

Relations Between Confidence and Training Effects, from Optional Study with an Abdominal Simulator

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General Objective

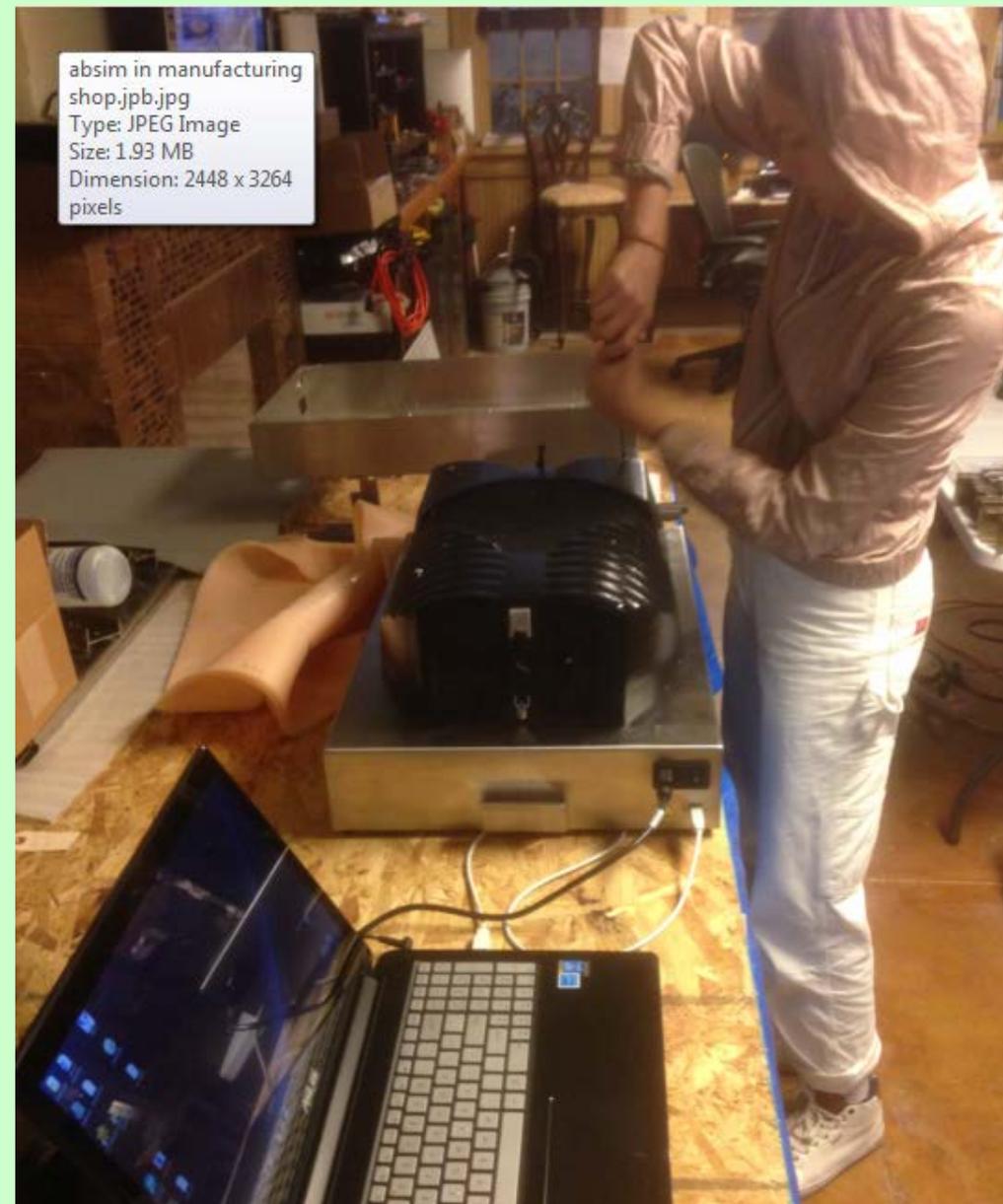
- To assess whether studying using an abdominal simulator helps medical students have
 - better abdominal exam technique
 - more confidence in their technique
- To assess whether “confidence in one’s ability” is accurate, and can be used to assess medical student competence.

Can Teachers Believe Medical Students' "Confidence"?

- Much research in medical education relies on self reports of competence (or "confidence in one's ability").
 - Quick and easy
 - Any validity? Some have suggested not (e.g., Eva and Regehr, 2011) while others find some relation (e.g., Carney et al, 2012; Davis et al, 2005), and suggest accurate self assessment could be trained .
- We both measured competence objectively and asked for self assessments ("confidence in my ability to...").
 - Opportunity to observe relation between the two types of measure.
- Learning task:
 - Palpation technique, for the physical exam of the abdomen.
 - Abdominal simulator.

