Creative collaborations with art, music and engineering: improving the perceptual abilities of novice clinicians

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“It is not what you look at, but what you see.”
Henry David Thoreau
but… we only find the world we look for…

“ We cannot create observers by saying 'observe', but by giving them the power and the means for this observation and these means are procured through education of the senses.”

Maria Montessori

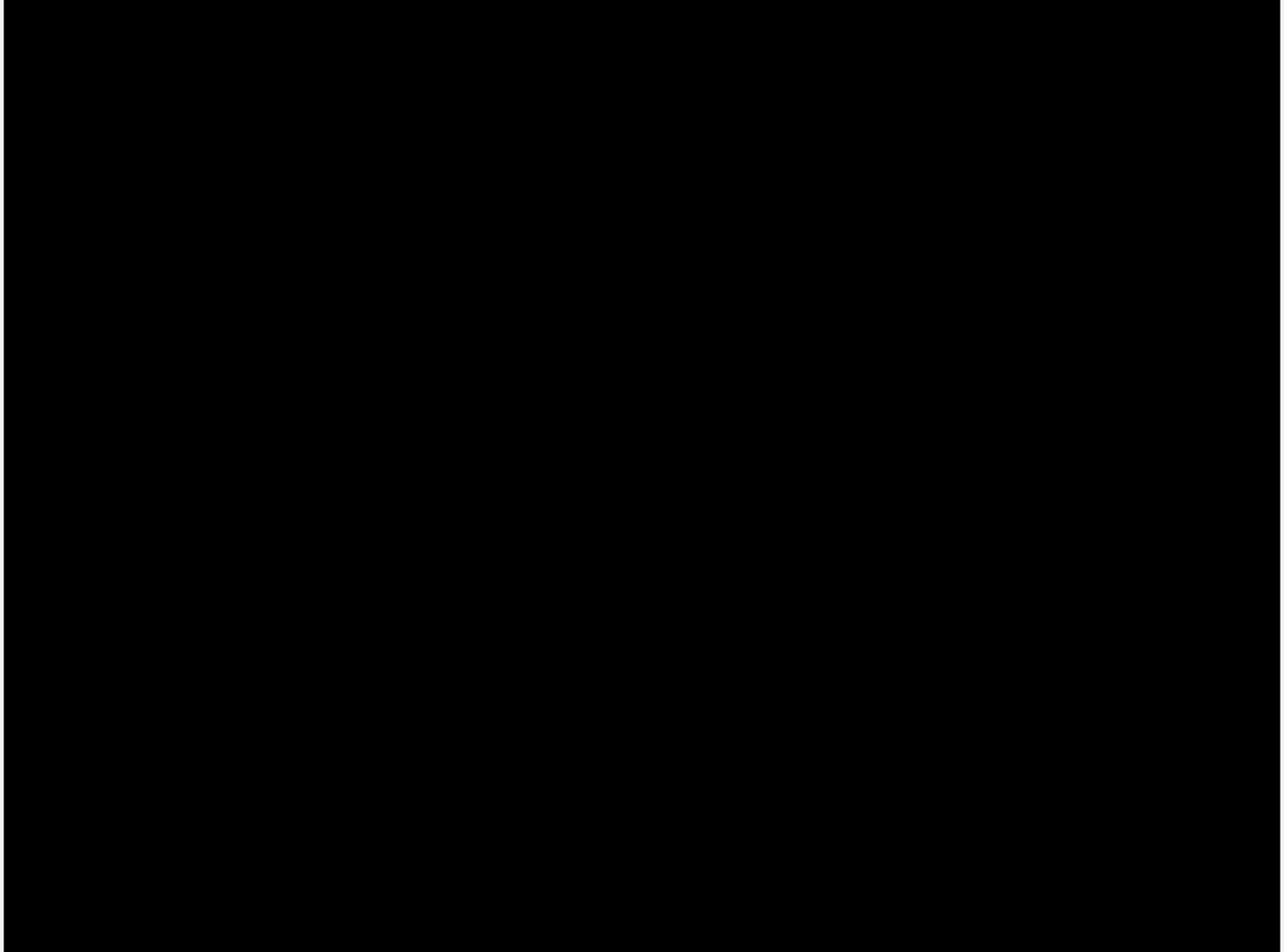
Development of perceptual skills is a critical yet complex skill that requires the effective organization and interpretation of data using visual, and auditory clinical observation.

Looking

- The art of diagnosis begins with seeing…
- “Never trust to general impressions, my boy, but concentrate yourself upon details.” Sherlock Holmes
- Details, details, details

WRITE DOWN WHAT YOU SEE

How many faces can you see ?



