Body print and assembly instructions

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Printing

I printed most pieces with FilamentPM's PLA+ skin edition series on my Prusa I3 and these are the settings I used, but you might have to adjust for your machine.

Frame parts

I printed all frame parts with a 0.15mm layer height and for most of them I used 200 degree nozzle temperature and 100% infill to make them more durable. Most parts are printed with a raft for better bed adhesion. Some have supports but most don't need it.

Print list:
Shoulder peg: print 2
Shoulder 1 and 2: print 2 of each
Upper arm bone: print 2
Elbow joint lower: print 2
Elbow joint upper: print 2
Elbow joint middle: print 2, one mirrored
Arm bone lower: print 2
Wrist joint 1 and 2: print 2 of each
Hand peg: print 2, one mirrored.

Neck middle 1 and 2: print 1 of each
Neck joint lower: print 1
Neck upper: print 1
Chest 1 and 2: print 1 of each
Spine top: print 1
Spine lower 1 and 2: print 1 of each
Pelvis joint: print 1
Hip 1 and 2: print 2 of each
Back plug: print 1
Thigh bone: print 2
Knee joint: print 2, one mirrored
Shin joint 1 and 2: print 2 of each
Shin bone: print 2
Ankle: print 2, one mirrored

Shell parts

I printed all the shell parts with a 0.1 layer height and 190 degree nozzle to help with overhang. I used 10% infill, though most parts are so thin they won't have much infill anyway. Most of these pieces are printed with supports.
All the shell parts that are made in two pieces have 1.75mm holes made so you can use pieces of filament as pegs to keep them together. This won't hold amazingly, as I designed them with glueing them together in mind.

Print list:
Chest shell: print 1
Lower arm shell: print 2, one mirrored
Pelvis shell: print 1
Shin shell 1 and 2: print 2 of each, one mirrored
Thigh shell 1 and 2: print 2 of each, one mirrored
Upper arm shell 1 and 2: print 2 of each, one mirrored
Waist shell: print 1
Hand: print 2, one mirrored
Head: print 1
Headcap: print 1
Foot: there are two different versions of the foot, one which is just the whole piece and one where I split the foot down the middle for easier printing. If you want the whole foot, print 2 of "foot whole", one mirrored. If you want the split foot, print two of "foot1" and "foot 2", one mirrored, as well as 4 of "foot peg" to hold them together.

Assembly

As all 3D prints are unique, not all pegs will fit into their holes immediately. Always have sandpaper handy for when they're too big, and when pegs are too small, a thin coat of superglue or a strip of tape may help. All the bolts I used are 3m bolts and the nuts are nylock nuts.

Arm

Fist, place the upper arm bone into the shoulder.



Place shoulder peg onto shoulder and add the second shoulder part on top, screw together with a 15mm bolt. I recommend adding some glue to keep the arm bone and shoulder pieces in place as they don't need to move.



Place into upper arm shell.



Add second part of shell.



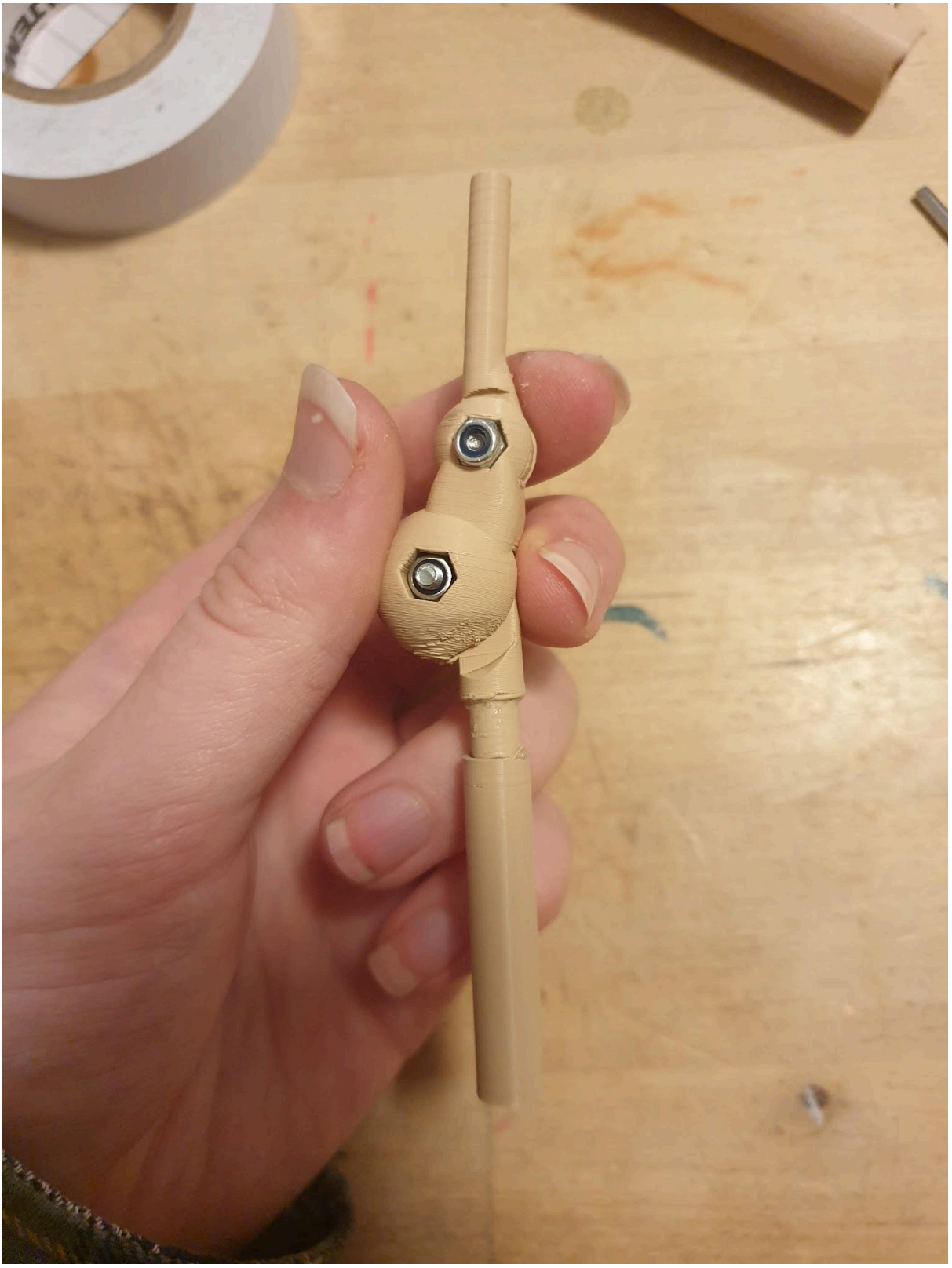
Attach elbow upper to elbow middle with a 8mm bolt.