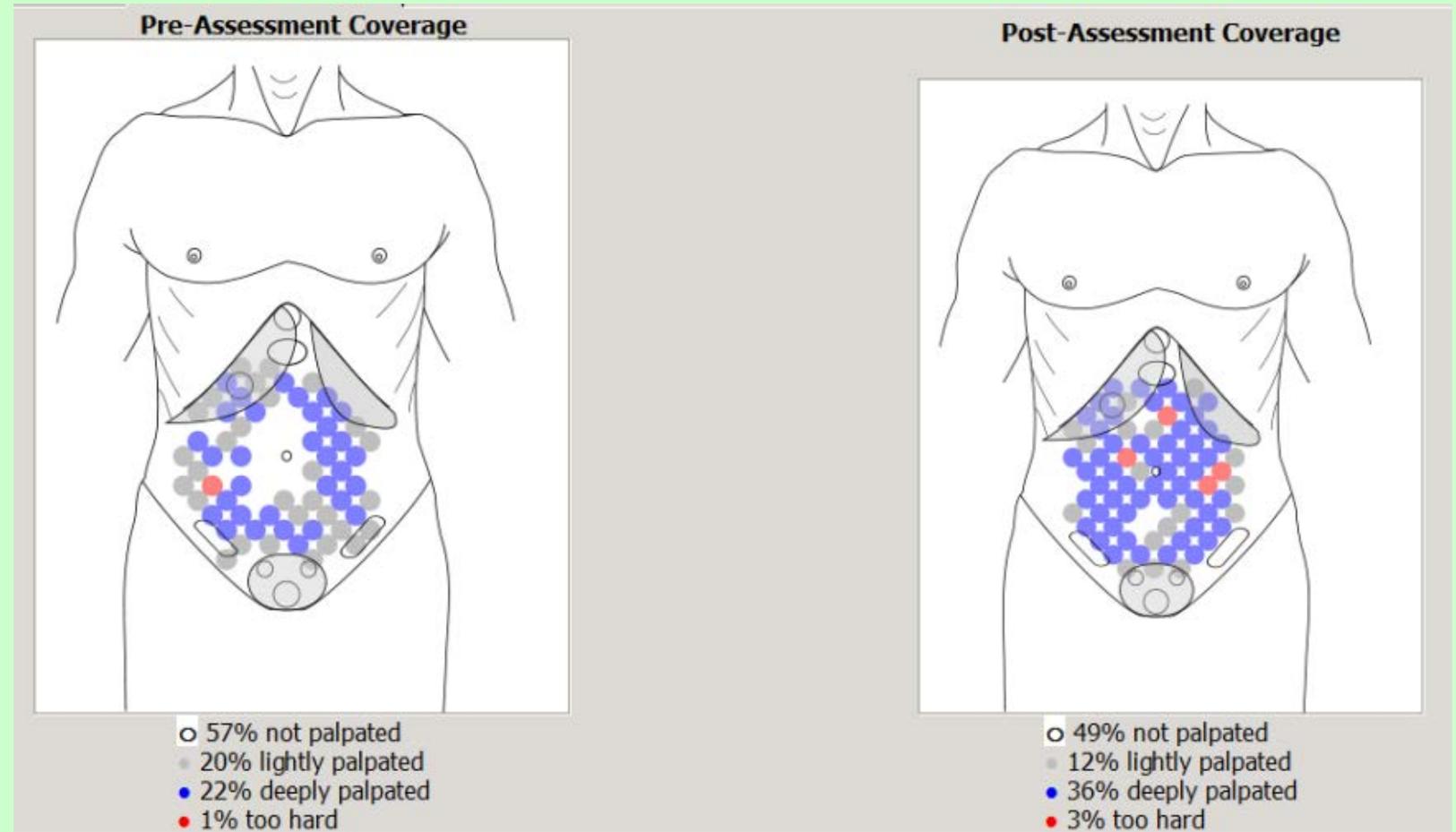
The Abdominal Simulator

- Co-author Frank Papa developed and owns it.
 - Workshop in his basement.
- Frame (ribs and pelvis)
- Skin
- Sensor pad
- Air Chambers/Bladders
- Moveable “hard spot”
- Computer controls
- Computer display of palpation location and depth



Feedback Display – Depth of Palpation

- Display of student palpation in examining the abdomen, before and after a training session.
 - Depth – gray, blue, red (versus none)
 - Coverage



Feedback Display - Organs

- This student increased the depth of palpation.

	Pre-Assessment Coverage			Post-Assessment Coverage		
	Light palpation	Deep palpation	Palpation too deep	Light palpation	Deep palpation	Palpation too deep
Appendix Region	✓	✓		✓	✓	
Colon Region	✓	✓		✓	✓	
Gallbladder Region	✓			✓	✓	
Gastric/Epigastric Region						
Left Ovary Region	✓			✓	✓	
Right Ovary Region	✓	✓		✓		
Pancreatic Region				✓	✓	
Normal Urinary Bladder				✓	✓	
Liver Region	✓	✓		✓	✓	
Splenic Region	✓			✓	✓	
Distended Urinary Bladder	✓			✓	✓	

HP Update
An update is available. Would you like to download

Feedback Display - Organs

- This student started off pressing too hard.

	Pre-Assessment Coverage			Post-Assessment Coverage		
	Light palpation	Deep palpation	Palpation too deep	Light palpation	Deep palpation	Palpation too deep
Appendix Region	✓	✓	✗	✓	✓	
Colon Region	✓	✓		✓	✓	
Gallbladder Region	✓	✓		✓	✓	
Gastric/Epigastric Region						
Left Ovary Region	✓	✓	✗			
Right Ovary Region	✓	✓	✗	✓		
Pancreatic Region	✓	✓	✗	✓		
Normal Urinary Bladder	✓	✓		✓		
Liver Region	✓	✓	✗	✓	✓	
Splenic Region	✓	✓	✗	✓	✓	
Distended Urinary Bladder	✓	✓	✗	✓	✓	

Study Design

- 3rd year medical students choose whether to volunteer to study with abdominal simulator, during required 4-week Family Medicine clerkship.
- Measures at beginning and end of clerkship:
 - Confidence in abdominal simulation technique
 - Ranking of preference for 9 methods of learning about the abdominal exam, including use of abdominal simulator.
- Measures only available for students who study with the abdominal simulator:
 - Before and after measures of organ coverage and depth of palpation.
- Measures only at end of clerkship:
 - Student opinion about value of studying with abdominal simulator.
 - Student report of amount of experience examining abdomens of patients.