Looking

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The process

The initial goal is not interpretations or analysis; rather it is verbalization of observations

- Do a visual inventory; what do you see?
- Do not jump to themes! Begin with objects, how many? Describe them. Color? Dress?
- No subjective statements- only objective. Describe, describe, describe…
- Unpack the picture- do all four corners

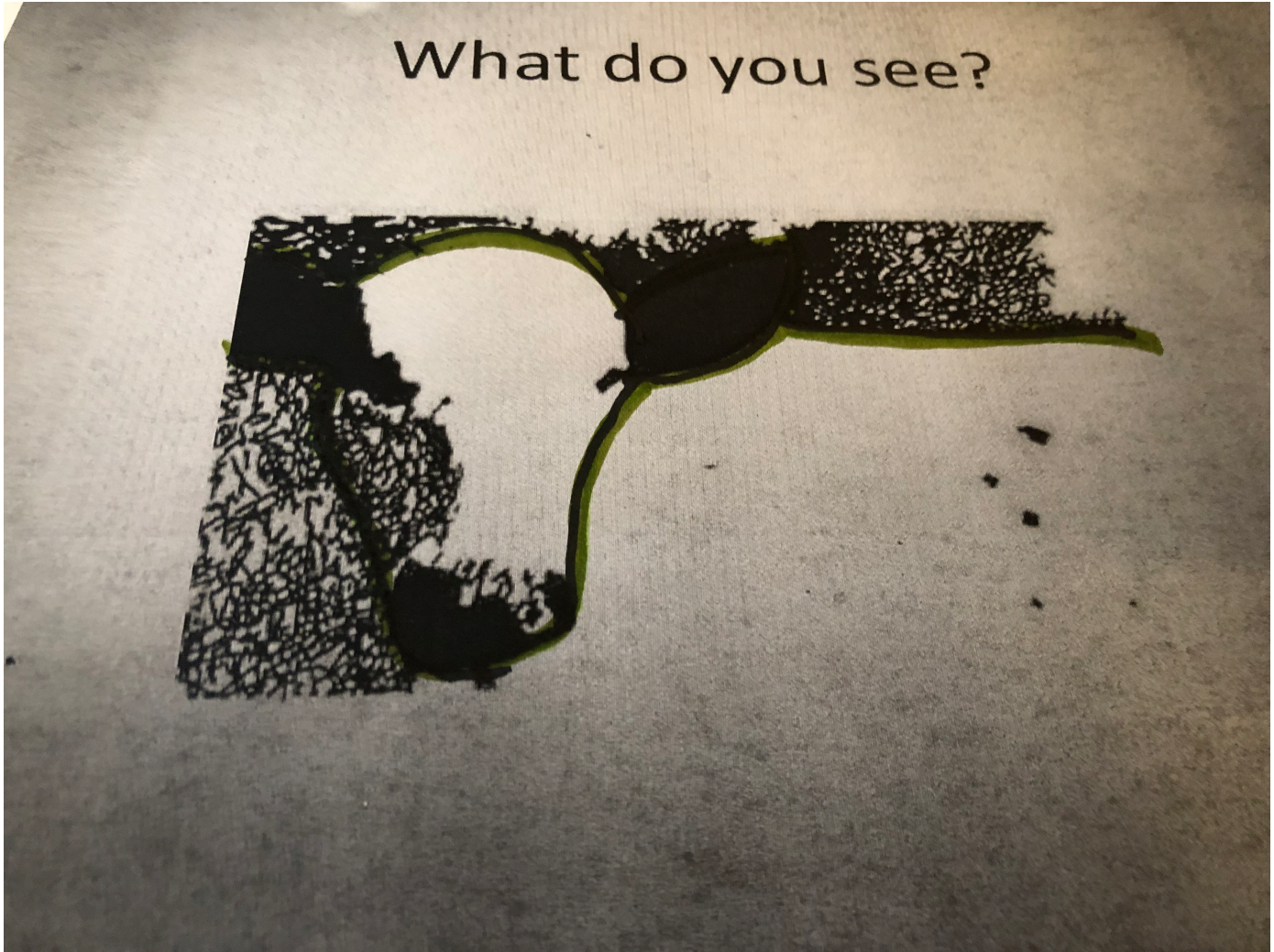
Now, stretch…

- Once you have done a visual inventory, note manner and mood in the painting, where is the light coming from (if appropriate)?
- Look at posture, body language- what do they convey to you?
- Themes- cluster the observations that relate to themes
- There are no right answers
- This is a level playing field

The experience…

What do you see?

What do you see?


What do you see?

The study

- Students who attended the looking is not seeing experience had significantly more written observations on the patient photographs on all but one photograph

	Number of Words		
Picture	Control	Museum	p-value
1	42	68	.0001*
2	45	56	.0196*
3	46	56	.0155*
4	55	57	.6676*
5	36	51	.0003*~
6	47	63	.0003*

	Number of Pt Objectives		
Pictur e	Control	Museum	p-value
1	10	14	.0001**
2	13	16	.0137**
3	12	16	.0001*
4	16	18	.0754*
5	9	11	.0004*~
6	15	18	.0063*

- The written words resulted in significantly more objective clinical findings on five out of six photographs.

Number of alternative diagnoses

	Mean			
Picture	**Museum**	**Control**	**Wilcoxon**	**p-value**
1	1.9	1.5	1199	0.0218
2	2.1	1.4	916.5	0.0033
3	2.7	1.7	807	0.0002
4	1.8	1.6	984.5	0.2182
5	2.7	1.9	899	0.0216
6	3	1.9	1387	0.0002

What do this photograph fall out from all others??

- Because they all saw it before!!! However, when analyzing this photograph closer, the researcher noted that the experimental group noted three out of four observations of the disease COPD as compared to two by the control group. Therefore even on the previously viewed photograph, students in the experimental group "saw" more than the control group.

