

# Stand With Me Standing Frame Construction Manual Version 1.1



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There are 6 phases to building the stander:

1. Find a CNC router near you
2. Acquire raw materials
3. Cut plywood parts using CNC router
4. Assemble basic components and prepare accessories
5. Assemble major sections
6. Final assembly

**Please read through the manual at least once entirely before you begin. This will help you avoid making mistakes and wasting material or time. Your case might require reordering the steps of certain processes.**



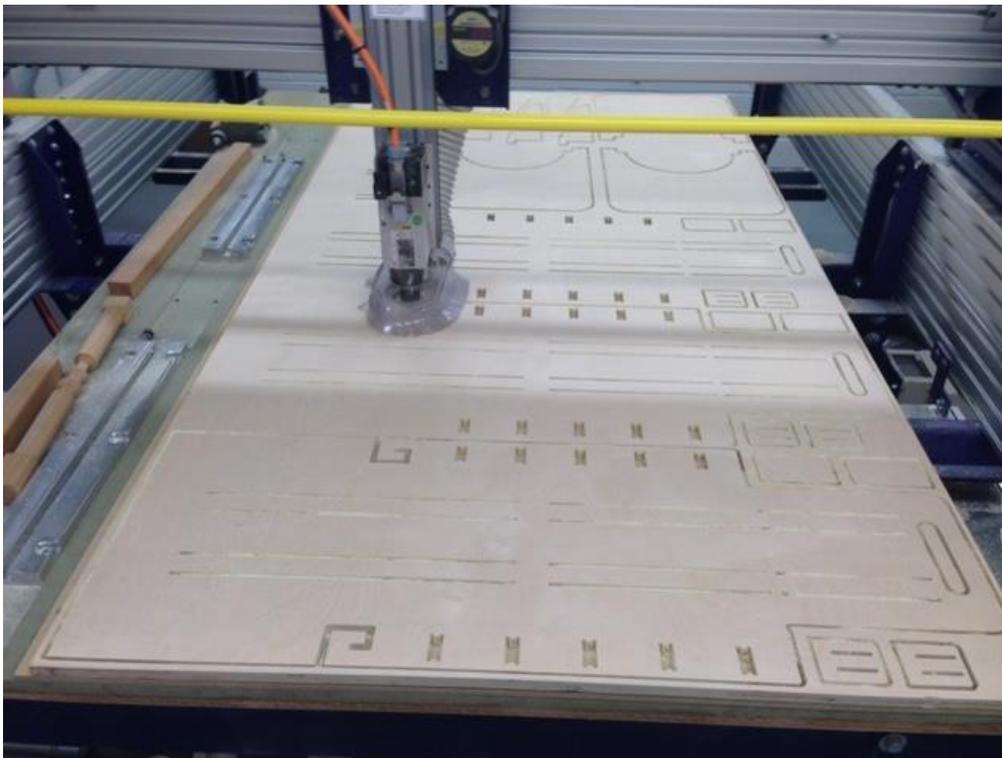
## Phase 1: Find a CNC router near you

**\*\*\*Note: If you do NOT Find a CNC machine you can NOT make a standing frame using this manual, you will have to use another method\*\*\***

Find a CNC router shop that is capable of cutting a 4'x8' sheet of 3/4in (19mm) hardwood plywood

- *What is a CNC router?* A Computer Numerical Control (CNC) router is a computer-controlled cutting machine related to the hand-held router used for cutting various hard materials, such as wood, composites, aluminum, steel, plastics, glass, and foam
- *Where?* There should be a CNC machine in every country's capital city around the world. There may be CNC machines in a city closer to you. Often engineering schools, technical schools have a CNC machine. You may also inquire about locations for CNC machines at laser cutting stores and they might be able to guide you to a CNC shop.
- The CNC must be capable of at least 4ft by 4ft sheets of plywood!

Example of what a CNC machine looks like and does...



## Phase 2: Acquire Raw Materials

Table 1: Below is a list of all the materials used in the construction of ONE standing frame (with a description, quantity, approximate cost and a link to more details and specifications). If you are building more than one standing frame make sure to adjust your shopping list accordingly!