Study Hypotheses

- H1. That students who are less confident in their abdominal exam technique will choose to study with the abdominal simulator.
 - H1a. That students who already had Internal Medicine or Surgery rotations will be less likely to study with the abdominal simulator.
- H2. That studying with the simulator will increase students' abdominal exam competence (calibration and coverage).
- H3. That students who study with the abdominal simulator (plus clerkship clinical experience) will experience a larger increase in confidence than students who have only the clerkship experience.
- H4. That there will be a correlation between student confidence and measured competence, both before and after the training and clerkship experience.
- H5. That changes in competence will be reflected in changes in confidence.
- H6. That students who study with the abdominal simulator will increase their opinion of its value.

Methods

- Study was conducted every MS3 four-week clerkship cycle, 2017-2018, OUHSC OKC COM Class of 2019.
 - 9 to 13 students per cycle.
- The study is introduced in a group meeting, 1st week;
 - Informed consent.
 - Initial survey - confidence regarding physically examining the abdomen, and study method preferences.
 - Individual sessions with the simulator are scheduled.
- Training with the AbSim (from ACDET, Inc., Fort Worth, TX) about palpation technique.
 - One ½ hour session, with pre- and post-training measures of palpation technique.
- Final questionnaire (confidence, preferences, attitudes, and experience) administered in group session, 4th (final) week.

Procedure With Abdominal Simulator

- Pre-instruction. Each student did two “blind” exams of the simulated abdomen, which were recorded by the abdominal simulator (AbSim) software.
 - First, show their “light” touch, looking for localized pain, muscular guarding, or gross abnormalities.
 - Second, show their “deep” palpation, assessing the size and feel of each organ, as appropriate, and looking for localized painful spots.
- Instruction.
 - The student did two AbSim training modules, with visual and auditory feedback on (1) the appropriate depth of palpation and (2) coverage of various organs.
 - After this, the student inspected a comparison of their pre- and post-training “deep” palpation exams.
- Post-instruction. Then the student repeated the “light” and “deep” exams.



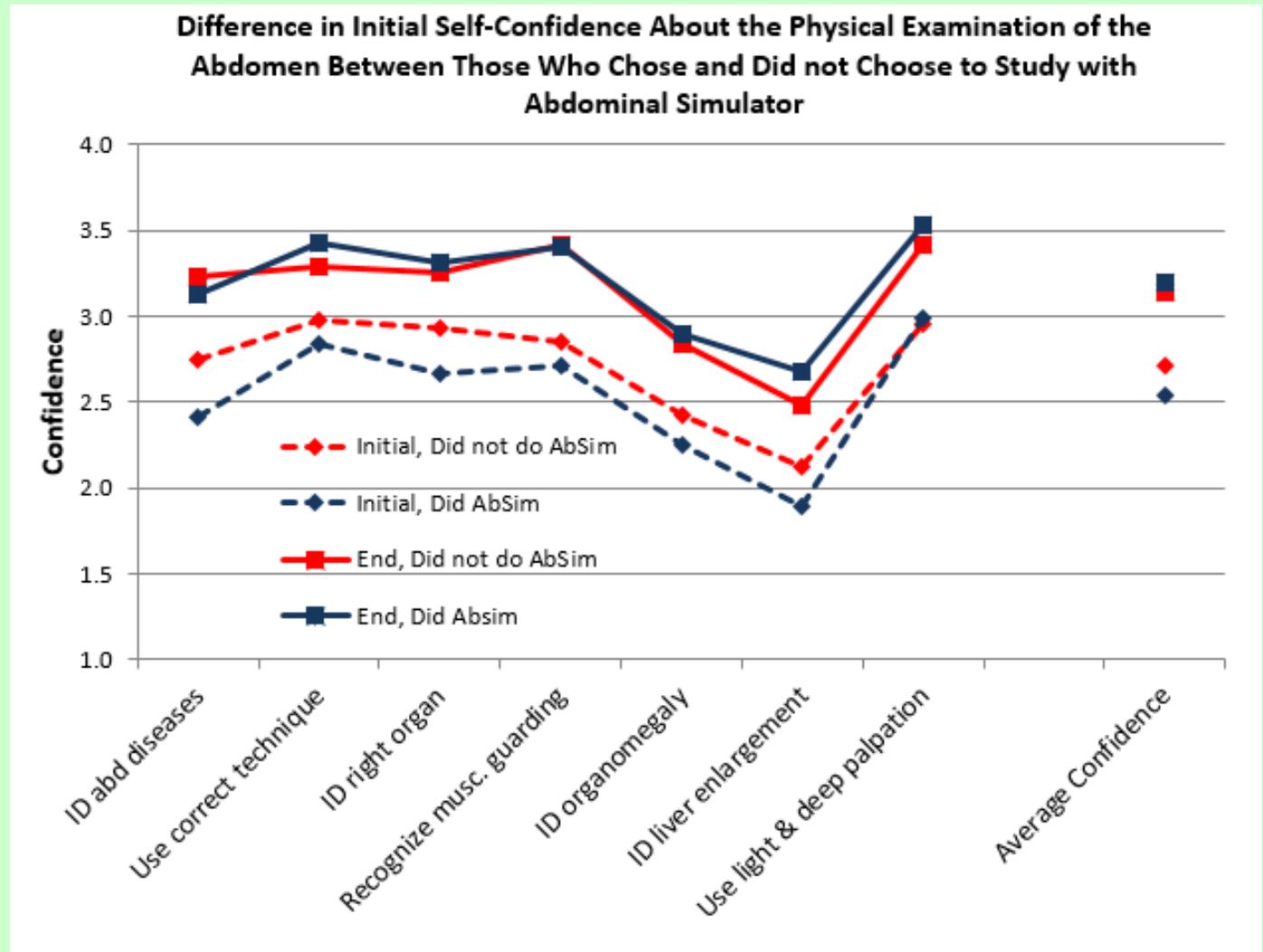
Number of Student Participants

Month	# Students	# Initial Questionnaire	# AbSim Session	# Final Questionnaire
July	12	12	9 (8)	12
August	10	10	10	10
September	13	9	6	8
October	13	13	10	10
November	10	10	10	10
December	11	7	3	5
January	9	9	4	9
February	11	11	8	11
March	12	9	6	7
April	12	12	4	7
May	12	11	3	12
June	12	6	0*	5
Total	137	119	73 (72)	106

*Researcher not available.