Picture four specifics		
Control	Museum	p-value
2	3	.0008**

The newest study

Students who participated in the *looking is not seeing* experience had significantly more written observations;

higher number of objective physical assessment findings;

more objective physical assessment findings on the patient photographs, and…

	Pre	Post	Wilcoxon Signed rank Test (P)
Variable	**Mean**	**Mean**	
Image 1 (arm DVT)			
Total word count	142.73	148.52	0.6023
Total number of observations	21.23	31.33	0.0003
Number of objective physical assessment findings	7.95	16.33	<.0001
Number of diagnoses	0.64	1.67	0.0006
Image 2 (COPD)			
Total word count	143.45	173.90	0.0097
Total number of observations	26.86	33.62	0.0186
Number of objective physical assessment findings	8.00	12.57	0.0003

Correct diagnosis based on assessment of signs

	Pre		Post	
Variable	**Correct**	**%**	**Correct**	**%**
Image 1 Correct Diagnosis of arm DVT	1	4.55	14	66.67
Image 2 Correct Diagnosis of COPD	14	63.64	19	90.48

Differential diagnosis

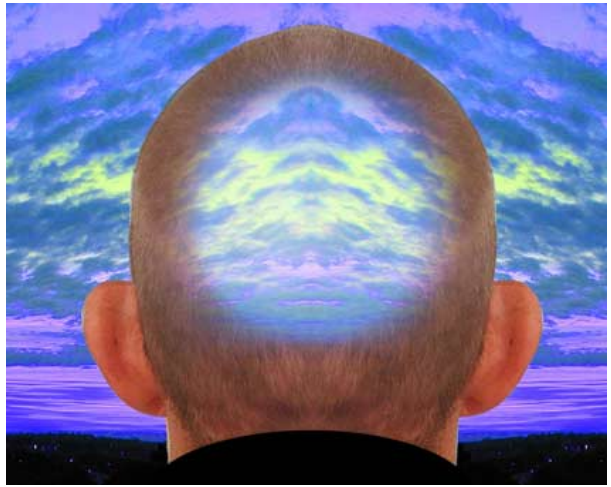
- **“Circumstantial evidence is a very tricky thing. It may seem to point very straight to one thing, but if you shift your own point of view a little, you may find it pointing in an equally uncompromising manner to something entirely different” Holmes**
- **Fluid, flexible seeing**

Lesson learned

- Slow down and observe
- The eyes don’t see what the mind does not know! Keep learning
- Everything including our learned biases influences what we see….
- You will only find what you look for…

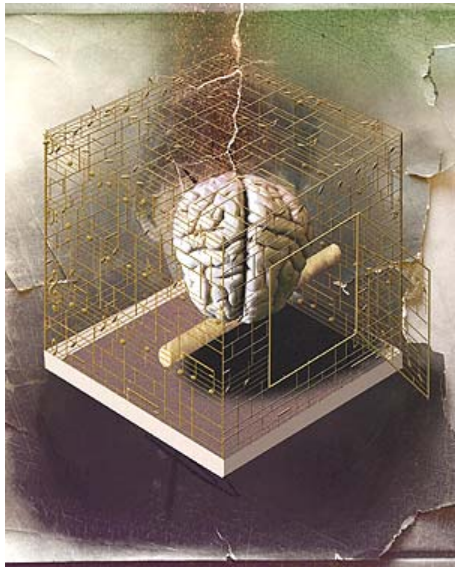
And so…

- Seeing is constructed, flexible and fluid. Observational skills can be enhanced with the use of art work and the experience translates into deeper seeing that results in enhanced diagnostic skills.



The extension…listening is not hearing

- The auditory arts were integrated with nursing science to develop curriculum for training students' listening skills in pitch, frequency, and discrimination

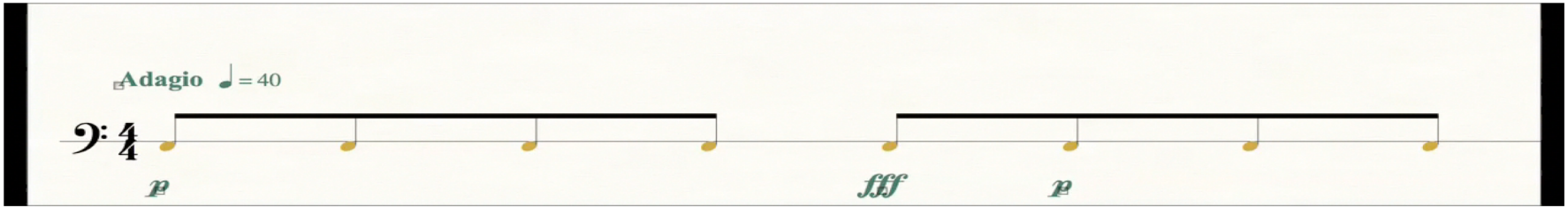


General Idea of Number in Sound

One beat is a unit of time. In a measure with 4 beats, beat one lasts from the point where it is first heard until the next beat is heard.

