Critical Skills for Manual Therapy Competency in Physical Therapy

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Objectives

- Participants will be able to describe and apply the eight critical skills for competent manual therapy application
- Participants will be able to describe and apply the three areas of manual therapy competency
- Participants will learn and be able to apply the current evidence to further develop their manual therapy skills

What makes a good manual therapist?

Available at: http://gclipart.com/wp-content/uploads/2017/03/Cute-question-mark-clipart-3.jpg. Accessed March 24, 2017.

Eight Critical Skill Sets Required for Manual Therapy Competency: A Delphi Study and Factor Analysis of Physical Therapy Educators of Manual Therapy

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Sizer et al (2007)-Eight Critical Skill Sets Required for Manual Therapy Competency

- Purpose
  - Obtain consensus among manual therapy educators from the United States regarding stand-alone skills required during competent application of manual therapy
  - Distill further these stand-alone skills into smaller, more homogeneous skill sets

Eight Critical Skill Sets

- Manual Assessment and Treatment of Joints and Soft Tissue
- Clinician's Proficiency in Manual Fine Sensorimotor Characteristics
- Clinician's Effectiveness in Manual Patient Management
- Bilateral Hand-Eye Coordination
- Clinician's Manual Gross Sensorimotor Characteristics of the Upper Extremity
- Clinician's Manual Gross Sensorimotor Characteristics of the Lower Extremity
- Clinician's Control of Self and Patient Movement
- Clinician's Discriminate Touch

Manual Therapy Competency (Sizer)