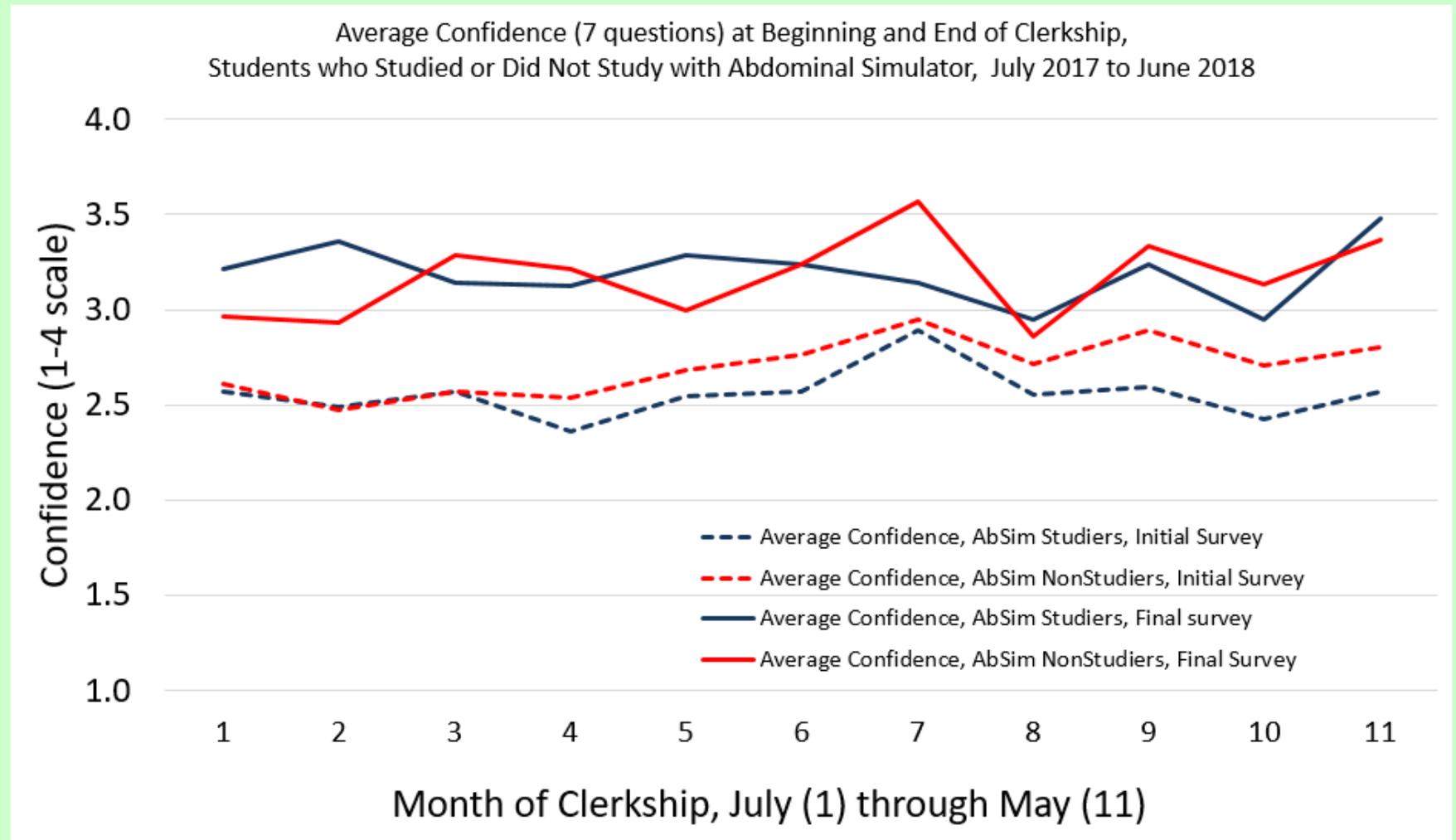
Comparison of the Self Confidence in Abdominal Exam, between those who chose and did not choose AbSim study, at beginning and end of month.

- At end of month, both groups more confident.
- At beginning of month, those who came for AbSim training were less confident than those who did not.
 - On 3 items, plus average.
- At end of month, no difference between groups.
 - Consistent with idea that studying with AbSim increases student confidence up to the average in their class.
 - Though might simply be the excellent education provided by the family medicine clerkship experience.
 - We have no measure of abdominal exam competence of AbSim non-studiers.



Change over the year in the Initial and Final Confidence of those Who Chose to Do AbSim and Chose Not to, Separately

- Only “non AbSim” students had an increasing trend.
- But, fewer AbSim students over time – hence an overall increase in Initial confidence.