Dynamics

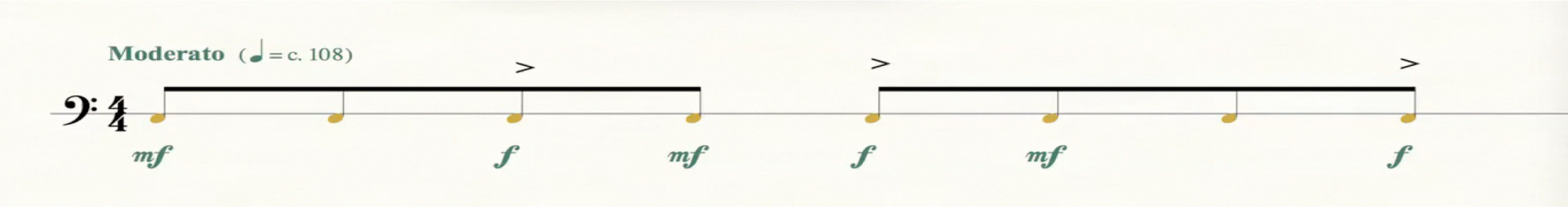
Beats can be played very loudly or very softly and everything in between. The volume of a sound is called its *dynamic*.



p = *piano* = soft
ppp = triple *piano* extremely soft
f = *forte* = loud (strong)
fff = *triple forte* = very loud

Accents

Some beats are stronger than others, they are “accented.”

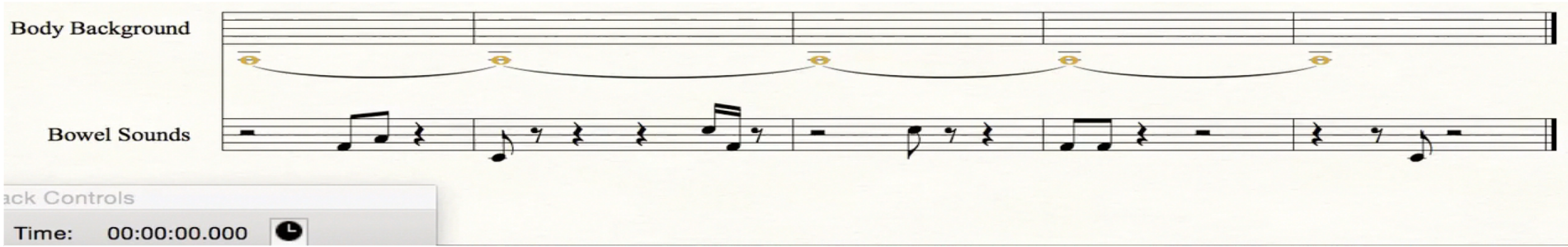


Bowel Sounds

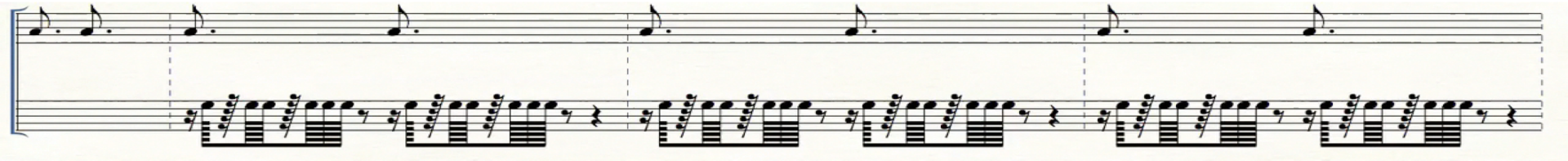
Count the bowel sounds over this 20 second sample and multiply by three for the "per minute" value.