Consumable Materials	Measure	# used per stander	Unit	Cost Estimate	Example Material URL
Furniture grade plywood, NOT MDF or particle board	4'x4' length, 3/4" thick: IF building more than one stander use 4'x8' sheets	1 (4'x4')	sheets 4'x4' or 4'x8'	\$20.00	<a href="https://www.homedepot.com/p/Columbia-Forest-Products-3-4-in-x-4-ft-x-8-ft-PureBond-Birch-Plywood-165921/100077837">https://www.homedepot.com/p/Columbia-Forest-Products-3-4-in-x-4-ft-x-8-ft-PureBond-Birch-Plywood-165921/100077837</a>
Beam 2"x4"	If using 2"x4"x8", cut two 40" segments, plus feet 16 1/2"	1	beam de 8ft	\$4.00	<a href="https://www.homedepot.com/p/2-in-x-4-in-x-92-5-8-in-Prime-Whitewood-Stud-569062/202091224">https://www.homedepot.com/p/2-in-x-4-in-x-92-5-8-in-Prime-Whitewood-Stud-569062/202091224</a>
Beam 2"x3"	use 40" of a 2"x3"	0.5 (1/2)	beam de 7ft	\$2.00	<a href="https://www.homedepot.com/p/2-in-x-3-in-x-96-in-Select-Kiln-Dried-Whitewood-Stud-845000/100038668">https://www.homedepot.com/p/2-in-x-3-in-x-96-in-Select-Kiln-Dried-Whitewood-Stud-845000/100038668</a>
Door hinges	3.5"	2	Units	\$4.00	<a href="https://www.homedepot.com/p/Global-Door-Controls-3-5-in-x-3-5-in-Satin-Nickel-Plain-Bearing-Steel-Hinge-with-5-8-in-Radius-Set-of-2-CP3535-R-US15-M/203384308">https://www.homedepot.com/p/Global-Door-Controls-3-5-in-x-3-5-in-Satin-Nickel-Plain-Bearing-Steel-Hinge-with-5-8-in-Radius-Set-of-2-CP3535-R-US15-M/203384308</a>
Wing nuts	1/4" coarse	8	Units	\$1.00	<a href="https://www.homedepot.com/p/Everbilt-1-4-in-20-tpi-Coarse-Zinc-Plated-Steel-Wing-Nut-4-Pack-802371/204274202">https://www.homedepot.com/p/Everbilt-1-4-in-20-tpi-Coarse-Zinc-Plated-Steel-Wing-Nut-4-Pack-802371/204274202</a>
Washers	1/4" inner diameter	12	Units	\$1.00	<a href="https://www.homedepot.com/p/Everbilt-1-4-in-Stainless-Steel-Flat-Washer-6-Pack-800341/204276462">https://www.homedepot.com/p/Everbilt-1-4-in-Stainless-Steel-Flat-Washer-6-Pack-800341/204276462</a>
Carriage bolts	1/4" diameter x 1.5" long	4	Units	\$1.00	<a href="https://www.homedepot.com/p/Everbilt-1-4-in-20-tpi-x-2-in-Zinc-Plated-Coarse-Thread-Carriage-Bolt-800036/204633614">https://www.homedepot.com/p/Everbilt-1-4-in-20-tpi-x-2-in-Zinc-Plated-Coarse-Thread-Carriage-Bolt-800036/204633614</a>
Carriage bolts	4" diameter x 1" long	4	Units	\$1.00	<a href="https://www.homedepot.com/p/Everbilt-1-4-in-20-tpi-x-1-in-Stainless-Steel-Coarse-Thread-Carriage-Bolt-804406/204633606">https://www.homedepot.com/p/Everbilt-1-4-in-20-tpi-x-1-in-Stainless-Steel-Coarse-Thread-Carriage-Bolt-804406/204633606</a>
Staples	8 mm	~40	Units	\$1.00	<a href="https://www.homedepot.com/p/Arrow-Fastener-T50-Heavy-Duty-Staple-Gun-T50/100021099">https://www.homedepot.com/p/Arrow-Fastener-T50-Heavy-Duty-Staple-Gun-T50/100021099</a>
Wood Screws	2" long	12	Units	\$0.50	<a href="https://www.homedepot.com/p/Grip-Rite-8-x-1-1-4-in-Phillips-Bugle-Head-Coarse-Thread-Sharp-Point-Polymer-Coated-Exterior-Screw-PTN114S1/100170151">https://www.homedepot.com/p/Grip-Rite-8-x-1-1-4-in-Phillips-Bugle-Head-Coarse-Thread-Sharp-Point-Polymer-Coated-Exterior-Screw-PTN114S1/100170151</a>
