

Eldervators

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Sit to Stand Assistive Device

OVERVIEW

Getting in and out of a seated position can put too much of a burden on joints, causing pain and discomfort for those who have weaker joints and muscles. A STS (sit-to-stand) assist device will be manufactured to reduce the burden on the limbs of individuals struggling to do so by utilizing a combination of springs and 3D-printed parts. The task of getting in and out of the seated position is known to be a struggle for many, especially the elderly, the injured, and the disabled communities. Over time, muscles weaken with age, requiring more effort to get up from a sitting position. In addition, bones become less dense and more brittle, making them more susceptible to injury. There is also some loss of flexibility in joints that allow easy movement. With these difficulties often faced by members of different communities, an accessible solution is necessary.

TARGET AUDIENCE

Those who have weaker joints and muscles, such as the elderly or those recovering from injuries all suffer from weak joints or muscles, along with pain. During activities of daily living, such as standing and sitting, these difficulties are proven to be a great setback for these individuals. A device able to aid them during this process would permit them to practice these acts independently, as well as emit the amount of time, effort, and even pain it takes to do so.

DEVICE DESCRIPTION

Our device is a spring powered system consisting of two platforms: a base, and a seating platform upon which the user sits. Between the two platforms are springs which act as a pushing force against the bottom of the client during STS (either sit-to-stand or stand-to-sit). The platforms are connected by hinge so that when the springs are fully extended without weight on them, the device creates an angle of incline beneficial to the user. The device also includes removable armrests for the user to hold onto for support during STS, if their seat does not already include them.

INSTRUCTIONS

Standing to Sitting

1. Place the device on a flat seating platform such as a chair or bench.
2. Using the armrests for support, lower yourself until your behind is touching the seat.
3. Allow the seat to slowly bring you into a fully seated position.

Sitting to Standing

1. Hold armrests for support.
2. Push up against armrests and lift yourself into a standing position.

CARE AND MAINTENANCE

This device includes a removable sheet covering the seating platform that may be washed as needed.

SAFETY WARNINGS

- This device should be used on flat surfaces.
- The device is relatively heavy (11.6 lbs) –handle with caution.

DEVICE CONSTRUCTION

Materials

1. Wood: 15” x 16.5” x 0.5”
2. 2 pieces of wood: 15” x 2” x 1”
3. 3D print filament (approximately 1 roll)
4. 13” x 13” steel plate (or smaller plates with a cumulative area of 169 square inches)
5. 22 wood screws
6. 12 sheet metal screws
7. 2 springs: 6” height 2.5” minimum diameter
8. 2 springs: 12” height 2.5 minimum diameter
9. 6 metal brackets
10. 15” metal hinge
11. Sheet material: 18” x 18”
12. Rubberbands
13. 15” x 16.5” x 1” foam
14. Drill

CAD Files



Construction

Seating Platform: Part I

1. Print out CAD file for the seating base.
2. Attach all four components together.
3. Drill together the steel sheet and the base using sheet screws.

Springs

4. Mark the spring placements on the base, with each spring edge no more than 1" from the sides, and the front two springs no less than 3" from the front of the base. The rear springs can be adjusted to find the inclined angle appropriate for the user. The front springs are the shorter two of the four total springs.
5. Place springs onto the base and fasten them into place by drilling in the metal brackets (using wood screws) over the first coil of the spring.
6. Repeat the process on the bottom of the seating platform, fastening the other sides of the springs onto the platform (using sheet metal screws instead). Each bracket will require two of the appropriate screws.

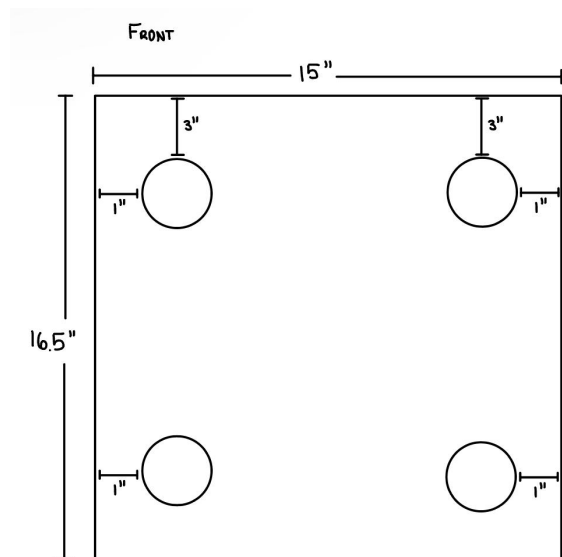


Figure 1: Spring orientation on base.

Hinge

7. Align the hinge on the 25" x 2" x 1" wood, parallel with the 25" x 2" plane. Ensure that it is straight.
8. Drill the hinge into the wood using wood screws.
9. Connect the 25" x 2" x 1" wood pieces together with the two platforms, hinge angle facing inward, by drilling the pieces into the inside space between the platforms.



Figure 2: Hinge point on spring design.

Seating Platform: Part II

10. Print the CAD parts for the armrests.
11. Connect the armrests to the base.
12. Tape the foam to the front face of the seating platform.
13. Use sheets and rubber bands to create a removable sheet for the foam: cut a line of holes throughout the perimeter of the sheet.
14. Create a large rubber band by tying together several rubber bands. Weave the rubber bands through the holes you just created, tying a knot once you reach your initial rubber band.
15. Cover the seat with the sheet, and enjoy your STS assistive device.