And elbow lower with a 15mm bolt.



Slot it into the lower arm bone. I glued this in place as well.



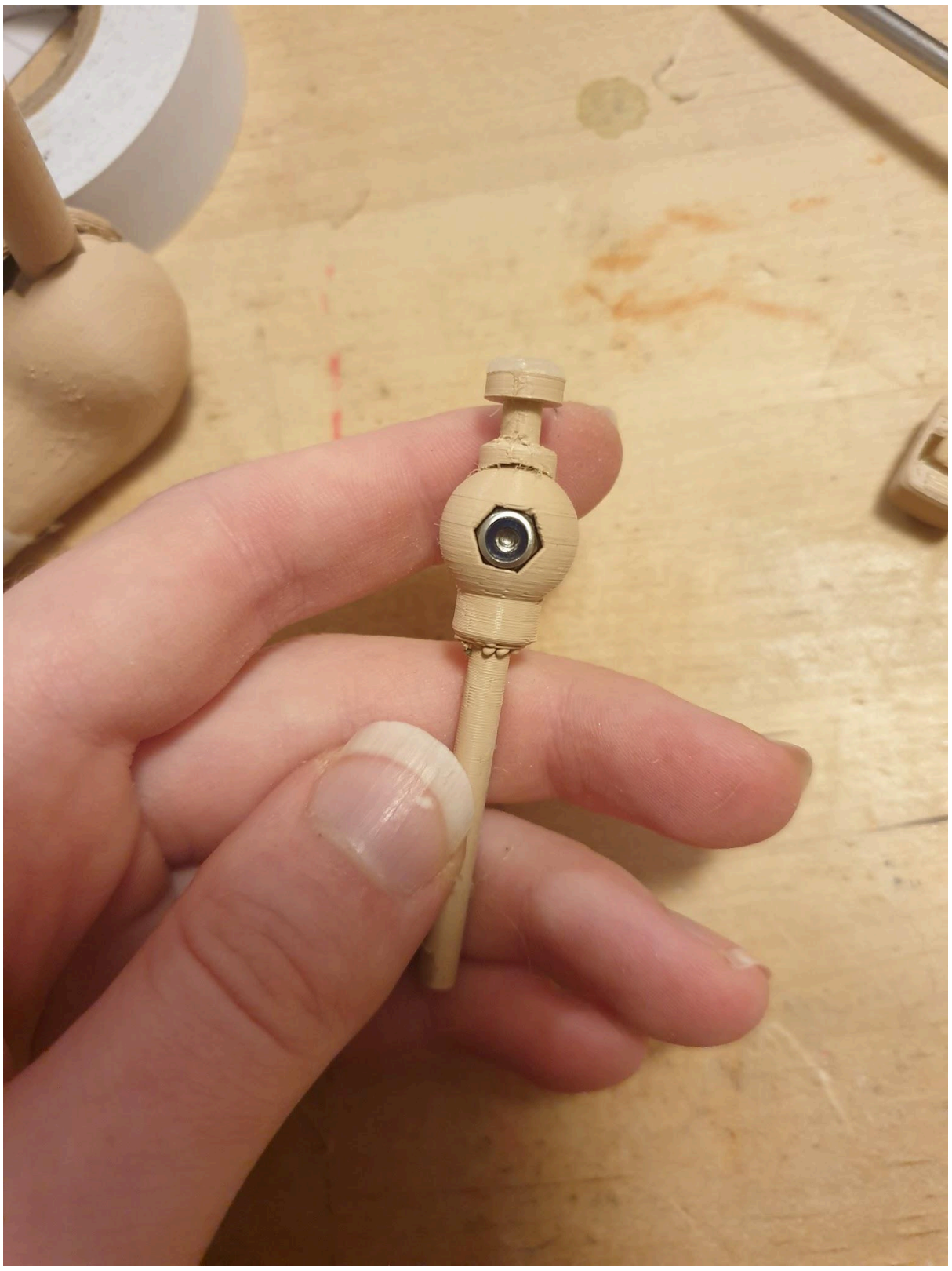
Slide it into the lower arm shell. It's not supposed to go past the bottom hole in the shell.