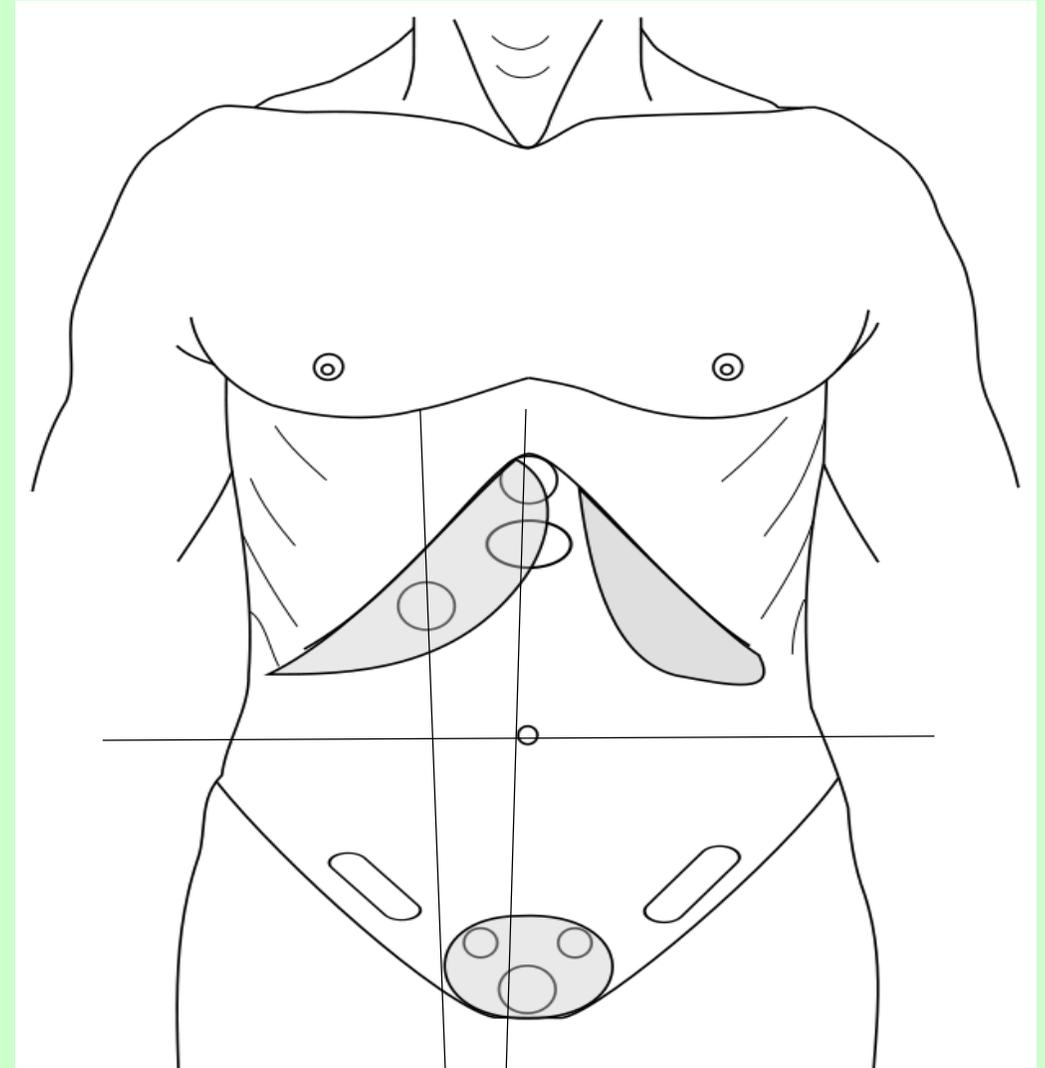
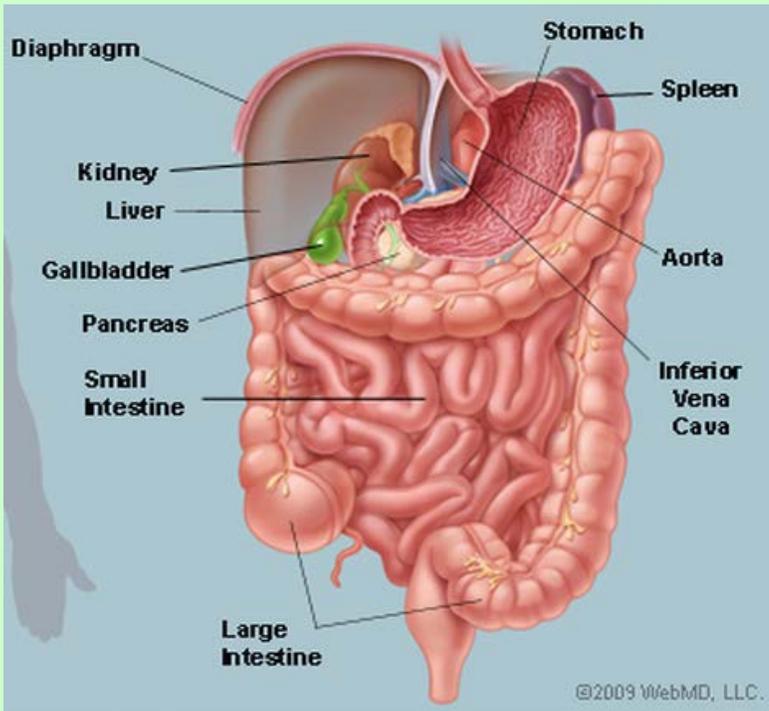


Effect of Previous Clerkship Experiences Upon Choice to Study with the Abdominal Simulator

- Students who previously had an Internal Medicine clerkship were less likely to try the AbSim; Having done Surgery showed the same relation but not significant.
- Internal medicine.
 - Already had internal medicine: 25 of 49 did AbSim (51.0%)
 - No internal medicine yet: 36 of 47 did AbSim (76.6%)
 - Difference is statistically significant: Chi-Square (df = 1) = 6.77, p = .009.
- Surgery.
 - Already had Surgery: 27 of 48 did AbSim (56.3%)
 - No Surgery yet: 34 of 48 did AbSim (70.8%)
 - Difference is NS: Chi-Square (df = 1) = 2.20, p = .138.
- Of course, the later in the year, the more likely had had practice and supervision examining the abdomen of adult patients.