Wood Screws	2.5" long	8	Units	\$1.00	<a href="https://www.homedepot.com/p/Grip-Rite-8-x-2-in-Phillips-Bugle-Head-Coarse-Thread-Sharp-Point-Polymer-Coated-Exterior-Screws-1-lb-Pack-PTN2S1/100197689">https://www.homedepot.com/p/Grip-Rite-8-x-2-in-Phillips-Bugle-Head-Coarse-Thread-Sharp-Point-Polymer-Coated-Exterior-Screws-1-lb-Pack-PTN2S1/100197689</a>
Wood Screws	3" long	6	Units	\$1.50	<a href="https://www.homedepot.com/p/Grip-Rite-8-x-3-in-Phillips-Bugle-Head-Coarse-Thread-Wood-Screws-1-lb-Pack-3GS1/100134103">https://www.homedepot.com/p/Grip-Rite-8-x-3-in-Phillips-Bugle-Head-Coarse-Thread-Wood-Screws-1-lb-Pack-3GS1/100134103</a>
cotter pins	1/8"x1.25in	2	Units	\$1.00	<a href="https://www.homedepot.com/p/1-8-in-x-1-1-4-in-Zinc-Plated-Cotter-Pins-5-Piece-816358/204276206">https://www.homedepot.com/p/1-8-in-x-1-1-4-in-Zinc-Plated-Cotter-Pins-5-Piece-816358/204276206</a>
yoga mat or padding	6-8mm or 1/4" thick	4.5	sq ft	\$6.00	<a href="https://www.yogaaccessories.com/yoga-accessories-1-4-inch-extra-thick-deluxe-yoga-mat.html?gclid=EAlaIqobChMh-2LnJvSzwIVkAOGCh2vTqn7EAQYAvABEaKeW_D_BwE">https://www.yogaaccessories.com/yoga-accessories-1-4-inch-extra-thick-deluxe-yoga-mat.html?gclid=EAlaIqobChMh-2LnJvSzwIVkAOGCh2vTqn7EAQYAvABEaKeW_D_BwE</a>
Rope	.375" or 10mm thick +250-pound test	10	ft	\$3.00	<a href="https://www.homedepot.com/p/Everbilt-3-8-in-x-100-ft-Diamond-Braid-Poly-Rope-14156/202048173">https://www.homedepot.com/p/Everbilt-3-8-in-x-100-ft-Diamond-Braid-Poly-Rope-14156/202048173</a>
Velcro Straps	2" thick "One-Wrap" or double sided	5	ft	\$3.00	<a href="https://www.fastenation.com/products/velcro-brand-fasteners/one-wrap-brand-fasteners-straps/one-wrap-brand-fasteners-tape.html">https://www.fastenation.com/products/velcro-brand-fasteners/one-wrap-brand-fasteners-straps/one-wrap-brand-fasteners-tape.html</a>
Velcro Cinch Strap	2" thick "All-Purpose Cinch Strap"	1	Units	\$5.00	<a href="https://smile.amazon.com/VELCRO-Brand-Purpose-Straps-Strap/dp/B00575600W/ref=smi_wm_rco2_go_sm_q1405964225?encoding=UTF8&amp;%2AVersion%2A=1&amp;%2Aentries%2A=0&amp;ie=UTF8">https://smile.amazon.com/VELCRO-Brand-Purpose-Straps-Strap/dp/B00575600W/ref=smi_wm_rco2_go_sm_q1405964225?encoding=UTF8&amp;%2AVersion%2A=1&amp;%2Aentries%2A=0&amp;ie=UTF8</a>
Exterior Wood Varnish	water based wood varnish	0.05 (1/20)	Gallons	\$3.00	<a href="https://www.walmart.com/ip/POLY-FINISH-SOFT-TOUCH-1-2PT/167025072?wmlspartner=wpa&amp;selectedSellerId=466&amp;adid=2222222227065660935&amp;wmlspartner=wmlabs&amp;wl0=&amp;wl1=g&amp;wl2=c&amp;wl3=169823885030&amp;wl4=pla-277164568745&amp;wl5=9003439&amp;wl6=&amp;wl7=&amp;wl8=&amp;wl9=pla&amp;wl10=111840037&amp;wl11=online&amp;wl12=167025072&amp;wl13=&amp;veh=sem">https://www.walmart.com/ip/POLY-FINISH-SOFT-TOUCH-1-2PT/167025072?wmlspartner=wpa&amp;selectedSellerId=466&amp;adid=2222222227065660935&amp;wmlspartner=wmlabs&amp;wl0=&amp;wl1=g&amp;wl2=c&amp;wl3=169823885030&amp;wl4=pla-277164568745&amp;wl5=9003439&amp;wl6=&amp;wl7=&amp;wl8=&amp;wl9=pla&amp;wl10=111840037&amp;wl11=online&amp;wl12=167025072&amp;wl13=&amp;veh=sem</a>
Paint thinner	varnish thinner	0.05 (1/20)	Gallons	\$1.50	
TOTAL COST Estimate				~\$60.00	