Controlled Practice Methods

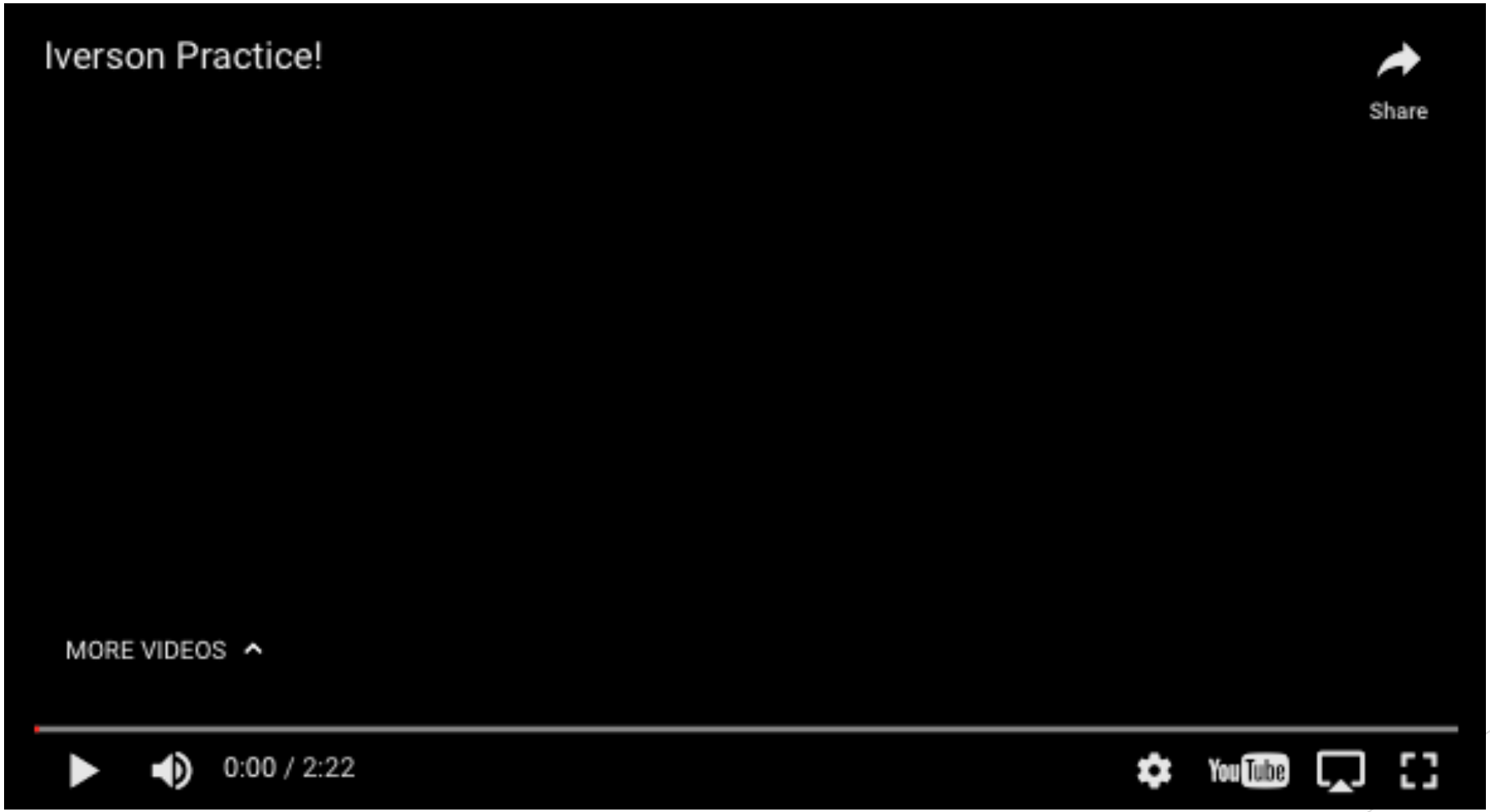
Repetition and Body Control

Expertise and Discriminate Touch

Controlled Practice Methods

Sizer et al, 2007

We're talking about practice!



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Controlled Practice Methods

- Clinician's Proficiency in Manual Fine Sensorimotor Characteristics
  - Downie et al (2010)
  - Chang et al (2007)
  - Descarreaux et al (2006)
- Clinician's Effectiveness in Manual Patient Management

Downie et al- Quantifying the High-Velocity, Low-Amplitude Spinal Manipulative Thrust: A Systematic Review

- Objective/Aim of the Study
  - "The purpose of this study was to systematically review studies that quantify the HVLA spinal thrust, to qualitatively compare the apparatus used and the force-time profiles generated, and to critically appraise studies involving the quantification of thrust as an augmented feedback tool in psychomotor learning."

Downie et al- continued

- 27 Studies included in the review that met inclusion criteria
- Discussion/Conclusions
  - “No standard exists for HVLA thrust recording, and the variation in sensing device and methodologies makes quantitative analysis between studies difficult.”
  - “There are currently no standards for preload and peak force of an HVLA thrust, but studies have found parameters.”

Table 2. Resultant preload and peak forces noting sensing device and intervention

Downie et al	Year	Author	Patient position, sensing device, and dimensions recorded	Remarks	Mean preload force (±SE) (N)	Mean peak force (±SE) (N)
Cervical spine	1992	Kawchuck et al[16]	Side posture toggle recoil method (1-D)			101.7 (±14.7)
	1993	Kawchuck and Herzog[10]	Various patient positions Pressure pad attached to subjects' neck neck (1-D)	Lateral break Gonstead Activator Toggle Rotation	39.5 (±4.9) 24.7 (±6.5) 21.9 (±5.2) 1.9 (±1.9) 29.1(±4.3)	102.2 (±46.8) 109.8 (±5.6) 40.9 (±2.8) 117.6 (±6.4) 40.55 (±4.5)
	1993	Herzog et al[15]	Side posture toggle recoil method (1-D)			117.7 (±15.6)
	2003	van Zoest and Gosselin[19]	Supine @ C5 Handheld sensor “puck” against subject's spine (3-D)		32 (±10)	110 (±12)

Example of Sensing Device

Triano et al, 2002

Chang et al- Effectiveness of Two Forms of Feedback on Training of a Joint Mobilization Skill by Using a Joint Translation Simulator

- Objective/Aim of the Study
  - “Investigate whether quantitatively augmented feedback could enhance the learning of joint mobilization and more specifically, to compare the effects of training with concurrent or terminal feedback by using a joint translation simulator (JTS).”