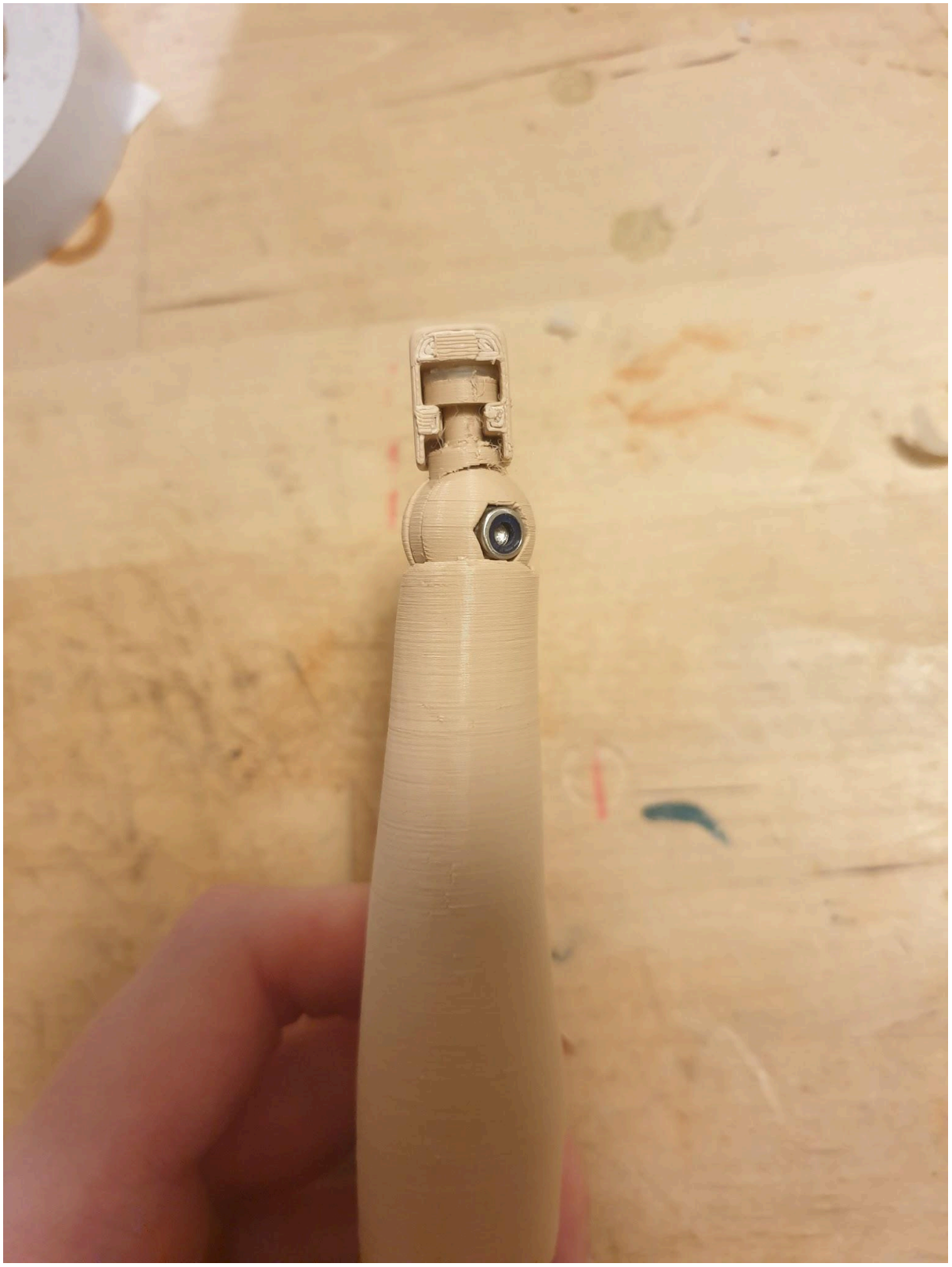
Then into the upper arm. You'll want the upper elbow peg to slide fairly easily in and out so the double joint works properly.



Assemble wrist 1 and 2 with a 8mm bolt.



Attach it to the lower arm, then slot the hand peg onto the wrist.



Then insert the hand peg into the hand. If it keeps falling off, you can keep it on with some blu-tac or a drop of hot glue. Hot glue is great because it's easy to peel off when needed but keeps things in place fairly well.