00:00:00.000

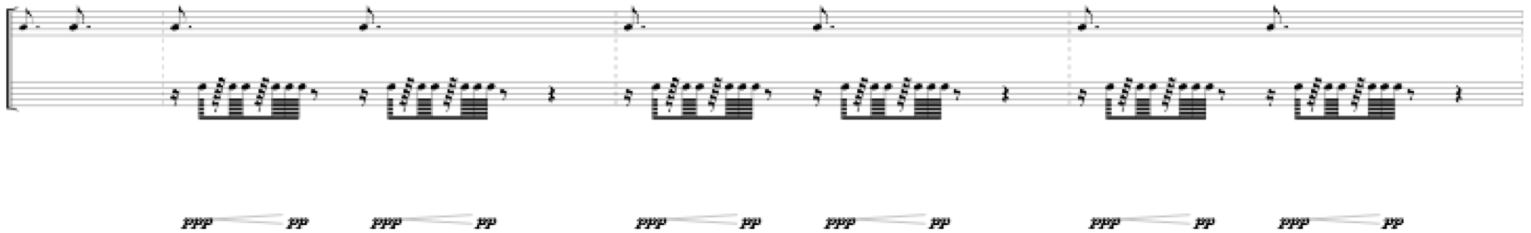
Bowel Sounds - Normal



Crackles

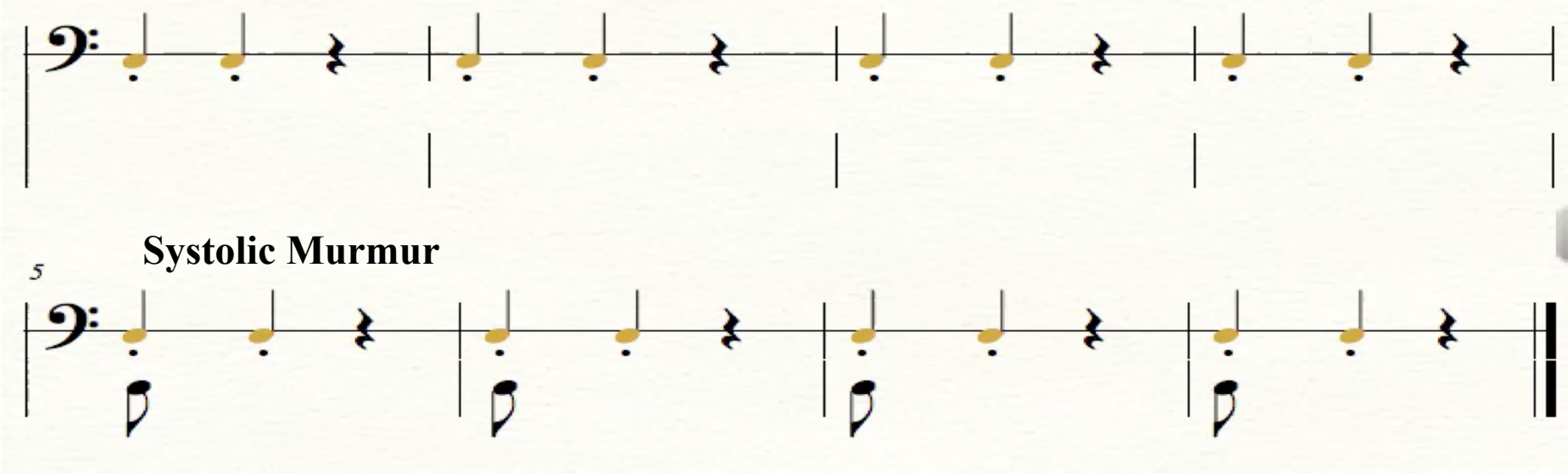


Real Lung Sounds: Crackles

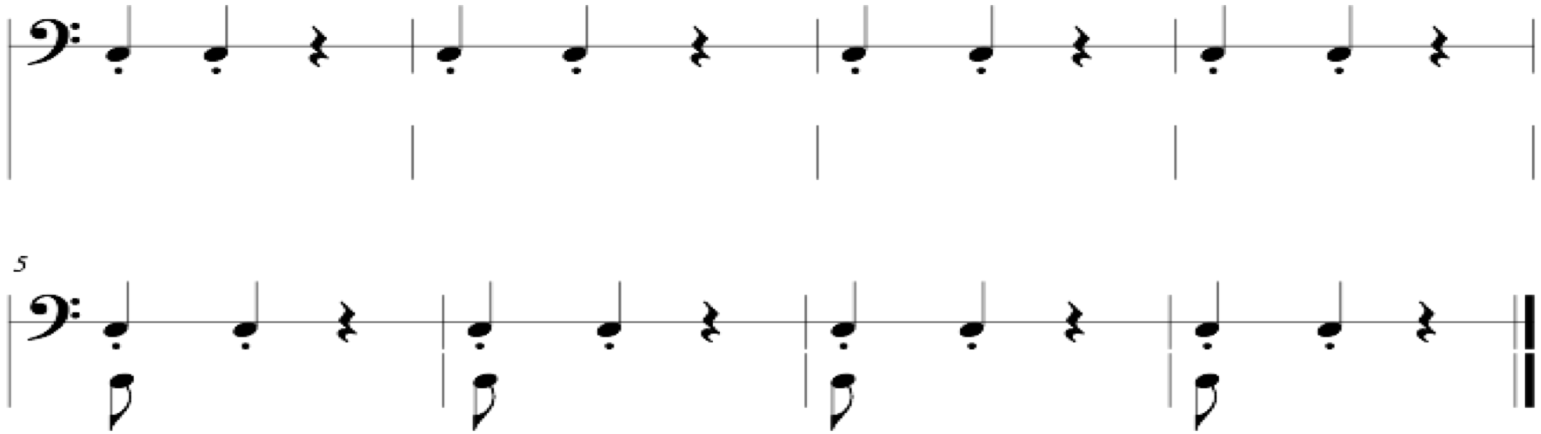


Heart - Systolic Murmur
120 bpm

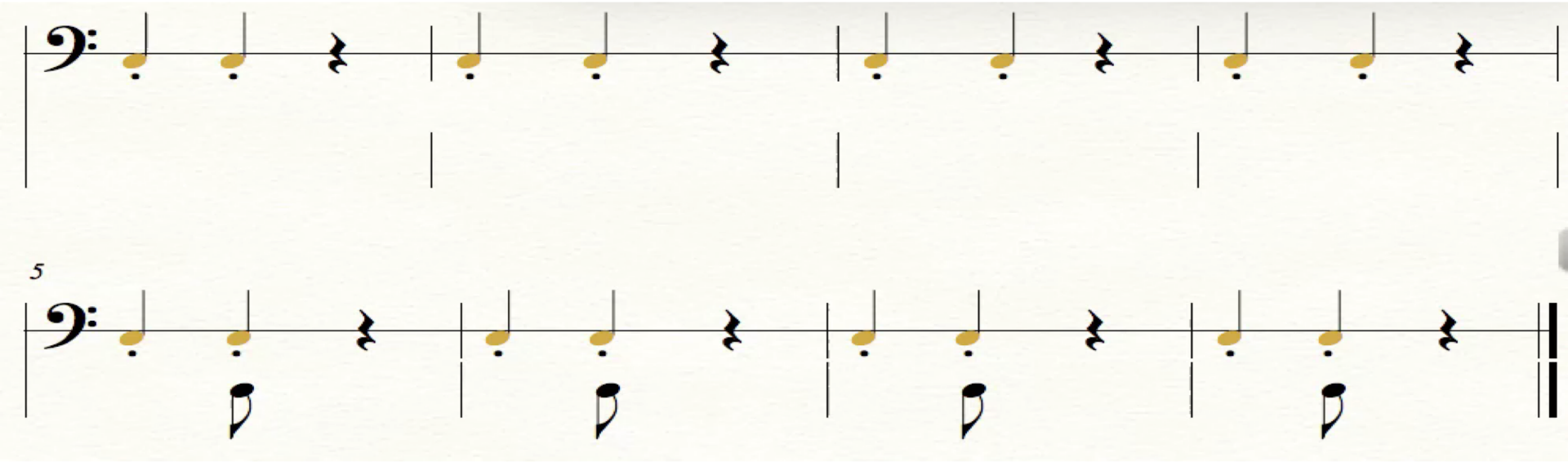
Middle



Real Heart - Systolic Murmur



Heart - Diastolic Murmur
120 bpm



Real Heart - Diastolic Murmur

Butterflies and Bees!

Listen for the cricket!

https://www.youtube.com/watch?v=6dHyxFPp_Ho

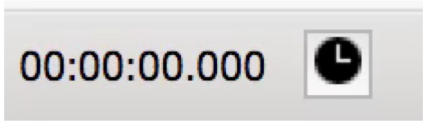
Butterflies and Bees!

Listen for the change!

Masking Games.

What do you hear?

Example 1. WHAT DO YOU HEAR?



A. Normal bowel, normal lung + diastolic murmur?
B. Normal bowel, normal heart + wheeze?
C. Normal bowel + split S2 + friction rub?
D. Normal lung, normal heart, hyperactive bowel?

Masking Games.

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Answer: **All normal**

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Masking Games.