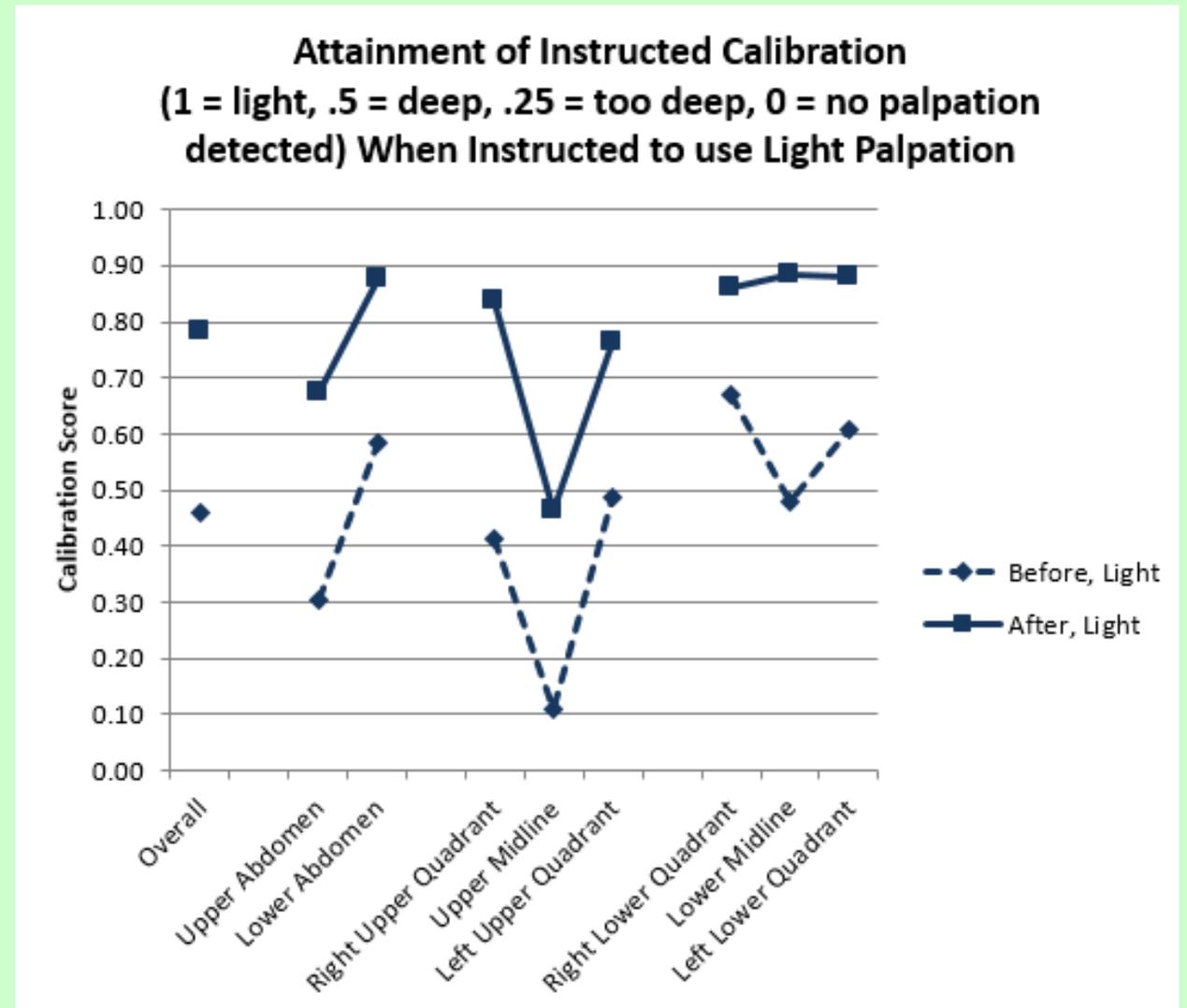
H2. Using Abdominal Simulator Increases Competence

- Measurement summarized by zone. Organs in each zone.
 - Upper right quadrant: liver, pancreas, gallbladder
 - Upper midline: gastric inlet
 - Upper left quadrant: spleen only
 - Lower right quadrant: appendix and right ovary
 - Lower midline: normal bladder, distended bladder
 - Lower left quadrant: colon and left ovary