Torso and thighs

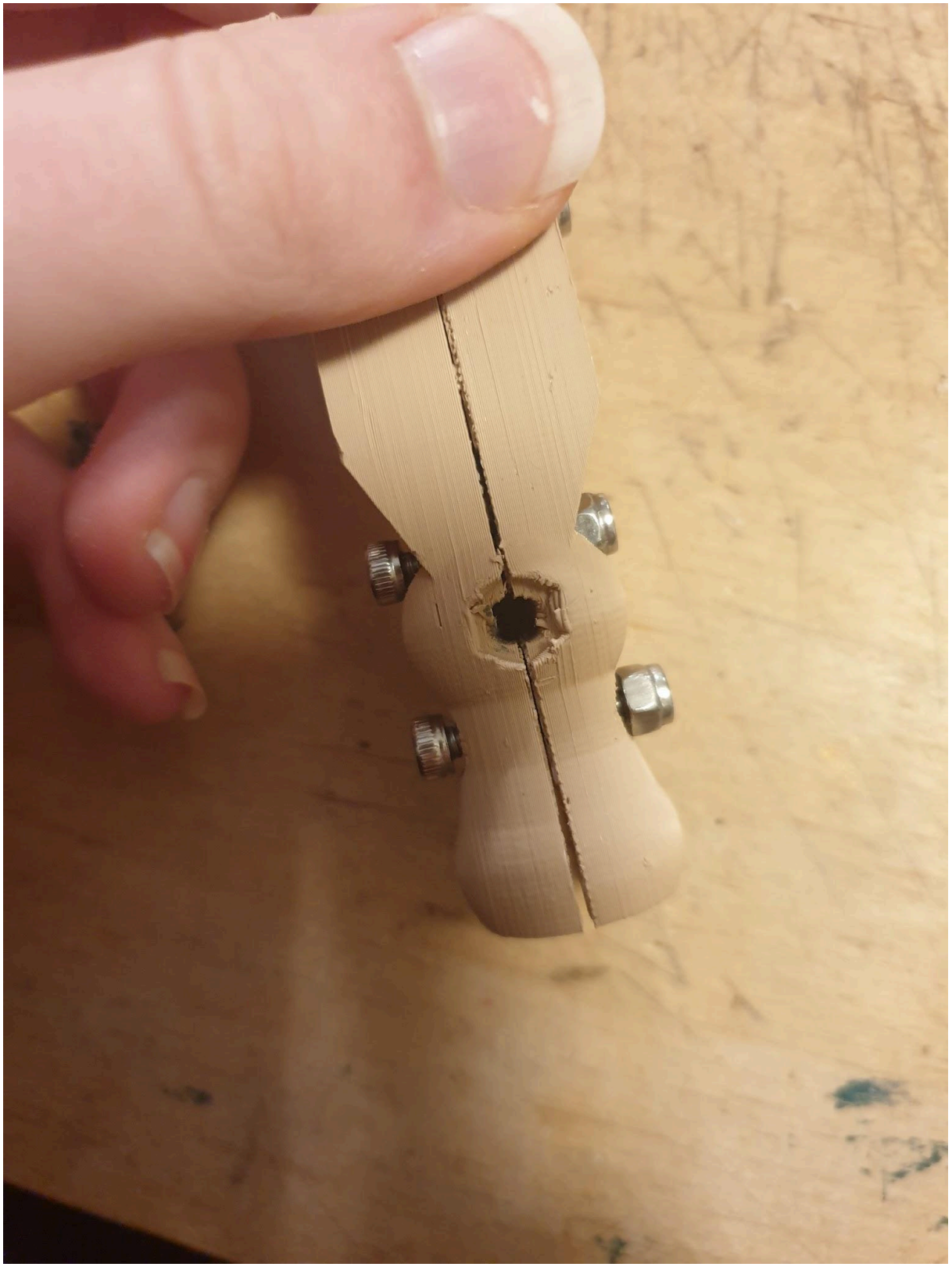
Screw the two bottom spine pieces together at the top with a 18mm bolt.



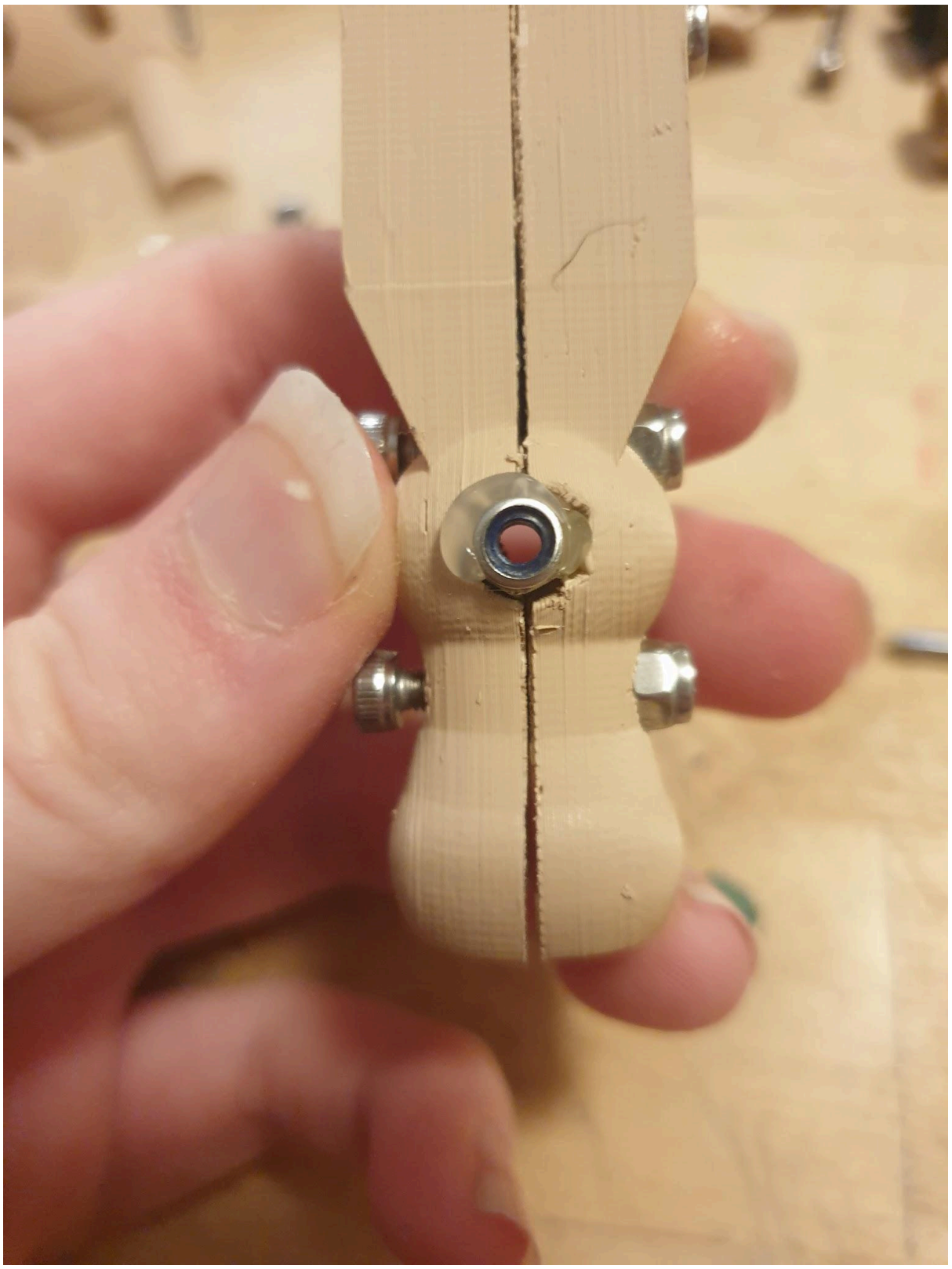
Attach the spine upper piece with a 25mm bolt. You can tighten the bolt below to increase the tension in this joint. You want it to be fairly tense so it won't wiggle around a lot, only to move when pressure is applied.