Chang et al- continued

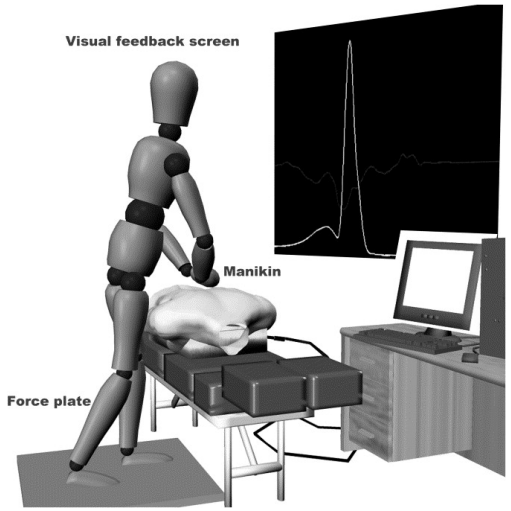
- 36 Subjects
  - Undergraduate physical therapy students that were randomly allocated to 3 different groups
    - Control group (No Feedback)
    - Concurrent Feedback
    - Terminal Feedback
- Discussion/Conclusions
  - Practice conditions with both concurrent and terminal feedback were more effective for learning joint mobilizations, as measured during skill acquisition and retention tests, compared to the control group.

Descarreaux et al- Learning spinal manipulation: the importance of augmented feedback relating to various kinetic parameters

- Objective/Aim of the Study
  - "The goal of the present investigation is to compare the performance of two groups of chiropractic students, one receiving traditional training from experienced instructors, and the other, augmented feedback on specific biomechanical aspects of SMT using an instrumented manikin."

Descarreaux et al- continued

- 31 Fourth Year Chiropractic Students
  - A manikin was used which emulated the resistance offered by the thoracic spine
    - modified version of the cardiopulmonary manikin which was instrumented with a spring



  - Participants were instructed to reach a peak force of 475 N with a preload force of 30-40% of the peak force

Descarreaux et al- continued

- Discussion/Conclusions
  - “The instrumented manikin providing augmented feedback is certainly as valuable as standard training and even more efficient for specific biomechanical parameters of spinal manipulation.”
  - “Training aids eliminate the risk of negative side effects occurring while students practice repetitive spinal manipulations on one another.”

Controlled Practice Methods- Key Points

- There are currently no standards for preload and peak force of an HVLA thrust, but studies have found parameters.
- Concurrent and terminal feedback, during practice, are the most effective forms of feedback to improve inter-subject variability.
- Training aids can provide valuable augmented feedback which can also eliminate the risk of negative side effects.

Demonstration- HVLA and Feedback

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Repetition and Body Control

Sizer et al, 2007

Bimanual Coordination

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Repetition and Body Control

- Bilateral Hand-Eye Coordination
- Clinician's Manual Gross Sensorimotor Characteristics of the Upper Extremity
- Clinician's Manual Gross Sensorimotor Characteristics of the Lower Extremity
- Clinician's Control of Self and Patient Movement
  - Smethurst et al (2003)
  - Temprado et al (2007)
  - Smethurst et al (2001)

Smethurst et al (2003)- The Effect of Volition on the Stability of Bimanual Coordination

- Objective/Aim of the Study
  - "Our purpose in this investigation was to compare the stability characteristics of bimanual coordination under two different instructional sets."
  - "We sought to determine how different instructional sets, representing distinct intentional states, influence the time at which transitions occur."

Smethurst et al (2003)- continued

- 30 Subjects (Ages 19-30) drawn from a University population
- Subjects were randomly assigned to groups
  - Between-group design (n=20)
  - Within-participant design (n=10)
    - Do-not-intervene (n=5)
    - Stay (n=5)

Smethurst et al (2003)- continued

- Discussion/Conclusions
  - "The intention to persist with an antiphase pattern of coordination as movement frequency was scaled did not influence the time at which a phase transition occurred"
    - As movement frequency increases, volitional control doesn't increase pattern stability
  - "**The ability to persist with an intended pattern needs to be learned**; when it is not, loss of stability typically results in a transition to a qualitatively different pattern."