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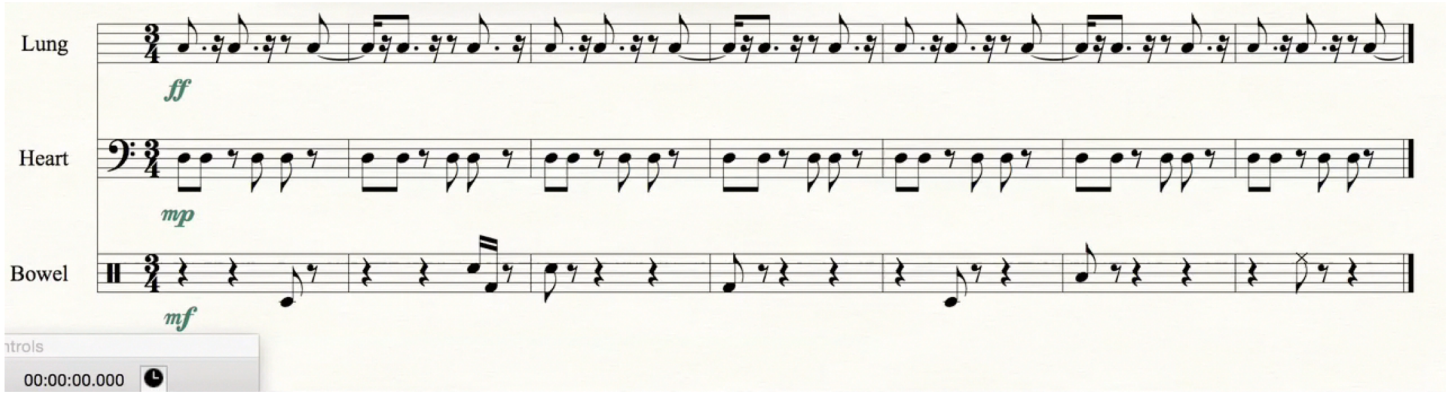


Post-test

Control Group

Control	N	Mean	Median	SD	Range
Heart sound score (N-10)	35	1.8	2	1.3	0.0 – 4.0
Lung sound score (N-11)	35	3.4	4	1.4	1.0 – 6.0
Bowel sound score (N-4)	35	1	1	0.9	0.0 – 3.0

Intervention Group

Intervention	N	Mean	Median	SD	Range
Heart sound score (N-10)	34	4.3	4	1.8	1.0 – 8.0
Lung sound score (N-11)	34	5.9	6	1.7	2.0 – 9.0
Bowel sound score (N-4)	34	2.7	3	1.1	1.0 – 4.0

Specifics

Sound	Percent properly identifying sound		p-value*
	Control	Intervention	
Systolic murmur	5.41	21.88	**0.07**
Diastolic murmur	5.41	18.75	0.13
Normal breath sounds	37.84	46.88	0.47
Bronchial breath sounds	0	12.5	**0.04**
Stridor 	72.97	81.25	0.57
Egophony	97.3	96.88	1
Decreased breath sounds	8.11	37.5	**0.004**
Normal bowel sound	29.73	65.63	**0.004**
Hypoactive bowel sounds	21.62	59.38	**0.003**
* Fishers exact			