Screw an 18mm bolt into each hole at the bottom. Do not tighten, as you'll need it to be loose enough to insert the pelvis joint into the socket at the bottom.



Glue nut into the hole at the back.



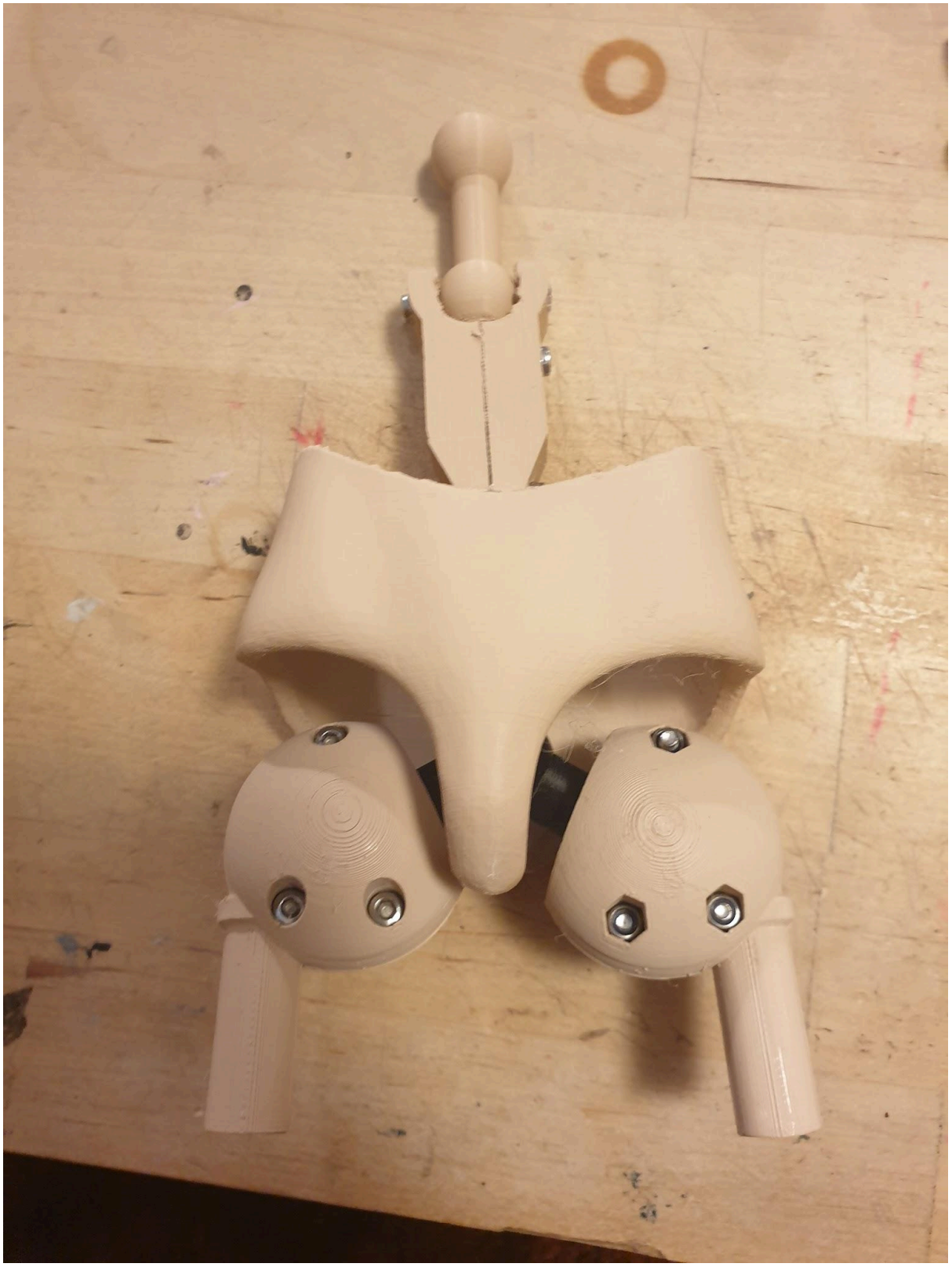
Slot pelvis joint into socket and tighten the screws.