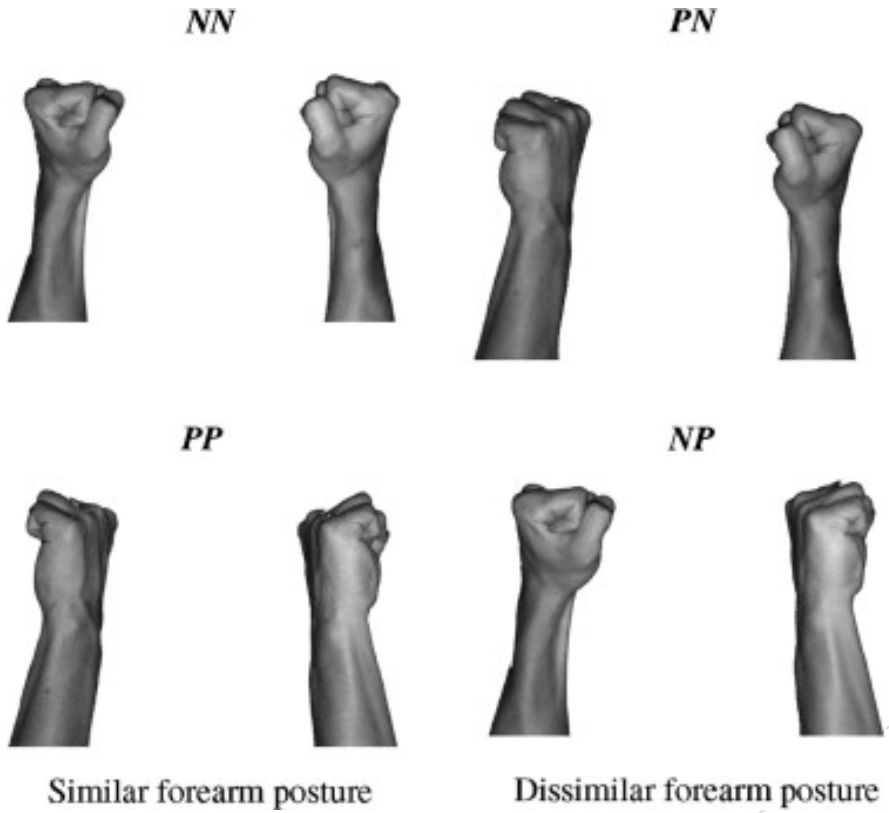
Temprado et al- Neuromuscular and spatial constraints on bimanual hand-held pendulum oscillations: Dissociation or combination?

- Objective/Aim of the Study
  - "The aim of the present experiment was to investigate the role of muscular and spatial constraints in hand-held pendulum oscillations by crossing their effects (i.e., mutually reinforcing or opposing) in the para-sagittal plane of motion."
  - "The present experiment aimed to determine whether muscular and spatial constraints had dissociable effects on pattern stability and pattern accuracy in the bimanual swinging of hand-held pendulum."

Temprado et al- continued

- 9 Right-handed Student Subjects
  - From the Sport Sciences in Marseille
- Participants had to oscillate the two pendulums by making wrist adduction–abduction movements in time with a metronome that increased in the course of a trial from 0.73Hz to 1.92Hz in steps of 0.07Hz every 3s, for a total trial duration of 60s. Four independent variables were manipulated for a total of 48 experimental conditions.
  - Direction
  - Muscular Coupling
  - Posture
  - Frequency

Temprado et al- continued



Temprado et al- continued

- Discussion/Conclusions
  - "The stability of coordination patterns was influenced by specific neuro-musculo-skeletal factors resulting from modifications of forearm posture, such as shortening/lengthening of functional muscles involved in the task when the forearm moved from neutral to prone-inversed position."
  - "**Patterns involving non-homologous muscular coupling (anti-phase) were less stable than patterns involving homologous muscular coupling (in-phase)** in the dissimilar forearm posture condition."

Smethurst et al (2001)- The acquisition of movement skills: Practice enhances the dynamic stability of bimanual coordination

- Objective/Aim of the Study
  - “In the present study, we examined how learning affected the production and dynamic stability of two bimanual coordination tasks corresponding to 90° out-of-phase (the to-be-learned task) and a 270° out-of-phase pattern (transfer task).”