	Number of Sounds	Baseline		Post education		% Improvement	Wilcoxon signed rank
		Mean Score	%	Mean Score	%		
Correctly identified organ (heart, lung or bowel combined)	25	21.78	87.12	23.39	93.56	7.39	0.0051
Correctly identified specific organ sound	25	4.91	19.64	10.65	42.60	116.90	<.0001
Correctly identified specific heart sound	10	0.96	9.60	3.48	34.80	262.50	<.0001
Correctly identified organ as lung	10	9.04	90.40	9.56	95.60	5.75	.0418
Correctly identified specific lung sound	10	2.04	20.40	4.26	42.60	108.82	.0003
Correctly identified organ as bowel	5	3.39	67.80	4.48	89.60	32.15	.0038
Correctly identified specific bowel sound	5	1.91	38.20	2.91	58.20	52.36	0.0117

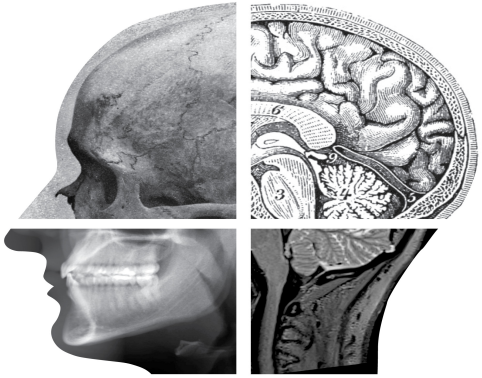
Specifics

Sound	Percent properly identifying sound		% Improvement
	N - Pre test (N-23)	Post test (N-23_	
Systolic murmur	N-0; 0%	N-7 30.43%	30.43%
Diastolic murmur	N-0; 0%	N-16 69.57%	69.57%
S4	N-1; 4.35%	N-12 52.7%	50%
Normal breath sounds	N-0; 0%	N-13 56.52%	56.52%
Stridor	N-2; 8.70%	N-13 56.52%	52.38%
Whispered pectoriloquy	N-0; 0%	N-11 47.83%	47.83%
Normal bowel sound	N- 4; 17.39 %	N-10 43.48 %	36.84%
Hypoactive bowel sounds	N-9; 39.13 %	N-19 82.61%	85.71%

	Correct organ	Correct Sound	Heart Sound	Lung Sound	Bowel Sound
Post-test					
BSN	<.0001	<.0001	<.0001	<.0001	<.0001
Dipl.	<.0001	<.0001	<.0001	<.0001	<.0001
AD	<.0001	<.0001	<.0001	<.0001	<.0001

Touching Is Not Feeling

MEDICAL DEVICE
DESIGN & INNOVATION



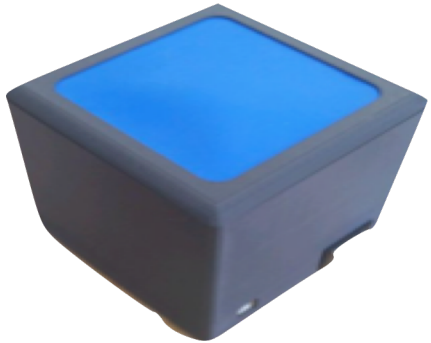
An essential skill for clinicians is the effective organization and interpretation of data using tactile clinical observation. It is a complex skill that requires synthesis of anatomical knowledge, perceptive discrimination, and cognitive knowing.

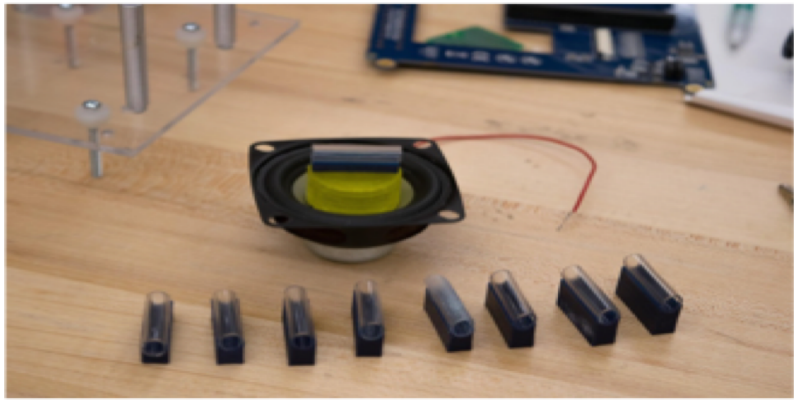
The limitations of traditional methods for teaching include the variability of clinical preceptor's skills in helping students identify and name abnormalities, inconsistent exposure to important abnormal findings, and limited high fidelity simulator ability.

