Title: Reusable 3D pelvic floor teaching model for layered construction activities (Super-Models) 200/300

Date: 10/31/2026 - 11/6/2026

Client: Kelsey Henriquez
Advisor: Prof. David Dean
Team:
- Katherine Ahlquist (kahlquist@wisc.edu) - Co-Team Leader
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- Mina Hawkins (mjhawkins@wisc.edu) - Communicator
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- Hiba Shah (hashah2@wisc.edu) - BPAG
- Karen Pisano (kpisano@wisc.edu) - BSAC

Problem statement

The Physician Assistant anatomy curriculum currently has a pelvic floor anatomy workshop that uses a 2-dimensional paper template of the bony pelvis, on which PA students build pelvic floor musculature and tissues using colored Play-Doh. While the activity promotes hands-on learning, the 2D model does not adequately allow students to develop the three-dimensional spatial relationships required for future clinical practice. The client needs a classroom set of pelvic outlet models that accurately represent the normal adult pelvic anatomy, including anatomical landmarks for muscle and ligament attachment, that can serve as a stable scaffold for students to build pelvic floor musculature. It should be durable enough for repeated classroom use, easy to assemble and store, and allow Play-Doh or another inexpensive modeling material to be adhered and removed without causing residue or degradation.

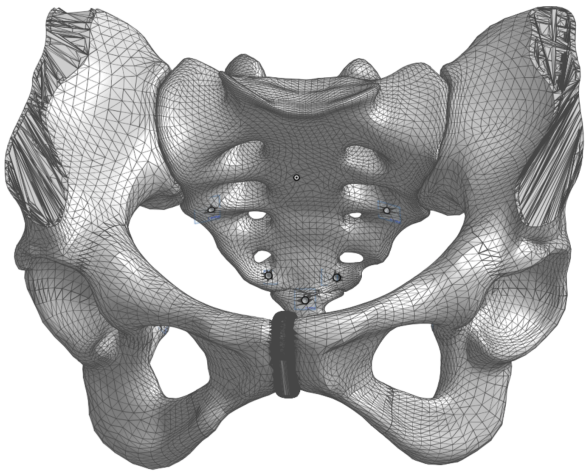
Brief status update

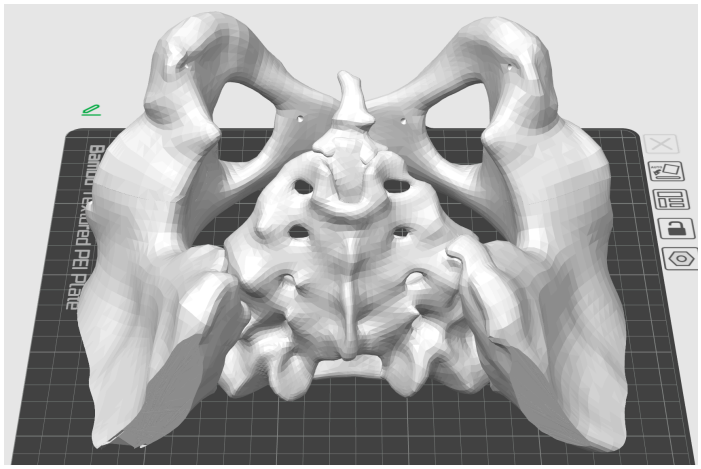
This week, the team conducted several tests with the models. A drop test was performed on both carpet and tile with the most recent prototype of the pelvis model. The coccyx tip broke on the carpet drop test, and the sacrum broke on the tile drop test. Due to these results, the team changed the infill of the model to Gyroid to help distribute shock waves evenly in future drop tests. This modified model also failed the tile drop test, so a new model was created with an increased local infill around the coccyx and sacrum to improve strength. The screw hole sizes were also adjusted to improve screw attachment strength. The model was also sprayed with an even coating of matte modge podge to test how it affects PlayDoh application. After testing, the team found the PlayDoh stuck better to the unmodified PLA, but the matte modge podge helped reduce PlayDoh residue, so it may have a useful application for cleanup.