Smethurst et al (2001)- continued

- 11 Subjects (from a University population)
  - All subjects were tested individually
- Auditory signals providing pacing for movement were presented to the participants via headphones.
  - These signals were in the form of a tone presented to the right ear and a discernibly different tone presented to the left ear.
- The participants were instructed to coordinate peak pronation of the right forearm with the tone presented to the right ear, and to coordinate peak pronation of the left forearm with the tone presented to the left ear.
  - The relative phase relationship between these tones was set at either 90° or 270°.

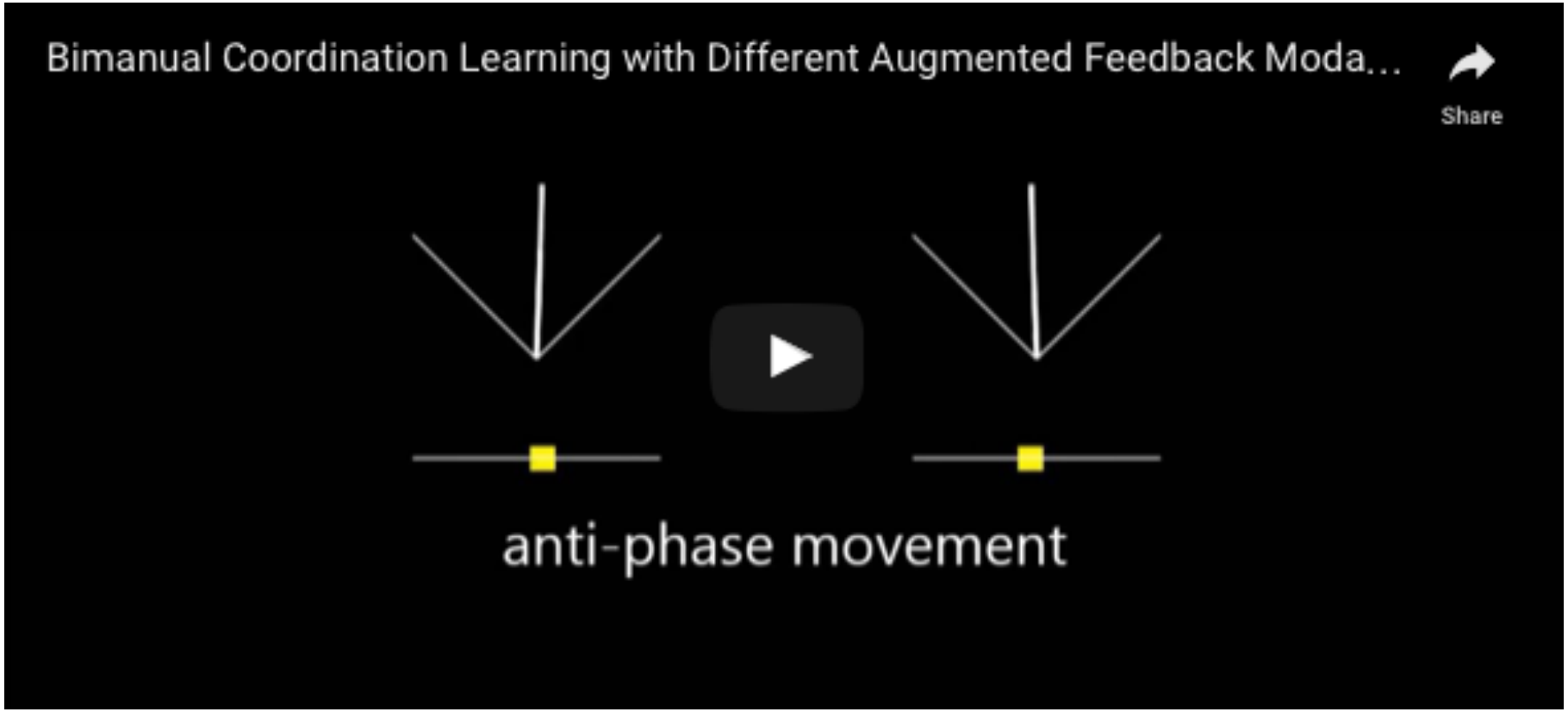
Smethurst et al (2001)- continued

- Discussion/Conclusions
  - **Practice increases the stability of a to-be-learned coordination pattern.**
    - This is reflected in an increased tolerance to frequency-induced transitions.
  - The changes are also reflected in a transfer task that is symmetrically opposite of the to-be-learned task.

