

eTable 1: Program Structure Differences

Data Collection for this study occurred during Term 6 in each program

	Term	Program A Courses	Program B Courses
First Year	1	Anatomy Tissue Mechanics Neuroanatomy Professional Interactions	Anatomy Developmental Anatomy Biomechanics Pathophysiology Research Methods Current Issues in Healthcare
	2	Biomechanics Physiology Anatomy Motor Control/Learning Professional Practice Issues	Kinesiology Neuroanatomy Orthopedic Pathology Physical Therapy Examination Processes Acute Care Principles Research Methods
	3	Exercise Science Pathology Gait Musculoskeletal Examination Neurological Examination Acute Care Principles	Neuroanatomy Neurophysiology Neurological Pathology Musculoskeletal Practice (lower quarter) Physical Agents (Modalities) <b>2 Week Clinical Practicum</b>
Second Year	4	Imaging Orthopedic Practice Management Integration Research Methods Critical Thinking <b>6 Week Clinical Practicum</b>	Musculoskeletal Practice (upper quarter) Neurological Practice Motor Control/Learning Psychology and Cultural Diversity Research Methods <b>2 Week Clinical Practicum</b>
	5	Musculoskeletal Interventions Neurological Interventions Cardiopulmonary Practice ENMG I Pharmacology Research Project <b>On Campus Clinical Practicum (ICE)</b>	<b>12-16 Week Clinical Practicum</b>
	6	Advanced Musculoskeletal Pediatric Practice Neurological Practice Prosthetics and Orthotics ENMG II Current Trends in Healthcare Research Project <b>On Campus Clinical Practicum (ICE)</b>	Anatomy II Rehabilitation Practice Cardiopulmonary Practice Pediatric Practice Diagnostic Imaging Physical Therapy Ethics Research Project
ird Year	7	Neurological Interventions II Differential Diagnosis	<b>12-16 Week Clinical Practicum</b>

		Current Trends in Healthcare II <b>6 Week Clinical Practicum</b>	
	8	Advanced Neuromuscular Practice Geriatric Practice Pathophysiology Advanced Cardiopulmonary Practice Orthopedic Practice II Research Project	Advanced Clinical Practice Wellness and Complementary Medicine Geriatric Practice Leadership and Administration Applied Administration Pharmacology Research Project
	9	<b>12 Week Clinical Practicum</b> <b>12 Week Clinical Practicum</b>	<b>16 Week Clinical Practicum</b>

eTable 2: Participant demographic information

	<b>Pseudonym</b>	<b>Age/ Gender</b>	<b>Clinical Experience</b>	<b>Pre-PT Clinical Experience</b>	<b>Other Work Experience</b>
<b>University A</b>	<b>Bethany</b>	27 Female	<ul style="list-style-type: none"> <li>• Integrated neurological clinic</li> <li>• Outpatient orthopedics (6 wks)</li> </ul>	<ul style="list-style-type: none"> <li>• Hospital/rehab volunteer</li> <li>• MDA camp volunteer</li> <li>• Outpatient orthopedics aide (1 yr)</li> </ul>	<ul style="list-style-type: none"> <li>• Restaurant service</li> <li>• Research assistant</li> <li>• Peer advisor</li> </ul>
	<b>Mason</b>	27 Male	<ul style="list-style-type: none"> <li>• Integrated neurological clinic</li> <li>• Outpatient orthopedics (6 wks)</li> </ul>	<ul style="list-style-type: none"> <li>• Outpatient orthopedics aide (6 years, 2 clinics)</li> </ul>	<ul style="list-style-type: none"> <li>• Food service</li> <li>• Retail</li> </ul>
	<b>Kelly</b>	25 Female	<ul style="list-style-type: none"> <li>• Integrated neurological clinic</li> <li>• Outpatient orthopedics (6 wks)</li> </ul>	<ul style="list-style-type: none"> <li>• Outpatient orthopedics volunteer</li> <li>• Volunteer at Rehab Hospital</li> </ul>	<ul style="list-style-type: none"> <li>• Water polo coach</li> </ul>
	<b>Chloe</b>	29 Female	<ul style="list-style-type: none"> <li>• Integrated neurological clinic</li> <li>• Inpatient hospital (6 wks)</li> </ul>	<ul style="list-style-type: none"> <li>• Outpatient orthopedics aide (4.5 years)</li> </ul>	<ul style="list-style-type: none"> <li>• Interior design</li> <li>• Gym coordinator</li> <li>• Organic orchard</li> </ul>
<b>University B</b>	<b>Peter</b>	27 Male	<ul style="list-style-type: none"> <li>• Outpatient orthopedics &amp; neurology (12 wks)</li> <li>• Stroke boot camp (2 wks)</li> <li>• Outpatient orthopedics (2 wks)</li> </ul>	<ul style="list-style-type: none"> <li>• Outpatient orthopedics aide (2 yrs, 2 clinics)</li> </ul>	<ul style="list-style-type: none"> <li>• Customer service</li> <li>• Food service</li> <li>• Basketball coach</li> </ul>
	<b>Lisa</b>	26 Female	<ul style="list-style-type: none"> <li>• VA outpatient orthopedics (8 wks)</li> <li>• Outpatient orthopedics (private clinic) (8 wks)</li> <li>• Inpatient rehabilitation (2 wks)</li> <li>• Pediatrics (2wks)</li> </ul>	<ul style="list-style-type: none"> <li>• Observation: orthopedics and pediatrics</li> <li>• Volunteer at inpatient hospital</li> </ul>	<ul style="list-style-type: none"> <li>• Corporate sales</li> <li>• Nanny/babysitting</li> <li>• Gym front desk</li> <li>• Event hostessing</li> </ul>

