**ASCIP Innovation Lab 2023 Entry**

**Entry:** Hand and Forearm Gym

Low Tech, Sports and Recreation (Conditioning Exercise) categories

**Team**: Jennifer Yenser (Lead)

Noreen Yamamoto

Good Shepherd Rehabilitation Hospital, Allentown, PA

**Total Cost:**  $301.63

**Time to Construct:** 45 minutes to 1 hour

**Video Link:** https://youtu.be/hPpGWJICDVQ

**SUPPLIES**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Qty** | **Item** | | **Cost** | **Where to Buy** |
| 8 | ½-inch PVC 3-way Side Elbows | | $2.80 ea | Lowe’s |
| 4 | ½-inch PVC Tee Connectors | | $0.79 ea | Lowe’s |
| 6 | ½-inch PVC 24” Pipes (Cut at Lowe’s to the specified lengths below) | | $2.83 ea | Lowe’s |
|  | 3 | 14-inch lengths for horizontal supports |  |  |
|  | 6 | 12-inch lengths for vertical supports |  |  |
|  | 4 | 2-in lengths to connect 3-way elbows to vertical bars |  |  |
| 12 | Ideal Tridon Stainless Steel Hose Clamps ½-inch to 1 ¼ -inch (30 pack) | | $44.98 ea | Lowe’s |
| 12 | National Hardware 1”/25mm Zinc Plated S-Hooks (100 pcs) | | $10.08 ea | Lowe’s |
| 18 | Ultitech Cable Ties, 12 to 4-inch (100 ct) | | $5.99 ea | Amazon |
| 6 | Dycem 1-inch Strips cut from Dycem 8’x3 ¼ foot roll (Blue) | | $26.42/roll | Walmart |
| 1 | Power Pro 65# 150 yards Microfilament Braided Line | | $34.99 ea | Dick’s Sporting Goods |
| 1 | Husky 5/16” Nutdriver | | $8.99 ea | Amazon |
| 1 | Leather Hold Punch (6 Size Revolving) | | $7.98 ea | Amazon |
| 1 | Box Velfoam 1-inch width | | $18.59 ea | Rehab Store.com |
| 3 | Bigfoot Locker Keyracks (with 5 key holders) | | $11.98 ea | Lowe’s |
| 1 | Velcro Straps (2-pack) | | $7.38 ea | Lowe’s |
| 1 | Foam Slant Board Calf Stretcher 12” incline (3pcs) | | $19.99 ea | Amazon |
| 1 | LuluEasy 10 pc Suction Cups with 20 pieces Adjustable Zip Ties | | $7.99 ea | Amazon |
| **EXTENSION SPRINGS** | | | | |
| 2 | Hillman .33 lbs. (2-piece pack) | | $2.98 ea | Lowe’s |
| 2 | Hillman .15 lbs (2-piece pack) | | $3.98 ea | Lowe’s |
| 2 | Hillman .49 lbs (2-piece pack) | | $4.98 ea | Lowe’s |
| 2 | Hillman .78 lbs. (2 piece pack) | | $4.98 ea | Lowe’s |
| 2 | Hillman .94 lbs ( 2 piece pack) | | $3.98 ea | Lowe’s |
| 2 | Hillman .88 lbs (2 piece pack) | | $4.98 ea | Lowe’s |
| 2 | Hillman 1.86 lbs (2 piece pack) | | $4.98 ea | Lowe’s |
| 2 | Hillman 1.03 lbs (2 piece pack) | | $3.98 ea | Lowe’s |
| 2 | Hillman 2.00 lbs (2 piece pack) | | $4.98 ea | Lowe’s |
| 2 | Hillman 4.76 lbs (2 piece pack | | $4.98 ea | Lowe’s |

**DIRECTIONS ON HOW TO MAKE**

**The Hand and Forearm Gym PVC structure is built from the bottom up**

1. Take one 14-inch PVC pipe and slide four hose clamps toward the middle and tighten with the Husky nutdriver. Fasten one 3-way side elbow to each end.
2. To each 3-way side elbow add one 1/2-inch pipe to each end and then add a Tee connector to each side. Once connected, add an additional 1/2-inch pipe to the other side of the Tee connector.
3. Add a final 3-way side elbow to the 1/2-inch pipe.
4. Cut 1-inch strips of dycem and wrap around each end of the 14-inch pipe. Take two suction cups and place a zip tie through each opening at the top. Attach them to the bottom of the 1-inch pipe on either side, on top of the dycem. Take four more 1-inch strips of dycem and wrap around each of the 1/2-inch pipes. Once applied, then attach two suctions with the zip ties on both sides, under the 1/2-inch pipes.
5. Take the six 12-inch pipes and place them vertically into the four 3-way side elbows and two connectors.
6. Fasten two hose clamps on the on the vertical PVC pipes (connected at the end of the horizontal PVC pipe).
7. Fasten two hose clamps on the two middle vertical PVC pipes (one on each side).
8. Add the final two vertical PVC pipes to the elbows.

**Complete the structure by adding the top:**

Place four hose clamps to the 14-inch PVC pipe and tighten to prevent sliding. Add one elbow, then the 14-inch pipe and attach the other elbow (it will sit directly above the other pipe with hose clamps). Add two 1/2-inch pipes to the elbow, followed by the Tee connectors. Attach the last 1/2-inch pipes and then the elbows. Place the final 14-inch PVC pipe between the two 3-way elbow corners

**Setting up the Hand and Forearm Gym for Patient Use:**

* Loosen all hose clamps and slide the smaller zip ties on the inner side and leave loose.
* Place a S hook on the zip tie and close the top of the S hook and then tighten the zip tie.
* Cut five pieces of velfoam for finger loops. Place the two edges together and punch a hole through them with the Leather Hole Punch.
* Take the Power Pro braided line and thread through the openings of the finger loops and knot. Reserve some length to be attached to the springs.

**Finger Flexion/Extension**

* Determine the exercise the patient is going to complete and set patient up into the position. Add the black foam wedges (Slant Board Calf Stretchers) as needed to position the wrist and fingers for extension or flexion. Velcro straps and dycem can help with securing the patient’s forearm and prevent slipping during use.
* Place springs onto the S hooks.
* Take the end of the braided line attached to each finger loop and tie to a key hook. Adjust for length and cut the remaining braided line. Attach the key hooks to the bottom of the springs.

**Wrist Flexion/Extension**

* Measure velfoam around the patient’s hand. Punch two holes on the top of the hand and two on the palmar surface of hand. Take the braided line and thread it through the top two holes and make a knot, leaving 2 to 3 inches of length. Place another piece of braided line through the two holes on the palm side and knot, again leaving a few inches of length. Attach the braided line to the key hook, which will serve as a connector to the desired spring. Trim any excess braided line if necessary.
* Use the black foam wedges (Slant Board Calf Stretchers) to position the patient’s wrist or fingers if necessary. Velcro straps and dycem can help with securing the patient’s forearm and prevent slipping during use.

**Pronation/Supination**

* Measure and cut out a strip of orthoplast splinting material that will wrap around the circumference of the palmer/dorsal surface of the patient’s hand. Punch two holes between the thumb and index finger on the dorsal side (pronation). Thread the braided line and tie it leaving enough length to attach to the key hook and chosen spring. Punch two holes on the palmar surface between the thumb and the index finger. Thread the braided line through and tie, leaving enough length to attach to the key hook and spring.
* Set the patient at an angle to the table to allow the arm to be positioned well inside the gym. The gym can be moved as needed for the exercise being completed.