**Tools List: Clamps, Electric drill, Philips head drill bit, 1/8 in drill bit, sandpaper, saw, square, measuring tape, box knife, glue or epoxy, varnish applicator (brush or cloth), bucket, pencil, notebook.**



### Phase 3: Cut plywood parts using CNC router

- Provide the CNC shop with the six “.DXF” files that were included in the email from scottcmitchell2@gmail.com: (NOTE: You will likely not be able to open them on your personal computer, but any shop with a CNC machine should be able to open and use them. You will want to work closely with the person who is doing this and show them several pictures of the standing frame to make sure that they have a good idea of what the end result is supposed to look like for scale etc.)
  1. Names of files you should have:
    1. Backboard
    2. Tray
    3. Traysupport
    4. FootBoardNew
    5. HeadOut
    6. HeadBack
- For EACH standing frame you are making you need to make sure to print **two** tray supports, **two** HeadOut and **two** HeadBack parts.

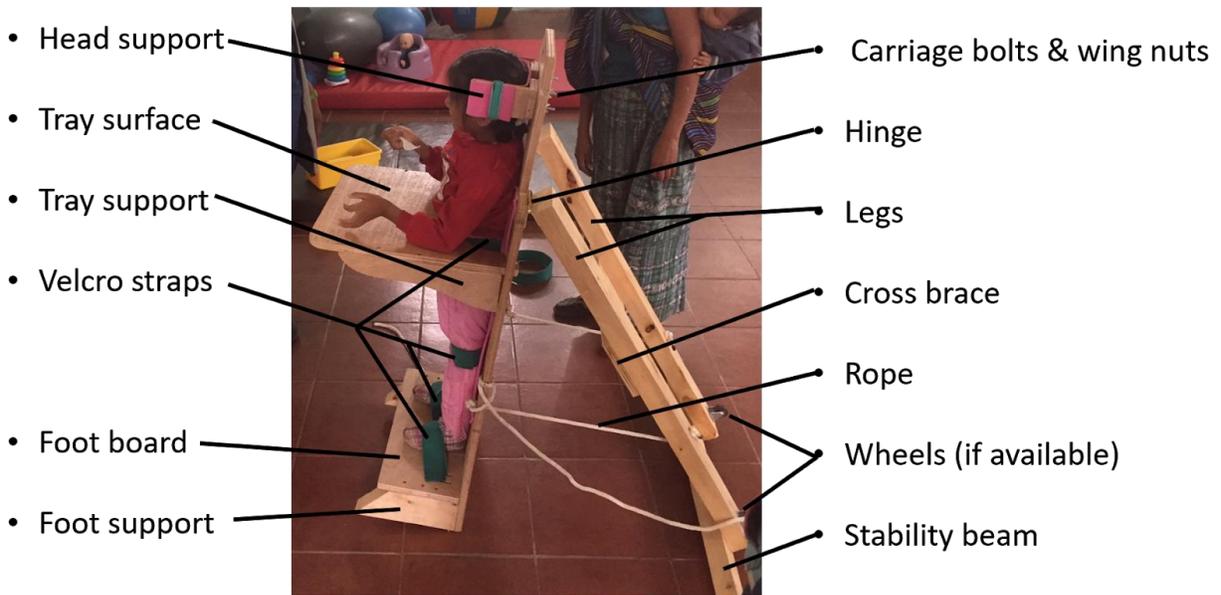
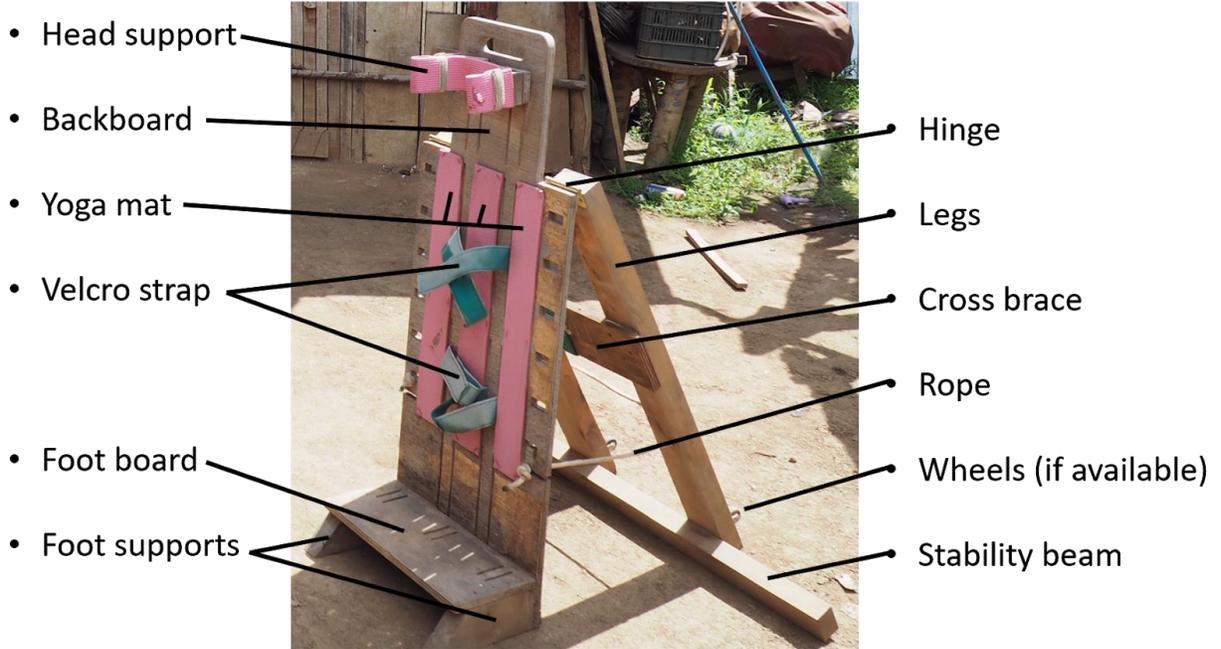
Part	# per stander
Backboard	1
Tray	1
Traysupport	2
FootBoardNew	1
HeadOut	2*
HeadBack	2*