	<b>Sophia</b>	24 Female	<ul style="list-style-type: none"> <li>• VA outpatient orthopedics (8 wks)</li> <li>• Private outpatient orthopedics (8 wks)</li> <li>• Outpatient orthopedics (2 wks)</li> <li>• Outpatient orthopedics &amp; vestibular (2 wks)</li> </ul>	<ul style="list-style-type: none"> <li>• Hospital volunteer: inpatient rehabilitation and skilled nursing</li> <li>• Acute care volunteer</li> <li>• Outpatient orthopedics aide</li> </ul>	<ul style="list-style-type: none"> <li>• Dorm residence Assistant (RA)</li> <li>• Food service</li> <li>• Event hostessing</li> </ul>
	<b>Hannah</b>	24 Female	<ul style="list-style-type: none"> <li>• Hospital based outpatient orthopedics (12 weeks)</li> <li>• Pediatrics (2 wks)</li> <li>• Outpatient orthopedics (2wks)</li> </ul>	<ul style="list-style-type: none"> <li>• Outpatient orthopedics (private clinic)</li> <li>• Hospital based outpatient orthopedics</li> </ul>	<ul style="list-style-type: none"> <li>• Kitchen work</li> <li>• Server/hostess in food service</li> <li>• Hair and make-up work</li> </ul>

**eTable 3: Hypotheses** <sup>24</sup>

<b>Code</b>	<b>Description and Subcodes</b>
Impairment (body function)	Physiological or biomechanical function (i.e.: ROM, Strength, Sensation, Pain)
	<b>Subcode:</b> Pain Irritability Level (Assessing how irritable the pain level is, Factors that affect the pain)
Pathology/ Medical Diagnosis	Tissue healing processes, pain mechanisms (inflammation etc.), using medical terminology (i.e.: tendonitis, muscle strain, arthritis, joint sprain etc.)
	<b>Subcode:</b> Phase of Healing (acute, chronic)
Participation ability/restriction	Abilities or limitations in involvement with life situations/activities
Examination Planning*	Generating an idea for further examination
Precautions Contraindications to PT	Activities, tests or interventions to avoid or proceed with caution
Contributing Factors	Identifying factors that contribute to the development and continuation of the problem
Prognosis	Making a prediction about expected functional outcomes or expected response to treatment
Unsure*	Participant indicates he/she is unsure about what is going on for the patient, or may make a hypothesis but indicates uncertainty about that idea
Patient Perspective/ Impact of Pathology	Hypothesizing about how the pathology is affecting the patient's life experience, Commenting on impacts on patient activities (i.e.: comment on pain interfering with occupation, or impairments limiting ability to play with kids etc.), also any comment about how the patient might feel/think about the situation
Structure	Body structure or tissue source, anatomical structure
PT Success*	PT states findings confirm what he/she was thinking, or PT is please with self that he/she is making progress in the dx
Patient Characteristics*	Assessment of the patient's interactive style/ personality, assessing patient's likelihood of compliance/follow through
	<b>Subcode:</b> Movement Characteristics (patient movement behaviors or patterns)
Management and Treatment	Developing ideas for management
Activity ability/ restriction	Abilities or difficulties in executing activities (ICF)
Ruling Out*	Determining the structure, pathology or activity is not the problem
Measure of Progress*	Data is used to assess progress or change

