into the design, in the lower portions of each leg. This will allow the user to adjust the height of the frame to accommodate for growth. The telescoping poles will also make the frame easier to disassemble and relocate. Figure 1 shows the basic frame.

This design will utilize 6 pulleys (four simple pulleys and two self-tensioning) to maintain user safety. Thick cables will attach to the bottom of the frame and run through the first pulley on either side (these pulleys are labeled as “1” in figure 1). A rope will attach to the other end of this cable, wrap around the first pulleys and then feed into the upper pulleys (denoted as pulleys “2” in figure 1). The supportive harness will hang from carabineers that attach to each rope. Pulley 1 will recoil once tension is removed from the rope, and will thus prevent slacking of the rope. The rope then will simply lie across the pulley 2’s. These pulleys are not self-tensioning; the sole purpose of these pulleys is to position the ropes over the user while keeping them out of the way of other trampoline users. Figures 2 and 3 further demonstrate the self-tensioning pulleys.

The rope chosen for the design will have low elasticity. The bungees connected to the ends of the rope at the bottom pulleys will allow for some shock absorption as the user is jumping. A rope with limited elasticity will be safer for disabled users, and makes the motion more predictable.

The final component of the design is the harness. A harness will be purchased to ensure abdominal and pelvic stability, but may require adjustment. The harness will be designed to withstand the weight of the user and the tension forces of the system, without causing user discomfort.

This design therefore satisfies the project specifications and should be further investigated.
Figure 1: The overhead assistive jumping device with self-tensioning pulleys.

Figure 2: Self-tensioning pulley located on each side of the overhead frame.
Figure 3: (Left) The rope is tensioned and extends the bungee attached to the frame. (Right) The rope becomes slacked and the force of the bungee becomes greater than the tension in the rope and therefore causes the pulley to recoil and pick up the rope slack.