\*each pair of “1 HeadOut” and “1 HeadBack” provide a support for either a head, hip or knee, your child may need anywhere from 0-4 pairs of these parts. Typically, we suggest printing 2 HeadOut and 2 HeadBack so you have them to use as head supports or leg braces as needed. If you anticipate needing more, print more.

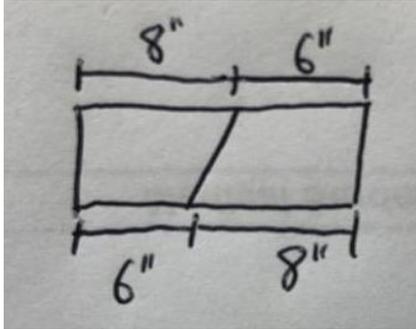
- Try to arrange to leave at least a 4”x18” segment of the plywood that is untouched by the CNC machine and save this for the cross brace in Phase 2B step 3.  
Here are the CNC parts for 4 standing frames.



## Phase 4: Preparing other major components and accessories



1. Cut the 2x4 beam into two 40" segments. Save the remaining piece for the next step.
2. Fashion the "feet" of the footboard by using the remaining portion of the 2x4 from the previous step. Below is an approximate size. This may vary slightly depending on the size of the remaining material that you have available to you. These parts will form the "feet" shown in the picture on the right (ignore the blue box and red circle for now).



3. Prepare the Lip for the footrest by cutting a 4inch by 1inch piece of plywood.



4. Prepare the cross brace from remaining CNC plywood. You should have saved at least a rectangle of 4"x18" from the CNC machine shop.
5. Prepare the stability beams from the 2x3 by cutting two 40" lengths.
6. Cut the rope to 6' segments and use a flame to burn the ends of the rope to prevent fraying.



7. Do not cut any Velcro yet as you may need different lengths for your child. Normally we recommend 13-15" segments for each knee/leg straps. If you cannot find "OneWrap" Velcro, you can find strips of single sided Velcro and sew them together to achieve the same thing with hook on one side and loop on the other.

8. Varnish: Seal all wood parts with varnish and thinner as directed on the product to protect the wood from water damage and humidity. Usually this is with 2-parts thinner to 1-part

varnish and is applied with a rag. Allow ample time to dry between coats. Sand the wood between coats.

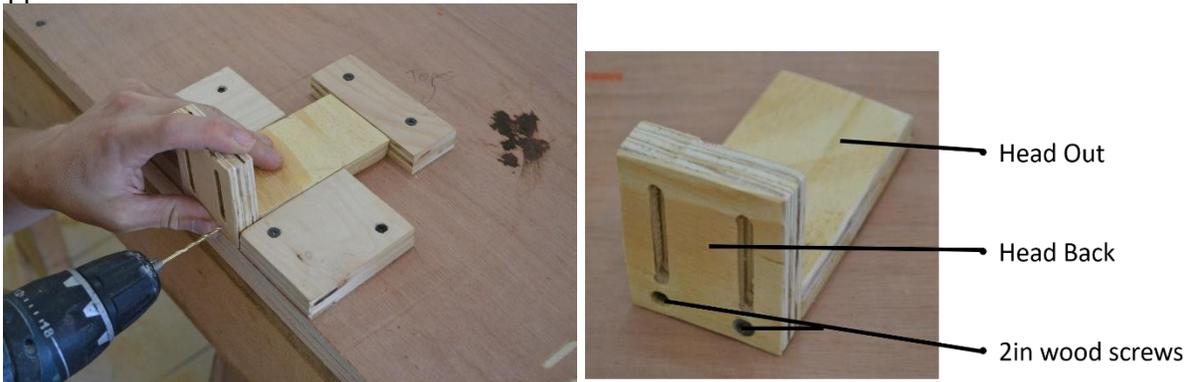


## Phase 5: Assembly of major segments

NOTE: It is best to pre-drill with a drill diameter that is approximately the size of the shaft of the screw (not as large as the threads) before placing a screw to prevent the wood from cracking, and also to help pull the two pieces together more snugly. You can also lubricate the tip of each screw with a very small amount of grease to increase ease of application.

### Phase 5A: Headrest (NOTE: can also be used as a leg or foot or hip support as necessary)

To assemble the headrest, use two 2" wood screws to attach the routed part to the head support as shown below.