\* Not part of Jones' et al. original list

**eTable 4: Reasoning strategies** <sup>28</sup>

<b>Code</b>	<b>Description and Subcodes</b>
Ethical Reasoning	Considering dilemmas that impinge on treatment and assessing the best action
Interactive Reasoning	Establishing and maintaining the patient-practitioner relationship
Reasoning about Teaching	Determining content and approach to patient education and assessing outcomes of education, rationale for teaching/explaining to patient
Reasoning about Patient Personal Needs*	Considering what the specific patient may want/ need
Reasoning about Procedures	Determining and carrying out the appropriate interventions
Reasoning about Goal Setting*	Developing ideas for treatment goals
Organizing/ Planning Examination*	Organizing thoughts for the next set of tests to conduct
Managing Uncertainty*	Trying to make sense of unclear findings
Predictive Reasoning	Envisioning and evaluating future scenarios and the role of patient and PT choices
Collaborative Reasoning	Building a consensual approach towards goal setting and treatment planning
Protocol*	Attempting to follow instructions from class or evaluation sheets from clinic
Narrative Reasoning	Seeking to understand the patient's understanding of his/her condition
Diagnostic Reasoning	Determining the active pathology, impairments, functional limitations, and contributing factors
	<b>Subcodes:</b> Diagnosis of Causal Factors, Diagnosis of Precautions/ Contraindications, Diagnosis of Movement Impairments, Diagnosis of Primary Pathology, Diagnosis of Functional/ Activity Impacts, Diagnosis of Severity

\* Not part of Edwards original list

**eTable 5: Examples of hypotheses**

Code	Examples Quotations
Structure	<p>Just furthering if I'm really in or out of SI and so she did have aggravation with compression and alleviation with distraction so that's leading me a little bit more towards SI. (Sophia)</p> <p>It supported my hypothesis that it was, the pain was coming from her muscle because the fact that she was tender and she said that was the pain that she was complaining of. (Peter)</p> <p>I was thinking maybe SIJ or maybe facet. (Chloe)</p>
Impairment (body function)	<p>So that's sort of a modified Thomas test that I picked up in the clinic and it's not going to give you a number, but it's going to give you an idea if there is some tightness. And she was tight through the front of her hip. At least on that left side, and was getting a little bit of pain, and it was really easy to feel that if I got to that end, she was immediately going into some lumbar extension. So it was pretty quickly pushing her in, causing that kind of excessive lordosis. That psoas and rectus, both of them. (Lisa)</p>
	<p>Pain: "Just to have a, like I said from a 0% to a 100%. 0% would be a 1/10 and a 100% pain would be an 8/10 and so if she gets into a 4, that's already halfway through her tolerance. Just to see her tolerance and to see it's irritability." (Bethany)</p>
Contributing Factors	<p>"She was really tight. She was very tight uhm, I had, for somebody that tight anytime you bend would be strenuous if you don't have that give through your hips" (Hannah)</p>
Pathology/ Medical Diagnosis	<p>"The mechanism of injury, the trauma, it was a fall, it was two weeks ago, there were no x-rays, I have to rule out fracture if and I think I put that on my hypothesis list if there was a fracture or a possibly a small fracture to the pelvis." (Mason)</p>
	<p>Phase of Healing: "It's probably – it's furthering my idea that this is an inflammatory response so that's where a lot of this pain was coming from." (Sophia)</p>
Ruling Out*	<p>"Well, achiness didn't really, it drove me away from thinking nerve because a nerve I would think that would be more described as a numbness or tingling or radiating" (Peter)</p>
Patient Characteristics*	<p>"See where she is at with that, sometimes they're not taking medications because they are in denial that there's an issue or maybe she's not taking medication because it's not as severe as you know, if she did need to take medication. It seemed like I didn't get the sense she was in denial of it. It felt more of it wasn't as severe as it needed to be." (Sophia)</p>
	<p>Movement characteristics: "So I wanted to see how willing she was to move for one thing. Not very willing to move. Very cautious with bending forward, which is always an interesting thing with somebody who says they are crouching things to pick up pots and pans from underneath." (Lisa)</p>