Difficulties / advice requests

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Current Design



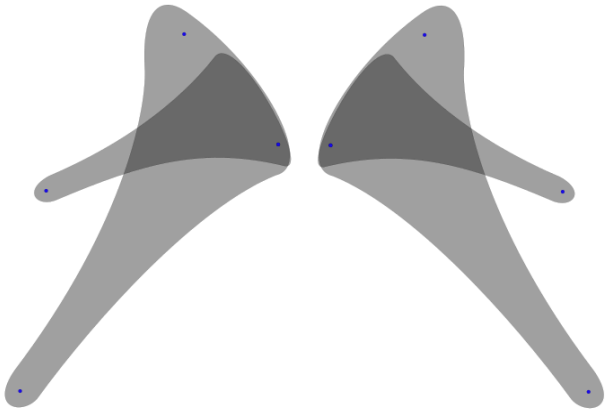


[OnShape 3D Model]

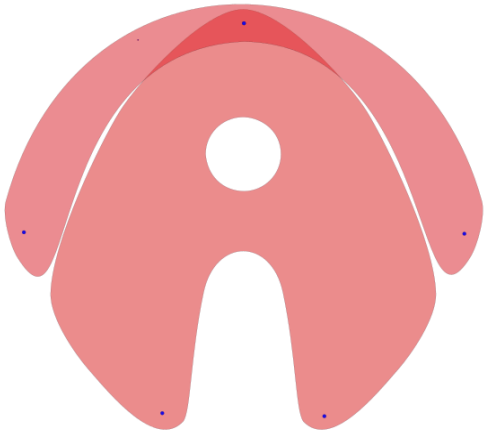


In the Screws with Attachments design, there are 7 pieces total: a 3D printed pelvis, a coccygeus muscle, a levator ani muscle, 2 flexible sacrospinous ligaments, and 2 sacrotuberous ligaments. The outer surface of the model will be coated with matte Mod Podge spray, allowing for better Play Doh adhesion onto the 3D printed surface. The pelvis is a simplified model, with the iliac crest sections superior to the proximal end of the sacrum removed. To allow the attachment of the diaphragm and ligaments, there are screws on the pelvis surface. To address the lower longevity score, the attachment sites involve self-threading screws, with future testing to ensure the screws are able to withstand repeated use without snapping under grip forces up to 624 N. Each of the flexible ligaments and musculature will have attachment holes at the ends with a wide and a narrow section to match anatomical shapes, as seen in the musculature attachment prototypes below. Finally, all structures will adhere to an average of male and female anatomical dimensions, creating a gender-neutral multi-piece pelvis model.

First prototype of musculature attachments:

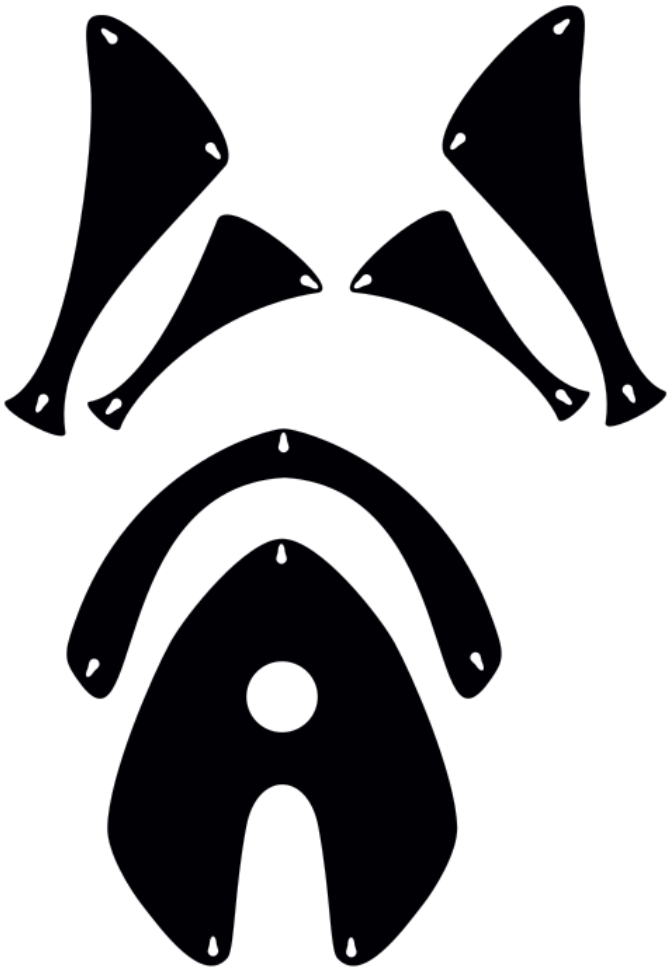


Sacrotuberous and Sacrospinous Ligament Dimensions

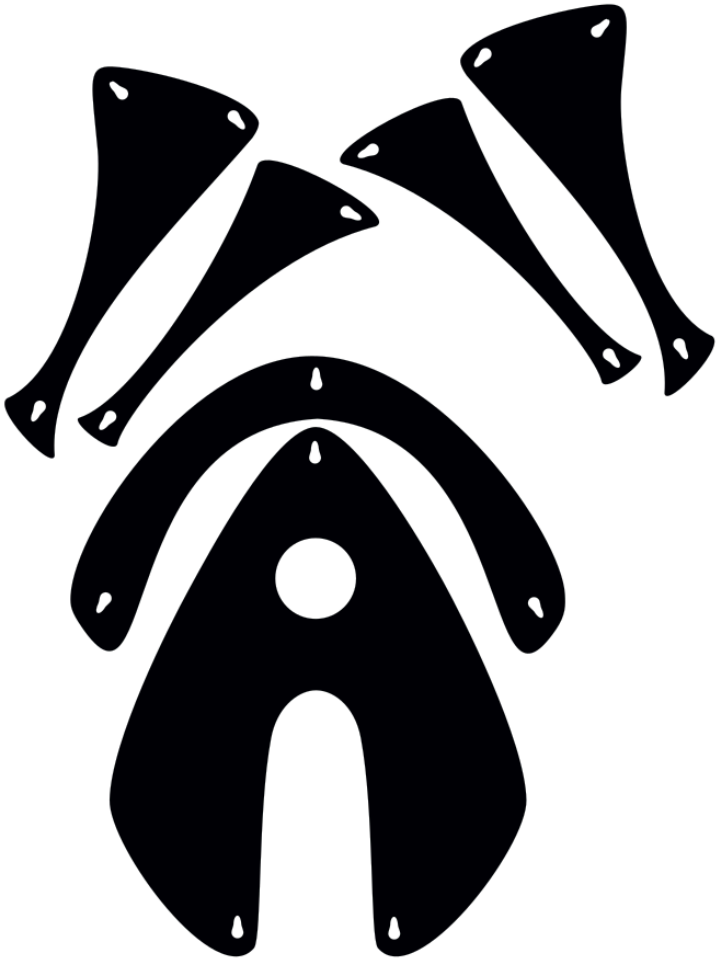


Levator Ani and Pubococcygeus Dimensions

Second Prototype of attachments:



- Coccygeous: narrower, and shorter to get rid of slack.
- Levator Ani: slightly longer.
- Sacrotuberous ligament: slightly shorter and splayed out anchoring end.
- Sacrospinous ligament: same sizing, slightly splayed out anchoring end.



Third Prototype of attachments:

- Coccygeous: narrower, and shorter to get rid of slack.
- Levator Ani: slightly longer and wider to match how it should lay on the pelvis.
- Sacrotuberous ligament: top hole lower and changed angle of the splayed out end.
- Sacrospinous ligament: longer