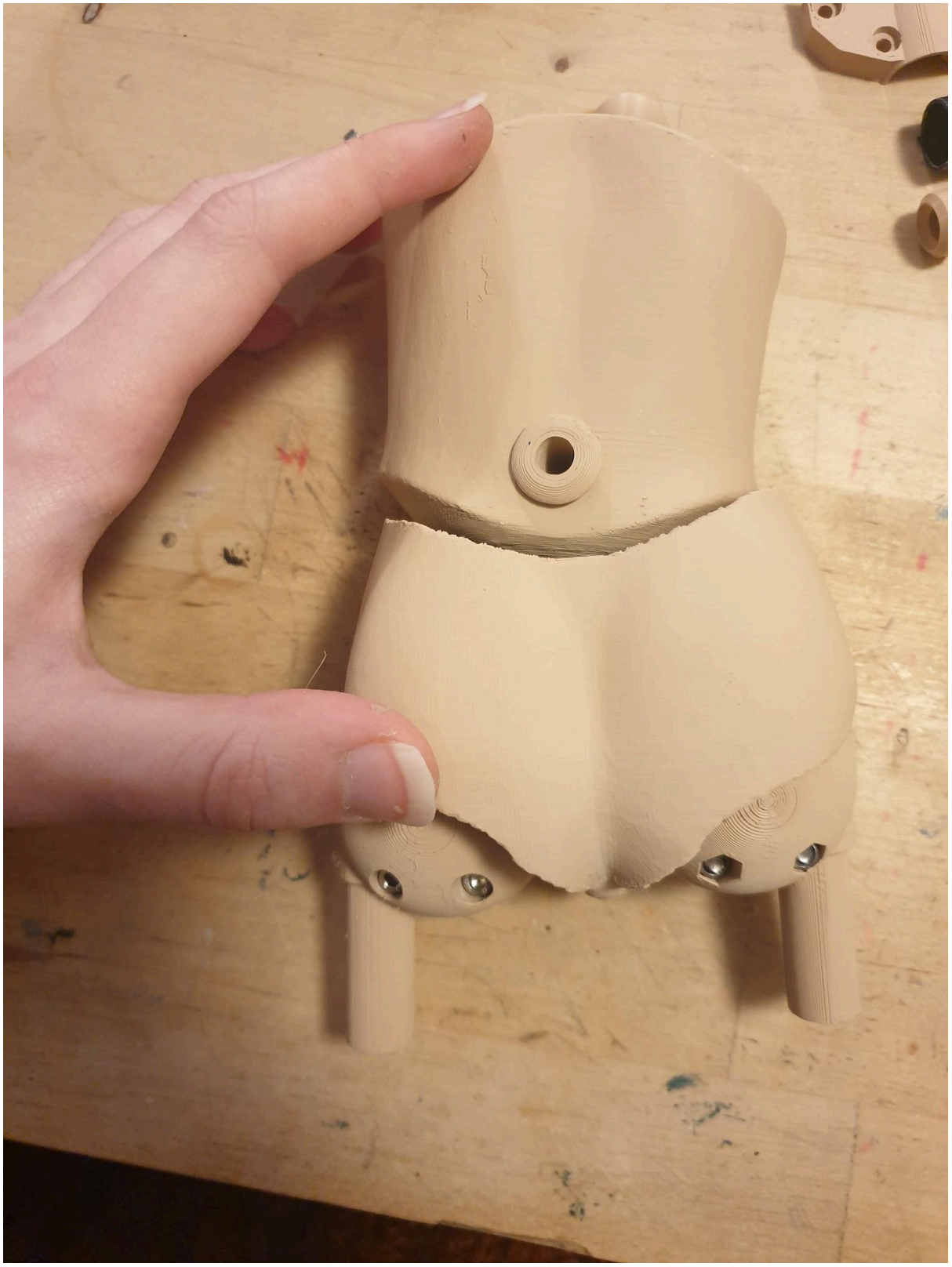
Using 18mm bolts, screw one of the hip joints together onto the pelvis. This joint should be pretty tight.



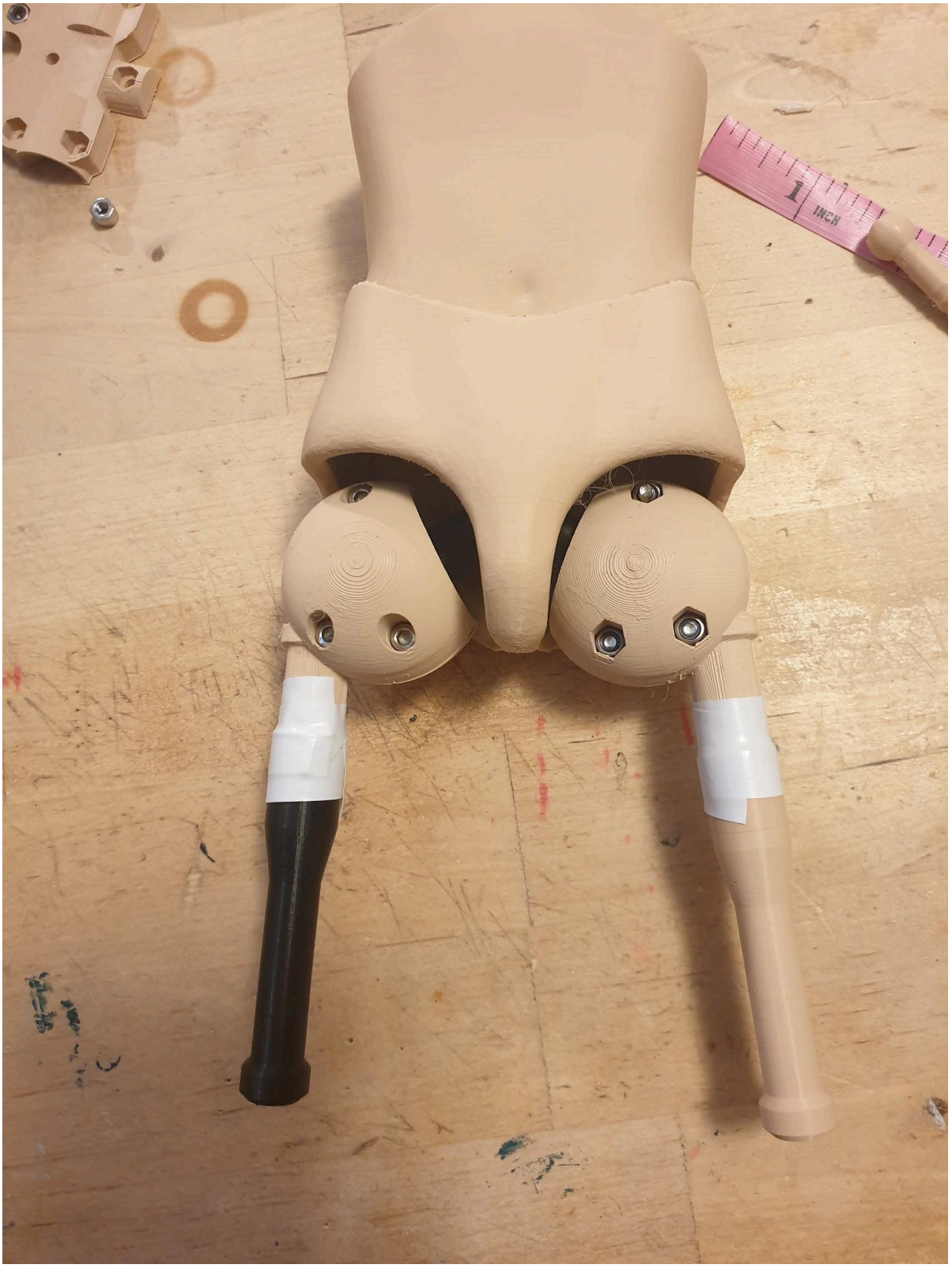
Slot the pelvis joint into the pelvis shell, the attach the other hip.