Repetition and Body Control- Key Points

- When participants are instructed to stay with an anti-phase pattern, transition from anti-phase to phase wandering generally occurs.
- Coordination patterns were less stable when they involved non-homologous muscle coupling (anti-phase) and more stable with homologous muscle coupling (in-phase).
- Practice improved the stability of coordination patterns.

Demonstration- Phase/Anti-phase



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Expertise and Discriminate Touch

Sizer et al, 2007

Expertise and Discriminate Touch

- Manual Assessment and Treatment of Joints and Soft Tissue
- Clinician's Discriminate Touch
  - Povoa et al (2015)
  - Billis et al (2003)
  - Nicholson et al (2003)

Povoa et al- Validation of palpatory methods for evaluating anatomical bone landmarks of the cervical spine: A systematic review

- Objective/Aim of the Study
  - "To perform a systematic review of the validity of palpatory procedures for evaluation of anatomical bone landmarks of the cervical spine."

Povoa et al- continued

- 5 Studies Selected That Met the Criteria
- Discussion/Conclusions
  - “There are few studies that have evaluated the validity of manual palpatory procedures for examining boney landmarks of the cervical spine.”
  - Of those studies that have been evaluated, they are of fair to good methodological quality.
    - Many studies use imaging as the gold standard

Billis et al- Reproducibility and repeatability: errors of three groups of physiotherapists in locating spinal levels by palpation

- Objective/Aim of the Study
  - "To investigate reproducibility and repeatability of physiotherapists in locating three spinal levels (one cervical, one thoracic and one lumbar) by palpation."
  - Take into account two factors that have not been sufficiently investigated in the previous literature:
    - comparison between clinical experience and post-graduate manual therapy training of therapists
    - consistency of palpation across the different spinal regions tested.

Billis et al- continued

- 30 Subjects
  - 13 Final Year Undergraduate Students
    - all familiar with spinal palpation
  - 10 Clinicians
    - with at least 2 years of spinal musculoskeletal physiotherapy experience and no accredited postgraduate manual therapy qualifications
  - 7 Manual Therapists
    - with accredited postgraduate manual therapy qualifications and a minimum of 5 years of spinal physiotherapy experience

Billis et al- continued

- Discussion/Conclusions
  - "The research indicated that physiotherapists have fairly poor reproducibility and good repeatability in locating C5, T6 and L5 spinous processes by palpation."
    - Poor inter-rater reliability, good intra-rater reliability
  - "The reproducibility data demonstrated that students were less consistent than clinicians and Manual Therapists in palpation."
    - Clinicians and MTs located similar spinal levels

Nicholson et al- Manual discrimination capability when only viscosity is varied in viscoelastic stiffness stimuli

- Objective/Aim of the Study
  - "**To determine the discrimination threshold for viscous stiffness using a posteroanterior pressure technique, such as that used by manual therapists when assessing the stiffness of the lumbar spine**, and with viscosity test values like those estimated to characterize the human spine."
  - Spinal stiffness has both an elastic and a viscous component. Previous research has suggested that the viscous component of stiffness is more difficult to judge.

Nicholson et al- continued

- 25 Subjects
  - 8 Manipulative Therapists
  - 9 Physiotherapists
  - 8 Lay Persons

- Subjects were given 5 stimuli, 20 times each in random order
  - Subjects were asked to judge whether the stimulus was more or less stiff compared to the other stimuli