**eTable 6: Reasoning strategies examples** (Most commonly employed strategies)

<b>Strategy</b>	<b>Example</b>
Diagnosis of Primary Pathology	That can kind of tell if there is facet issue versus quadrant. So facet versus maybe nerve. Just to kind of rule that out. And she had a lot of pain with it but teamed with flexion and the pain with extension it's still probably not, I mean the location of pain might be facet but it's like she has mixed everything (Kelly)
Diagnosis of Movement Impairments	So I was looking at Thomas test a little bit just sort of hip flexor length. So that's sort of a modified Thomas test that I picked up in the clinic and it's not going to give you a number, but it's going to give you an idea if there is some tightness. And she was tight through the front of her hip. At least on that left side, and was getting a little bit of pain, and it was really easy to feel that if I got to that end, she was immediately going into some lumbar extension. So it was pretty quickly pushing her in, causing that kind of excessive lordosis. (Lisa)
Reasoning about Procedures	You gotta know the aggs (aggravating factors) and eases you gotta know what makes it worse, what makes it better, if you don't then I kind of feel like the therapist is just blindly sort of guiding, that's how I guide my interventions, if I know that backward bending and forward bending make it worse, I wanna try to limit that as much as possible and if side bending and rotation don't really bring it on, I'll be a little less concerned about those positions or movements, or whatever it may be. (Mason)
Diagnosis of Causal Factors	Because posture can affect low back pain, again, those mechanics, bad posture could put strain on certain areas. (Peter)
Reasoning about Patient Personal Needs	Just to know where she is heading to and make sure we're on the same page. Obviously I want her to get better, I want to not have pain. I want her to know there are a million things we want patients to do, but we can only prioritize so much. I know she wants to get back to work without pain and then go back to hiking. Just no pain, able to go hiking, and increase productivity since her back pain, her work productivity decreased, so just three goals. (Bethany)



## **eAppendix 1: Standardized Patient Encounter Instructions to Participant**

1. The Patient Encounter
  - a. You will receive the referral information for your new patient. You may have up to 5 minutes to plan your examination. You may write yourself notes as you want.
  - b. You will conduct your physical therapy interview and examination as if you were conducting your initial evaluation of the patient in the clinic. Throughout the process, you may write any notes that you need to, as you would in the clinic.
  - c. When you have completed the examination and assessment, you should move into the first treatment intervention, just as you would in the clinic.
  - d. After you begin the treatment, the researcher will instruct you to proceed to the conclusion of the session.
  - e. Use the final 5 minutes to wrap up the session as you would in the clinic.
  - f. If you have not initiated treatment 35 minutes into the session, the researcher will instruct you to conclude your examination and proceed to treatment.
  - g. Throughout the process you should speak to the patient as you would in the clinic. Do not address the camera or researcher.
  
2. Interview
  - a. After you have completed the patient session, the researcher will interview you about your work with the patient.
  - b. Part of the interview will focus on explaining your thought process during the patient encounter.
  
3. Referral information (provided to participant prior to encounter)
  - a. MD referral: Low Back Pain, evaluate and treat
  - b. Vitals (taken by PTA): BP: 135/85, HR: 75
  - c. Insurance information: approved for 10 visits.
    - i. Copay for initial visit is \$75
    - ii. Copay for follow up visits is \$60 each

## eAppendix 2: Interview Questions for Post Encounter Interview

**Interview Guide Development:** A key aim of this study was to extend the work of Jensen et al<sup>31</sup> and Wainwright et al<sup>51</sup> to examine the clinical reasoning and use of reflection in PT students, thus the interview process probed for similar elements of their clinical reasoning processes. Jensen's work<sup>30,31</sup> set the stage and laid the foundation for the study of expertise and clinical reasoning in physical therapy. Wainwright et al further built our understanding of how PT clinicians think by bringing greater attention to the role of reflection. Thus the interview methods used in these studies provides a foundation for the study of clinical reasoning in PT students. The work of Sandholtz<sup>77</sup> brings attention to an additional factor in professional development regarding what the student views as effective and ineffective practice.

1. Prior to patient encounter: What is your goal for this patient session? What do you hope to accomplish? (prompting: what would be an ideal outcome?)
2. Prior to video review: What were your first thoughts when you first started to work with the patient?
3. Session/Video Review: Prompted by researcher's notes from patient encounter and review of the video:
  - a. What are you thinking here?
  - b. Why did you ask \_\_ (or why did you do \_\_\_\_ ) here?
  - c. What did you make of the response/finding?
  - d. How did this information help you?
4. How did you arrive at your assessment <sup>31</sup>?
5. Describe your approach to treatment for this patient?<sup>31</sup>
  - a. What is the highest priority?
  - b. Explain what all you would have done during this first session with the patient.
  - c. Explain what you would do on ensuing sessions.
  - d. What do you think will be most challenging?
6. How would you know if you have been effective in your treatment?<sup>31</sup>
7. What experiences most influenced your work with this patient?<sup>51</sup>

- a. Probing: what experience in PT school? What experiences with PT prior to PT school? What clinical experiences in PT school? What other life experiences? What types of mentoring?

8. If you could do this encounter over again:<sup>77</sup>

- a. What would you do the same?

- b. What would you do differently?

9. Basic Demographic Questions

- a. What practice areas of physical therapy are you most interested in?

- b. What clinical experiences (if any) do you have in physical therapy?

- i. Volunteer experiences?

- ii. Aide experiences?

- iii. Short term clinical experiences? (integrated? If so, what format)

- iv. Long term clinical experiences?

- c. What work experience do you have besides physical therapy (if any)?

- d. What is your age?