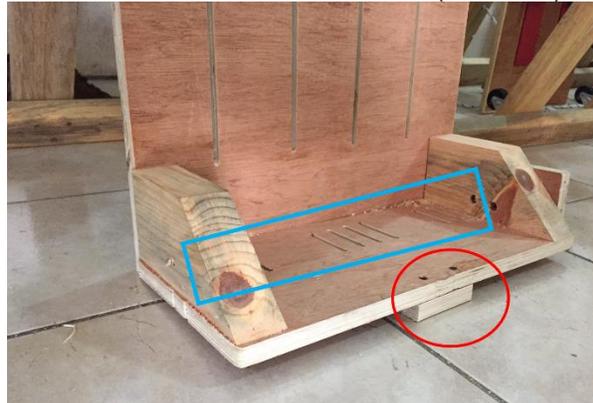


### Phase 5B: Footrest

Components:



Secure the 2x4 "feet" (from Phase 4.2) to the footboard with three evenly distributed 2" wood screws for each foot. Put the footboard slots near the backboard (blue box).



Attach the lip which is a small strip of extra plywood (1"x4") under the front of the device (red circle) this gives a little more stability in the upright position, so the child will not feel like they are falling forward (prevents from reaching 90 degrees vertical).

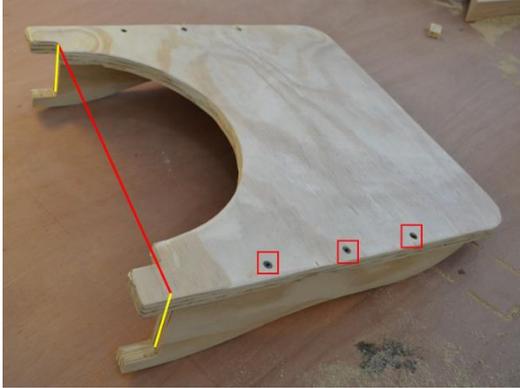


Final product



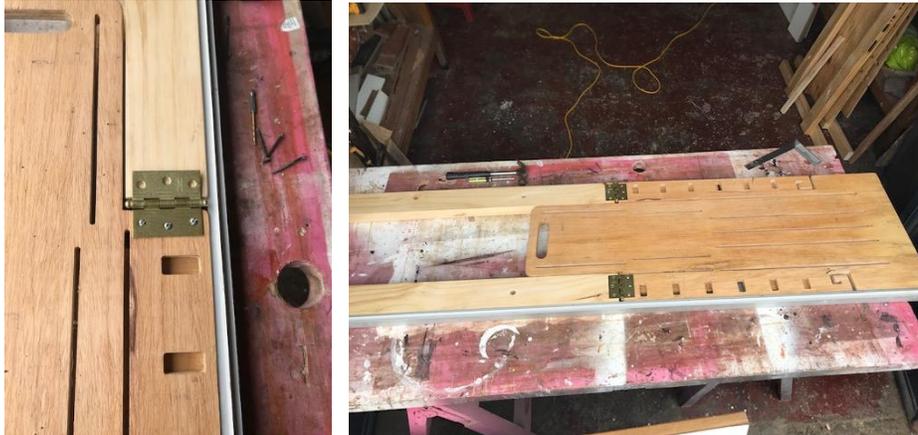
## Phase 5C: Tray table

Line up the yellow highlighted region of the Tray support with the red highlighted portion of the Tray surface so that they will fit flush against the backboard. Also, it is best if you can leave a small offset between the edge of the Tray-surface and the side of the Tray support so that it fits more easily into the slots in the backboard. This can be done by lifting the traysupport pieces off the table by several stacks of 2 washers when screwing the traysupport to the table. Use three 1.25" wood screws spaced evenly to attach the tray support to the tray table.



### Phase 5D: Hinge & Posterior Segment (critical step, take your time!)

Align the 2x4's with the edge of the backboard. Use a long straight piece of metal or draw a line on the floor or table and use this to help maintain alignment as the hinges are attached to the 2x4 and the backboard. Here we used a long piece of metal to keep everything straight.