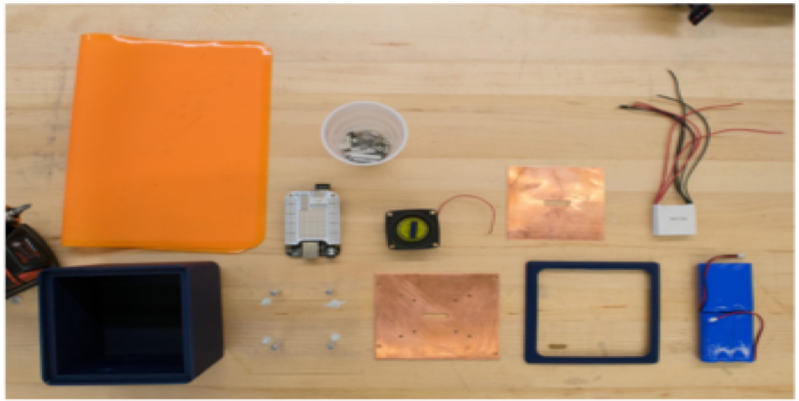
Pedal Pulsation

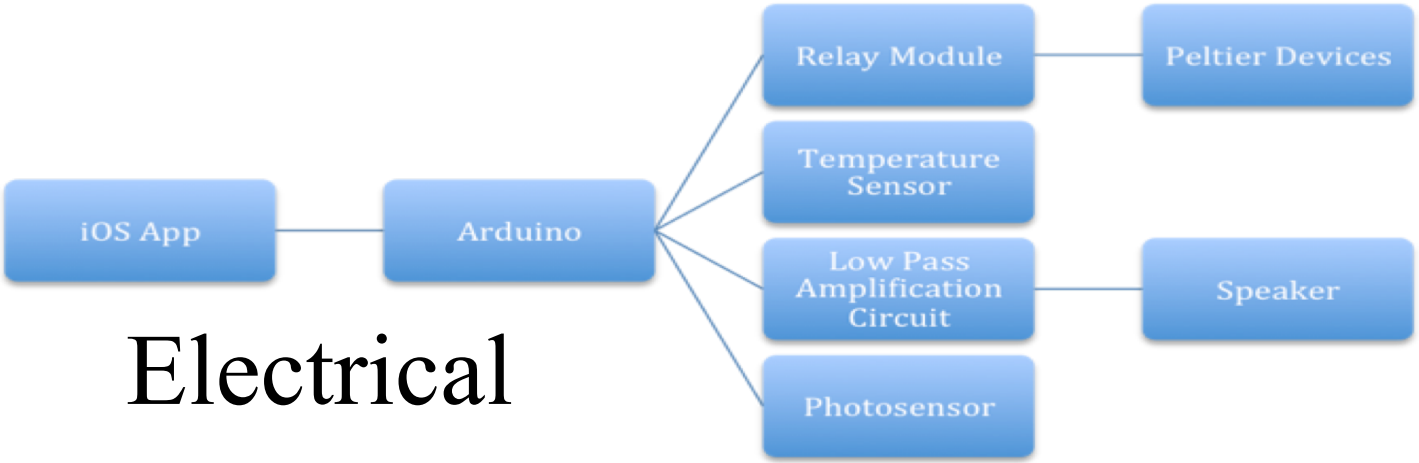
- Pedal pulses - pulses in the foot
- Allow clinicians to assess the blood supply to the lower limb
- EXTREMELY difficult to detect

BeatBox



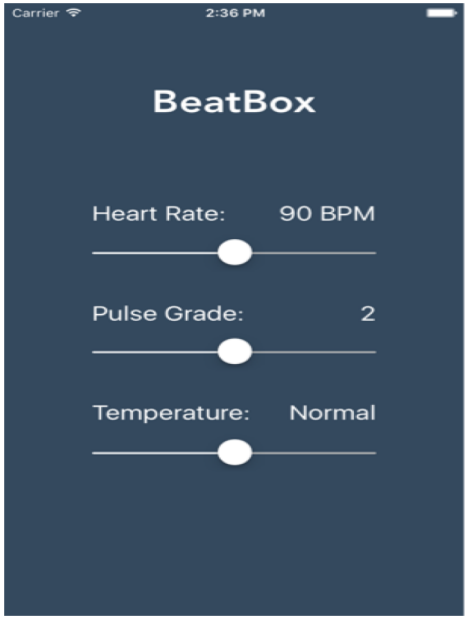





iOS App
Arduino
Relay Module
Peltier Devices
Temperature Sensor
Low Pass Amplification Circuit
Speaker
Photosensor

Electrical


Carrier
2:35 PM
BeatBox
v0.0.1
(c) 2015 JSB


Carrier
2:36 PM
BeatBox
Heart Rate:
90 BPM
Pulse Grade:
2
Temperature:
Normal

Software

CENTER FOR ENGINEERING
INNOVATION & DESIGN

The Trifecta…

Looking is not seeing….WORKS

Listening is not hearing….WORKS

Touching is not feeling….????

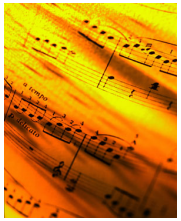
Innovation comes when a new set of eyes views your problems…

The future

The humanities are a valuable element of nursing education, yet the type of “humanities” has been constrained in nursing education. Our research reveals that arts and music bring a new lens through which students can learn valuable skills.

It’s your turn…

Ask away



- Art work images from Yale Center for British Art and MOMA web site
- Patient Photographs from Charles Goldberg, and Jan Thompson, UCSD and personal photographs
- This research was supported by Sigma Theta Tau Int., National League for Nursing, Johnson & Johnson/Global Alliance for Arts & Health Partnership to Promote the Arts in Healing; Robert Wood Johnson Foundation, Innovation grant
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