Nicholson et al- continued

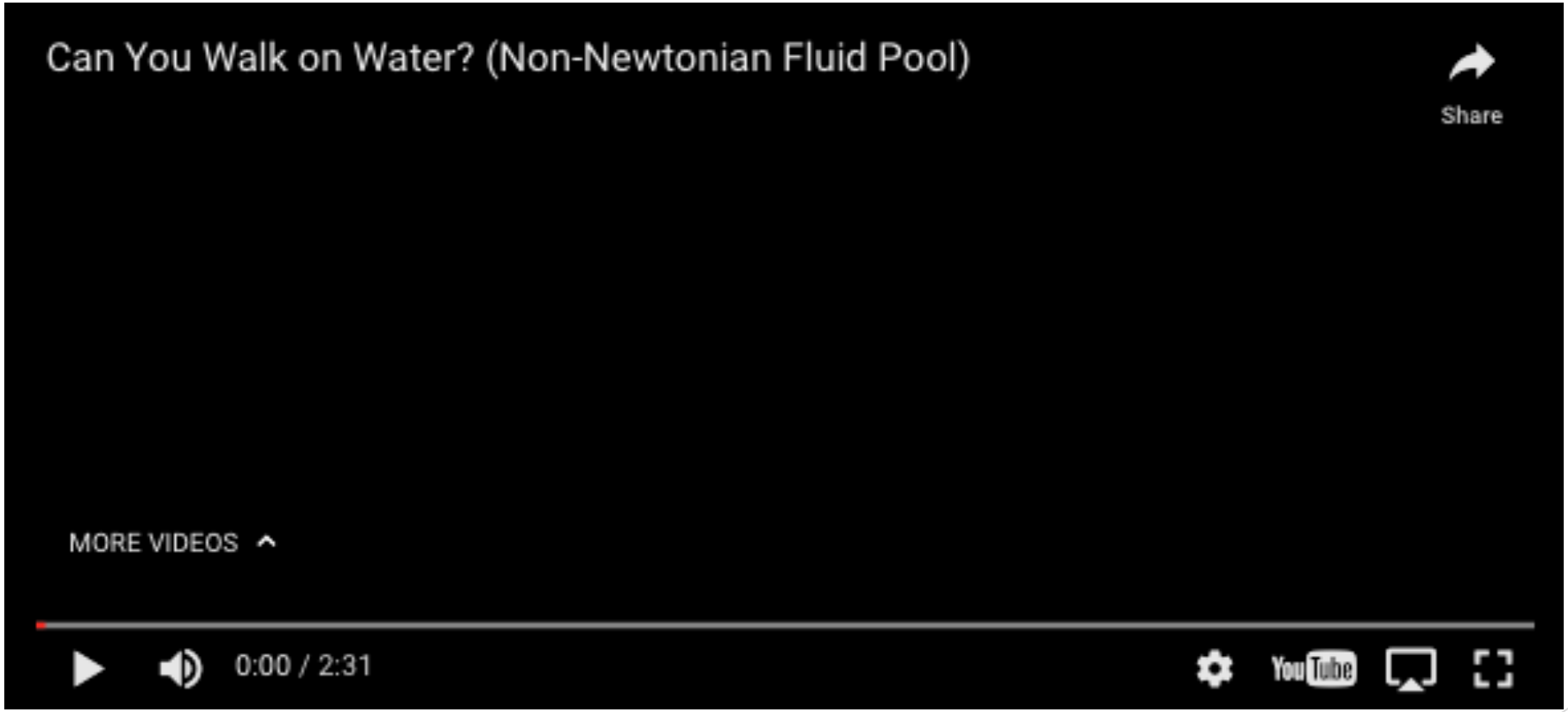
- Discussion/Conclusions
  - “The results of the current study imply that the task of discriminating viscous stimuli is a more difficult task than that of discriminating elastic stimuli.”
  - “It is suggested that since the task of judging viscous stiffness appears to be more difficult than that of judging elastic stimuli, it may be the viscous component of spinal stiffness that has contributed to the poor reliability of judgments of spinal stiffness.”

Expertise and Discriminate Touch- Key Points

- Of the studies that have studied the manual palpatory procedures for examining boney landmarks in the cervical spine, they are all of low to moderate methodological quality.
- Physiotherapists have poor inter-rater reliability and good intra-rater reliability in locating spinous processes by palpation.
- Viscous stiffness is more difficult to judge than elastic stimuli which shows that the viscous component of spinal stiffness may be the cause for the poor reliability in judging spinal stiffness.

Expertise and Discriminate Touch

Demonstration- Oobleck



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Take Home Message

- Practice Makes Perfect!

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Questions?

Lab Time

Accessed at https://drjohnrusin.com/wp-content/uploads/2016/05/Screen-Shot-2014-05-12-at-6.35.45-PM-e1439820975944.png

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