Slide the waist shell onto the spine (this will take some manoeuvring but it should work just fine). Slot the back peg through the hole in the shell and into the hole in the spine, then screw it together with a 18mm bolt.



Slot thigh bones onto hip joints. Keep these in place with glue, or in my case for a more temporary solution, tape.



Place thigh shell around hip joints.



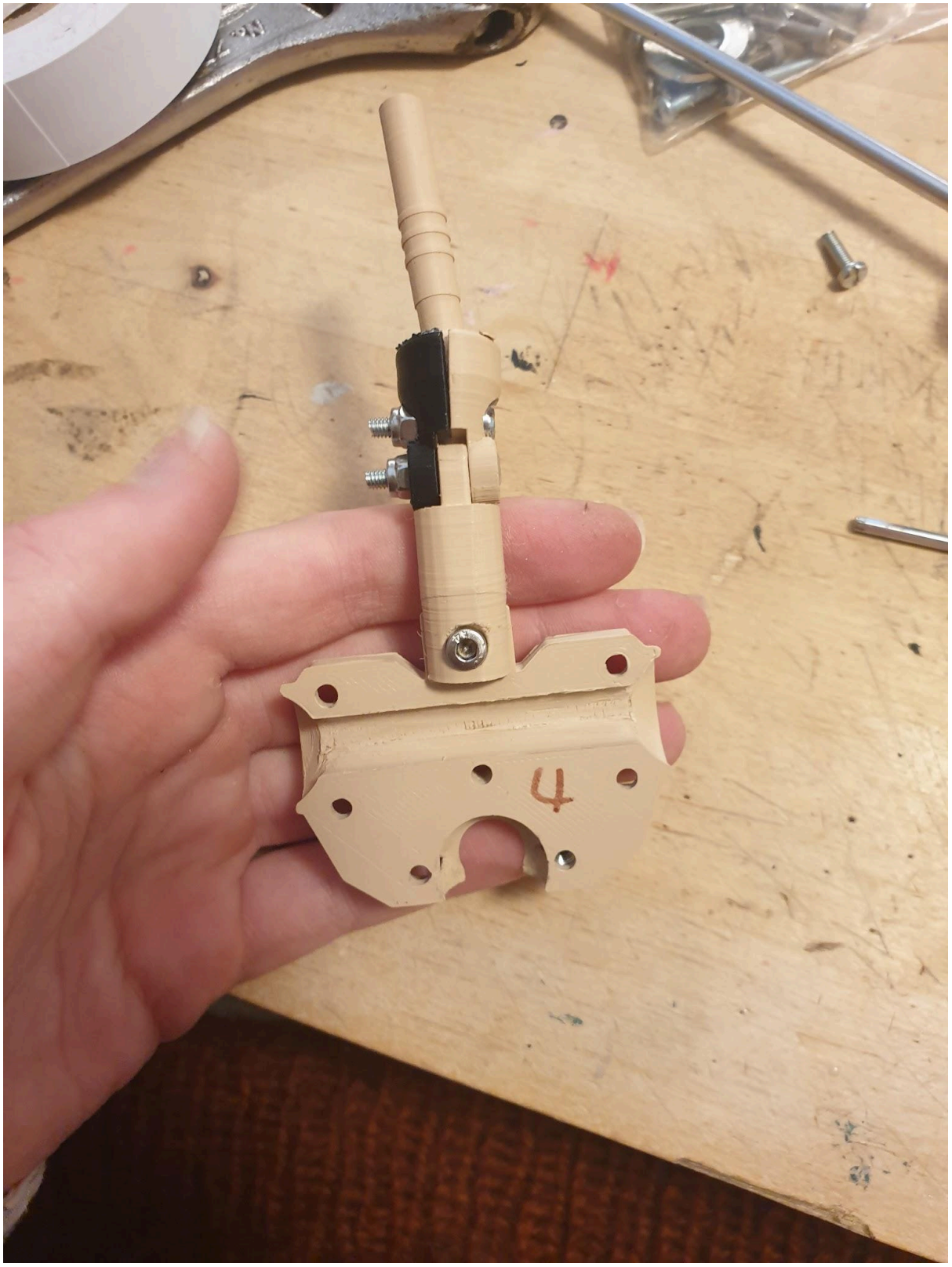
Sandwich neck top between neck middle 1 and 2 and screw them together with a 12mm bolt.