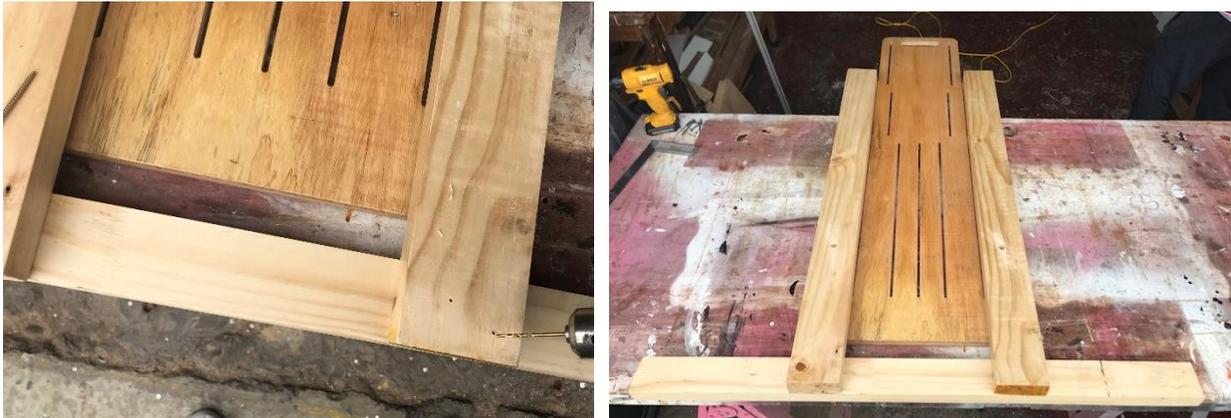


Make sure the hinge is in the correct orientation and opens and closes completely before attaching. The hinge should be attached leaving space for the pin of the hinge. Uses the straight piece of metal next to the pin to line up the hinge square to the back board.



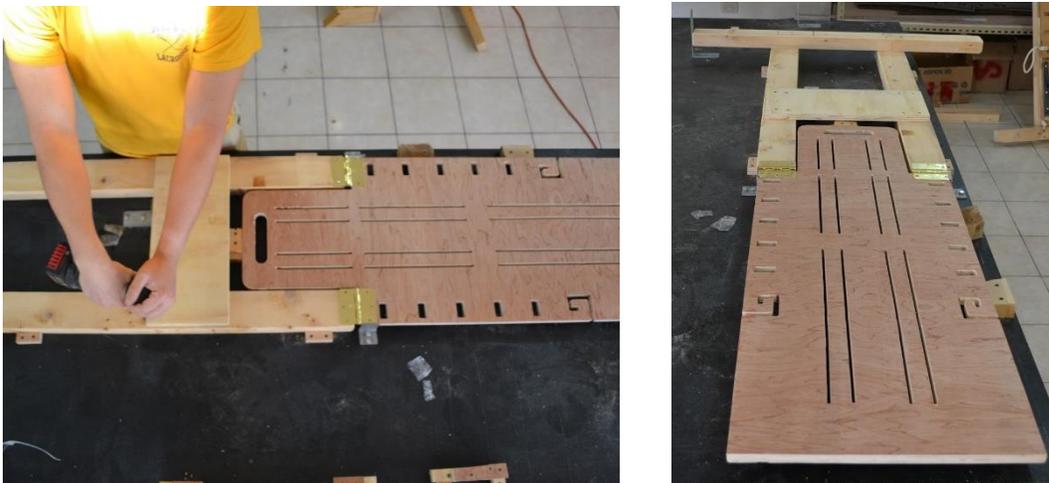
Once the Hinges are attached, fold the legs down and then attach the 40inch long 2x3 stability beam to the far end of the legs with two 2" long wood screws on each leg making sure that it is perfectly square to the 2x4 legs. Small misalignments here make a significant impact on the

stability of the stander. You can check the alignment of the stability beam vs the bottom of the backboard.



Check to see if the apparatus rests stably on the ground and does not rock significantly after this step).

Once the stability beam is attached satisfactorily, then add the cross brace with four 2" wood screws (one in each corner of the cross brace. Check stability again.



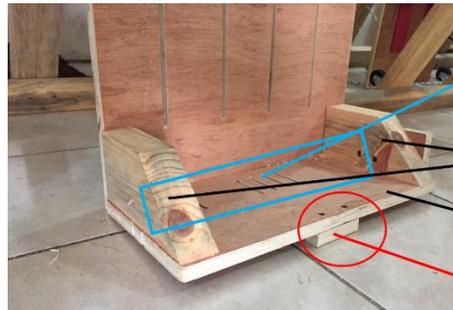
## Phase 6: Final assembly

### Footrest attachment:

Use two or three, high quality 3" long wood screws to secure each 2x4 portion of the footrest to the backboard. Pre-drill before placing screws to avoid cracking the wood. A total of 4-6 screws should be used to hold the footrest to the backboard. Note: it is nice if you can prop up the backboard on some scrap wood so you can push against something when you drive these screws as shown in the photos.



Final result



Slots

2x4 "feet"

Foot board

Lip

### Rope Attachment:

The ropes on the stander secure the angle while in use, ensuring that it will not fall flat to the floor while bearing weight.