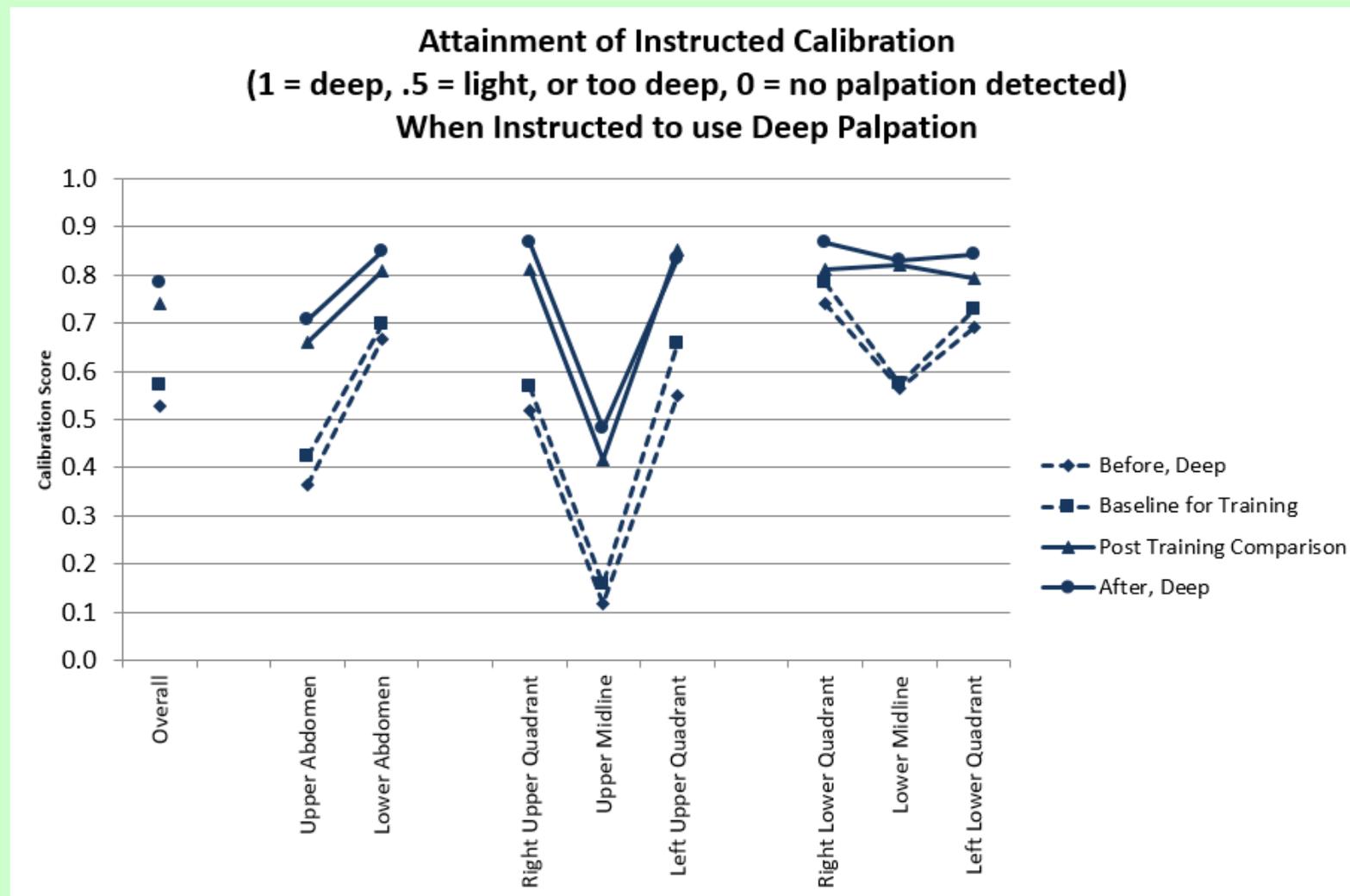
Students' Light Palpation got Significantly Better Calibrated

- N = 72
- “Goldilocks” score, where 1 = just right.
- Every comparison showed better performance, $p < .001$.



Students' Deep Palpation got Significantly Better Calibrated

- Two parallel measurements, before and after.
- N = 72 (before vs after), 60 (baseline vs comparison).
- Before vs after, $p < .001$ at every level of aggregation, every sector.
- Baseline vs comparison, $p < .001$ everywhere except left lower quadrant ($p = .04$) and right lower quadrant ($p = .343$).
 - Already pretty good at the appendix.