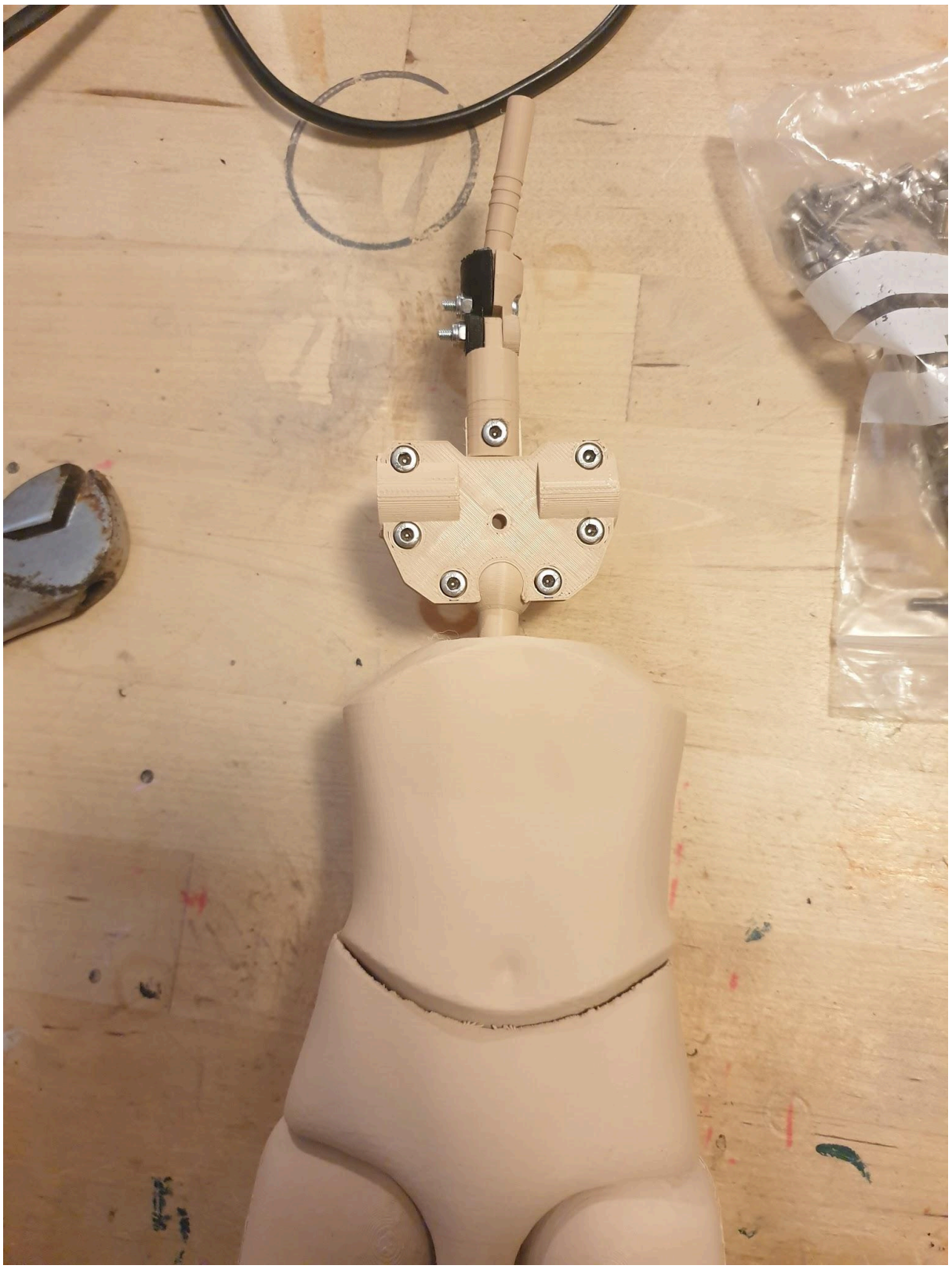
Attatch to neck lower.



And attach this to chest with a 8mm bolt.



Sandwich the top ball of the spine between chest 1 and 2 and screw together with 8mm bolts.



Slot chest shell on top and insert arms.



Attach head. If it's loose, wrapping the head peg with a little tape can help.



Shin/foots

Slot knee joint and shin bone into shin joint.



Place other shin joint on top and screw together with a 18mm and a 10mm bolt.



Place it in the shin shell.



If you printed the two-piece foot, put the pegs in the holes and put the foot pieces together. Then attach the ankle joint with a 15mm bolt.



Then put it into the shin bone.



Attach to thighs.


Sharpie
FINE POINT

Changes:

Stuff I want to change in future but haven't gotten the time to yet

This project was a lot of firsts for me so it's by no means perfect, so I decided to list out the future changes I'd like to make as a reminder to myself as well as a way to keep anyone interested up to date.

- Alter hand model
    - The way the hand sits on the peg looks slightly off
- Change the way the upper arm bone sits in the shell
    - Some added wiggle room would let the elbow bend further
- Make the shell models higher res
    - Especially the head
- Fix pelvis/hip joints
    - Can sit fairly well, but does "manspread" slightly
    - Hip joint is too loose
- The stand socket issue
    - The socket works fairly well and has the added bonus of keeping the spine joint in place, but it can slide in and out in certain poses, which isn't ideal
- General reinforcement
    - I've added a lot of reinforcement on the joints to make them as durable as possible, but I'm always on the lookout for weak spots and now that I've fully printed the doll, I'll get some normal use testing in. I don't feel comfortable glueing the shell pieces together without stress testing everything properly.