Materials and expenses

Item	Description	Manufac- turer	Mft Pt#	Vendor	Vendor Cat#	Date	#	Cost Each	Total	Link
3D-Printed Scaffold										
Main body of pelvic model	3D printed using PLA from the UW Madison Makerspace	UW Madison Maker space	N/A	N/A	N/A	10/06.2026	30	8.05	241.5	N/A
Screws	390 screws needed for 30 models' ligament attachment sites.	MoyoCodi	PTZG03 #312	Amazon	PTZG03#312.	10/20/2026	4	3.99	16	link
Modpodge	The entire outer surface requires coating.	Modpodge	1469	Amazon	1496	10/06.2026	3	10.18	30.54	Link
Pelvic accessories: Ligaments & Diaphragm										
TPU (red, black,white)	Printing ligaments with provided filament	UW Madison Maker space	N/a	N/a	N/a	10/25/26	30	2	60	N/a
	*$33 off makerspace left (total not subtracted yet)							**TOTAL***	348.04	

Major team goals for the next week

Next week's individual goals

- Katherine
  - Work on additional ligament sizing
  - Explore dif
- Sara
  - Analyze the results of testing and make adjustments to the pelvis 3D prints as needed
  - Work with the DI Lab to begin mass printing of the pelvis models
  - Compile and update all of the fabrication protocols in creating the final 3D pelvis model
- Mina
  - Send client pictures of the updated ligaments and muscles attached to the model to ensure they reach clients' expectations.
  - Perform durability tests of the updated ligaments and muscles.
  - Assist with laser cutting new ligaments and muscles out of EVA foam, then perform ease of use and durability testing.
  - Begin working on Final Report.
- Abigayle

    - Conduct final drop test on latest iteration of 3D printed pelvis, ensure durability matches client expectations before mass production
    - Assist with mass production of 3D models
    - Begin work on final report/assembly of documents
- Hiba
    - More testing with mod podge and dropping
    - Mass production of models
    - Putting together final report
- Karen
    - Help with final testing
    - Begin mass production of final 3D model
    - Help with Final Report

Timeline

Task	Sept			Oct					Nov				Dec	
	11	18	25	2	9	16	23	30	6	13	20	27	4	13
Project R&D														
Empathize	x	x	x	x										
Background…	x	x	x	x										
Prototyping					x	x	x	x	x					
Testings							x	x	x					
Deliverables														
Progress Reports	x	x	x	x	x	x	x	x	x					
PDS		x	x	x	x	x	x	x	x					
Design Matrix			x											
Prelim Presentation				x										
Prelim Deliverables					x									
Show and Tell								x						
Final Poster														
Final Deliverables														
Meetings														
Client	x				x	x								
Advisor	x	x	x	x	x	x	x							
Website														
Update	x	x	x	x	x	x	x	x	x					

Filled boxes = projected timeline
X = task was worked on or completed

Previous week's goals and accomplishments

- Mass printing of 30 models
- Starting post fabrication of models (mod podge layering, screws, etc)
- 3D printing ligaments

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Katherine	11/3/2026	Ligament sizing testing and adjustments. Started printing another version of ligaments.	3 hrs	3.75	34.25 hr
	11/4/2026	EVA foam research – ordered some material to prototype with.	.75 hr		

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Sara	11/3	Altered the texture of the 3D model and 3D printed it for testing	0.75	2.75	48.7 hr
	11/5	Added a 3D filament modifier to strengthen coccyx and printed modified models	1		
	11/5	Compiled all of the 3D print settings into a Bambu Studio file and documented the settings to prepare for mass printing	1		

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Abigayle	11/1	Drop Test on model, cleanability test on model, spraying mod podge on model for future testing	1	4.5	42.45 hr
	11/1	Documentation of protocols and testing	1		
	11/4	Post-processing/tree removal of latest 3D printed model Drop test on new model Development and performing of new cleanability test	1.5		
	11/4	Documentation of protocols/testing	1		

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Mina	11/3	Ligament ease of use testing, EVA foam research, and new ligament shape research.	2	2	40

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Hiba	02/11	Updated Lab notebook with project files and fabrication	1	3	39.45
	03/11	Drop Test on model, cleanability test on model, spraying mod podge on model for future testing	1		
	03/11	Documentation of protocols and testing	1		

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Karen		Unfortunately, I was extremely sick with Strep this week and was unable to participate in any in-person prototyping or testing - however I look forward to helping out with the Final Report and any future testing!		.5	38
	11/6/26	Updating progress report #9	.5		