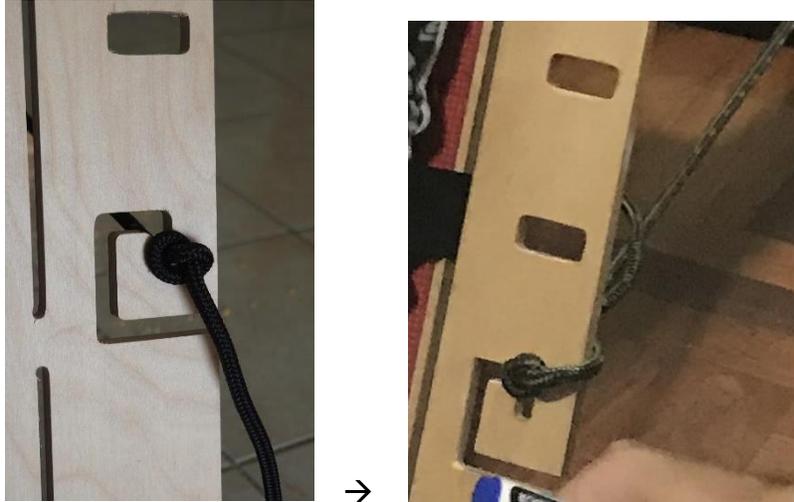
To attach the rope, first drill a hole 12 inches from the base of the 2x4 legs on the back of the stander. The hole should be large enough to allow the rope to pass through (about 1/2" diameter) but not so large that the rope fits loosely.



Before feeding the rope through the hole tie a small knot in one end the keep the rope from pulling all the way through.



Pull the untied end of the rope through the hole that you have drilled until it reaches the knot. This end should stay fixed with only the other end being untied or adjusted.



The other end of the rope should sit in the routed slot on either edge of the stander as such. Adjusting the placement of this knot will allow you to adjust the angle of the stander while in use.

**MAKE SURE THAT THE KNOTS ARE LARGE ENOUGH WERE THEY WILL NOT SLIP THOUGH AND CAUSE THE CHILD TO FALL!!!!**

Once in place through the backboard you can wrap the extra rope around to the back and tie it again so I can't fall out of the slot in the backboard.

### **Padding, Velcro & Harness:**

The final steps of building the stander are fastening the Velcro, padding, and straps to the stander. These accessories ensure that the patients are safe and comfortable while using their Stand With Me stander.

#### **Chest Strap/ Harness:**

**A harness is preferred, but a simple chest strap can work for many patients.**

Each stander can use a single strap that runs across the body and can be adjusted from the patient's waist to the upper chest depending upon their size. Typically, chest straps are about 2.5 to 3 ft in lengths. If a chest harness is available, that can replace or be used in addition to the chest strap.

#### **Leg Padding**

The yoga mat padding should be placed to cover any area that will contact the child excluding the tray table. You can secure the yoga mat to the backboard with either staples or glue. Glue works nicely and we will show that here.

Cut the yoga mat so that it fits like this on the board.



Then apply glue to one side of the yoga mat and stick it to the frame so the top edge is just below the handle as shown above. Once the glue is dry, then use a utility knife to cut the yoga mat and reveal the slots in the backboard. It works well if you stick the knife all the way through the board and use a sawing motion to cut the yoga mat as shown in the left image below.



### Headboard padding

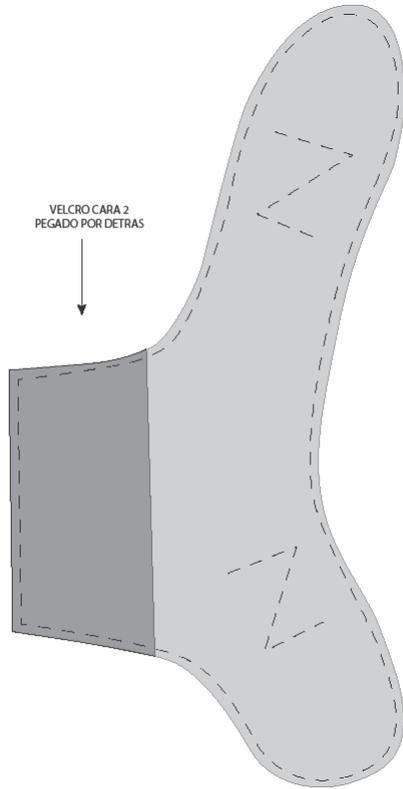
Another section of yoga mat should be placed across the headrest with enough slack to allow the mat to touch the back of the headboard, creating a U shaped padded area for the head to rest and prevent any direct contact with the wood of the stander and the patient's head.



### Harness:

Cut 4 strips of the 1" straps to be 22" long each. Drill/cut a whole in one end such that a carriage bolt can fit through the fabric to secure it to the standing frame. Burn the frayed material with a candle to strengthen it and to prevent ripping.





See more photos of functional standers at [www.standwithme.org](http://www.standwithme.org).

Questions or concerns? Call or email Scott Mitchell at +1-207-478-1100 or [scottmitchell2@gmail.com](mailto:scottmitchell2@gmail.com)

As a courtesy, please email Scott at [scottmitchell2@gmail.com](mailto:scottmitchell2@gmail.com) to let him know that you have built standers using this manual. We like to keep track of when, where and how many standers have been made by partners and friends around the world!

Best,

Scott Mitchell