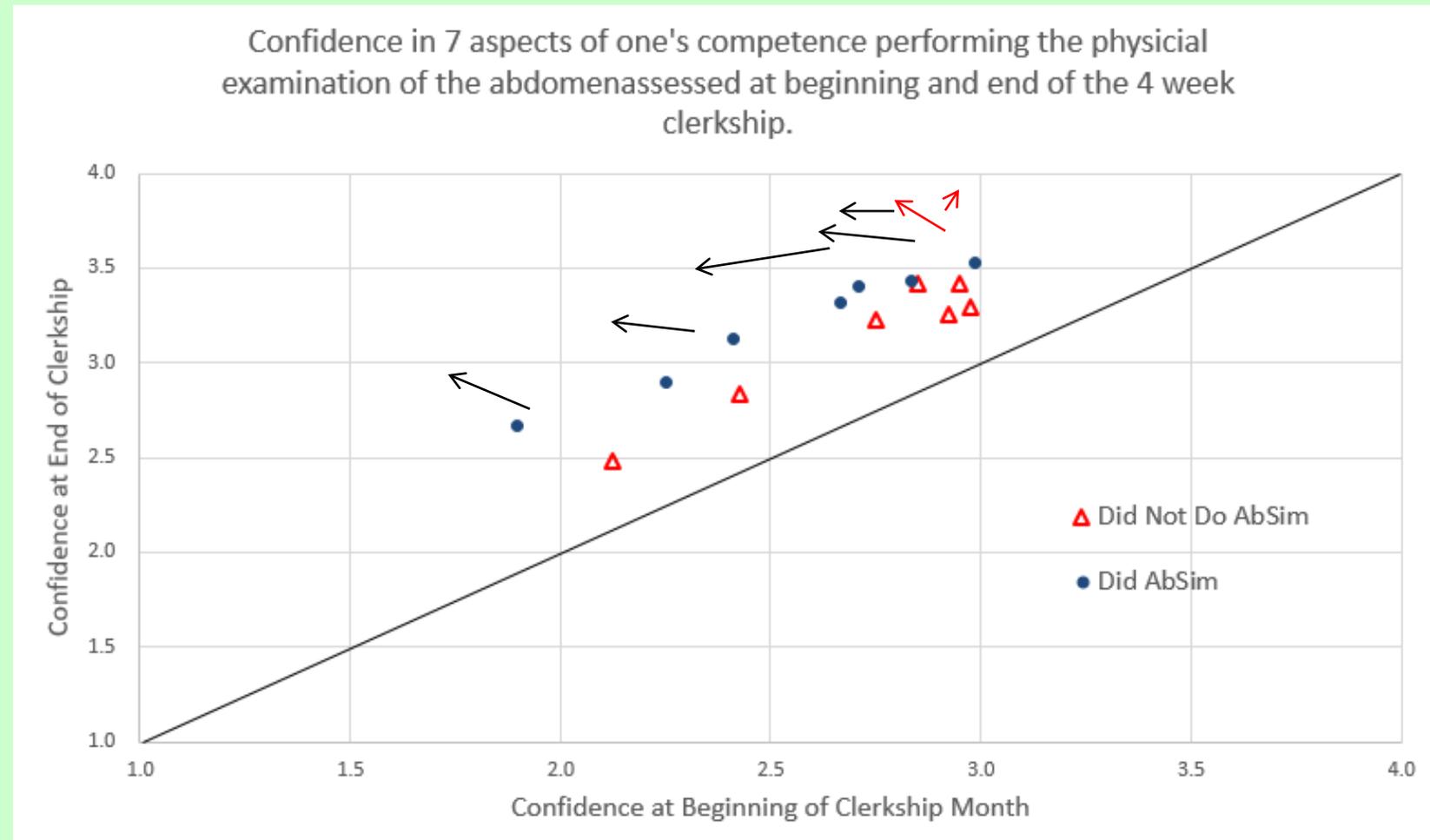


Does Confidence Reflect Measured Competence?

- Hypothesis 3. That students who study with the abdominal simulator (plus clerkship clinical experience) will experience a larger increase in confidence than students who have only the clinical experience.
 - Each group's confidence increased significantly on every question.
 - Confidence that can ID the right organ and ID liver enlargement, and overall, increased more ($p < .05$) in those who did AbSim than in those who did not.
 - Confidence in ID disease and Use correct technique increased more in AbSim studiers
 - ($p < .07$ but $> .05$).
 - Note, the comparison is between 72 participants and 28 non-participants.
 - But this is because the AbSim studiers had LOWER confidence at outset of month.
 - Unknown if confidence recovers because they studied AbSim, OR because while they were initially less confident, they learned through FM clerkship clinical experience that they could do it.

H3. Studying with Abdominal Simulator Increases Confidence

- This shows both the initial (x-axis) and final (y-axis) confidences.
- Point above diagonal – increased confidence at end of clerkship.
- Blue – did AbSim.
- Red – did not.
- If arrow rises – End confidence of AbSim doers is higher.
- If arrow goes left – Initial confidence of AbSim doers is lower.
 - More left (initial) difference, than up (final) difference, between groups.
- Red arrows: confidence in a palpation-specific aspect of abdominal exam.
- Black arrows: confidence in ability to identify particular organ abnormality.
 - This is where the AbSim students had the lower initial confidence.



Is Confidence Related to Competence (H4)?

- The correlations between confidence in one's ability to perform an abdominal exam, on the initial survey, and student performance **before instruction**:

		Initial survey, average confidence, seven questions	Initial confidence about your ability to use light and deep palpation
Overall depth of light and deep palpation, before training	Pearson Correlation	0.135	0.162
	Sig. (2-tailed)	.257	.174
	N	72	72
Overall calibration accuracy, light or deep when instructed, before training	Pearson Correlation	0.105	0.041
	Sig. (2-tailed)	.378	.732
	N	72	72

- Before training, there is **no relation** between the students' confidence in their ability to palpate the abdomen and their actual measured competence.

After Instruction

- Correlations between confidence in one's ability to perform an abdominal exam, on the end-of-clerkship survey, and student performance **after instruction**:

		End of rotation average confidence, seven questions	End Confidence about your ability to use light and deep palpation
Overall depth of light and deep palpation, after training	Pearson Correlation Sig. (2-tailed) N	0.129 .289 70	0.124 .307 70
Overall calibration accuracy, light or deep when instructed, after training	Pearson Correlation Sig. (2-tailed) N	-0.084 .490 70	-0.009 .941 70

- After training, **no relation** between students' reported confidence and measured depth or calibration.

Correlations between **Improvements** in Measured Palpation Competence and Increases in Confidence about Palpation

- Only 1 of the 6 most relevant comparisons (those in which a relationship could be expected) had a statistically significant correlation.
- Though all were in the expected direction.

Competence Measure	Confidence in Correct Palpation Technique	Light and Deep Palpation
Depth of Palpation	.073, p = .55	.271, p = .023
Calibration of Light Palpation	.055, p = .65	.111, p = .36
Calibration of Deep Palpation	.115, p = .34	.136, p = .26

Conclusions

- Students who studied with Abdominal Simulator became better calibrated.
- Students who studied with Abdominal Simulator became more confident in their abdominal exam.
 - So did students who did not study with AbSim.
 - Studiers had a greater increase in confidence.
 - But, studiers started with lower confidence.
- No correlation between competence and confidence measures.
- No correlation between change in competence and change in confidence.
- So, we can not rely on student self confidence to predict their competence.
 - Perhaps their LACK of self confidence predicts more effort to increase competence.

Discussion

- We have conflicting results regarding the validity of self assessed competence, i.e., self reported confidence in one's ability.
 - It predicts whether the student chose to seek the opportunity to improve.
 - It gets a tiny bit higher over the first year of clinical experience.

BUT

- It does not correlate with the objective measure of competence in the palpatory exam of the abdomen.

Perhaps...

- Perhaps the training and assessment did not address students' concerns.
 - We asked about their confidence in many aspects of the abdominal exam – 5 of our questions were about the ability to identify abnormalities, and the training and competence measure was only about palpation technique.
 - In 2018-2019 we continued the study, this time giving training about locating particular organs, and measuring their ability to do it before and after.
- And perhaps the literature and our results are right:
 - Feeling of confidence in one's ability is unrelated to actual ability.
 - But it affects what one chooses to do.

Teachers should not rely on students' self-assessments of their competence.

- Perhaps you already knew that.
- And: How to design a better study without compelling participation, and with randomization?