



# **STUDENT NOTEBOOK**

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# INTRODUCTION

Ando & Aston Physical Therapy has adopted their primary philosophy of care from the Institute of Physical Art. There are eight primary courses which form this foundation: Functional Orthopedics I and II, Back Education and Training, Proprioceptive Neuromuscular Facilitation I, Functional Mobilization Upper Quadrant, and Functional Mobilization Lower Quadrant. Art Ando PT DPT is a Certified Functional Manual Therapist (CFMT), and Char Zamarripa is Functional Orthopedics Certified (FOC) through the IPA.

Our biomechanical model of joint mobilization primarily comes from Integrative Manual Therapy Solutions (IMTS). The two reference notebooks for this model are Cervical Thoracic Integration (CTI), Lumbo Pelvic Integration (LPI).

The purpose of this notebook is to assist you in the development of the skills that you will need to develop over the coming weeks. We hope that having your own notebook will speed up the learning process, and allow you to have your own reference source for articles, questions, techniques, and notes.

In conclusion, we believe that the profile of a successful student at Ando & Aston Physical Therapy has:

- Good self-esteem that allows professionalism, accelerated learning and humility
- Desires to be a highly effective manual therapist and rehabilitator
- Understands that PT school is a preparatory process

Please set up your notebook in an organized fashion that will allow you to find information quickly, and have fun!

## FACILITY EDUCATIONAL REQUIREMENTS

### I. Pre-affiliation reading assignments:

The Greenman and Gibbons textbooks are located in our office. All reading of Company textbooks must be done in our office or you may purchase your own copies. These texts would be excellent additions to your library.

- A. Greenman, Philip DO. Principles of Manual Medicine, 2<sup>nd</sup> ed. ISBN 0-683-03558-1. Responsible for reading and comprehending the following:
  - 1) Chapter 1, pp. 3-5
  - 2) Chapter 3, pp. 39-44
  - 3) Chapter 4, pp. 46, 49-52
  - 4) Chapter 6, pp. 65-73
  - 5) Chapter 8, pp. 93-98
- B. Gibbons P, Tehan P. Manipulation of the Spine, Thorax and Pelvis: An Osteopathic Perspective. ISBN 0443062625. Responsible for reading and comprehending the following:
  - 1) Chapters 1-7

Reading assignments C-G can found under the For PT's section of andoaston.com.

- C. The 5-Step Functional Care Approach. Ando 2012
  - D. Evaluation and Treatment of Unilateral Sacrum with Concurrent Iliac and Coccygeal Dysfunctions. Ando 2007
  - E. FAPI. Development and Use of the Standard and Modified Function and Pain Inventory. Ando and Aston Physical Therapy. July 2004. The FAPI is found in the Evaluation section of the Electronic Medical Record (EMR). Each patient, along with the therapist is asked to identify both functional losses and regions of pain on a 0-10 scale. The FAPI is revisited subsequently with each progress note (on a monthly basis) and at discharge.  
The FAPI is NOT used with Medicare patients. Use the Oswestry, NDI, LEFS, and DASH instead.
  - F. Soft Tissue Mobilization. Chapter 30: Soft tissue mobilization by Johnson, Gregory PT.
  - G. PNF. Saliba, Johnson & Wardlaw. PNF. Rational Manual Therapies edited by Basmajian & Nyberg. ISBN 0-683-00420-4.
  - H. LPM. Saliba and Johnson. Chapter 13: Lumbar Protective Mechanism. The Lumbar Protective Mechanism is a postural special test that is used to standardize trunk strength.
- II. Pictograms: Pictograms of the lumbosacral region can be found in Appendix A. Be able to document the loss of motion in each pictogram.
- III. Greenman DVDs

- A. There are nine DVDs covering the lumbar, thoracic, cervical spines, sacrum, ribs, and extremities. They average about one hour per DVD.
  - B. We recommend that you view these tapes prior to your internship, as the philosophy, terminology, evaluation and treatment for joint management at Ando & Aston Physical Therapy is primarily biomechanical and Osteopathic-based.
  - C. We recommend that you take notes for each DVD in a way that will allow you to add to these notes as you continue through the internship.
- IV. Daily written journal: Journal contents should be reviewed with the preceptor on weekly basis and should include the following:
- A. Types of patient diagnoses observed or treated.
  - B. Treatment techniques applied.
  - C. Information that needs to be researched or reviewed (i.e. anatomy, biomechanics, treatment techniques).
  - D. Short-term and long-term goals related to what learning experiences the student hopes to gain by the end of the rotation.
  - E. Plan for how the student expects to achieve the goals.
  - F. Areas of improvement.
- V. Patient Care Meetings. Student will be responsible for presenting new patients and discussing patients' progression at weekly meetings. Student in-services are NOT required, unless participation in Patient Care meetings is deemed sub-standard or required by student's school.
- VI. Other opportunities, please arrange through your preceptor:
- A. Free Pilates, Yoga, body rolling, tai chi lessons from A&A employees.
  - B. Discounted or free, acupuncture/acupressure, massage from A&A contractors who determine their own student discount (or complementary treatment)
  - C. Community projects, e.g. P.T. support of community fun run, basketball tournaments as available.
  - D. Self-assessment of Character & Temperament Type. David Kiersey, Marilyn Bates, Prometheus Nemesis Book Company 1984. Can provide invaluable information on your overall character and temperament portrait and also leading, teaching style.

- VII. HIPAA training and testing will take place for each student according to company policies.

# Biomechanics: The Spine

- I. **Fryettes Laws of physiologic spinal motion.** Biomechanical assessment and treatment is a core competency in the assessment and treatment of spine dysfunction. Fryettes Laws of motion form the basis of the biomechanical assessment and treatment. Consistent application of these laws leads to an organized assessment and treatment and results in consistent and reproducible assessment and treatment of the spine.
- A. **Fryettes 1<sup>st</sup> Law.** When any part of the lumbar or thoracic spine is in a neutral position, rotation and sidebending occur to opposite sides. Type I dysfunctions follow Fryettes 1<sup>st</sup> law. Treatment must be done in neutral, but you may visually observe the scoliosis created by the dysfunction in neutral or non-neutral positions. This is a compensatory dysfunction.
- Application of this law in the lumbar and thoracic spine may be described as “neutral mechanics”
  - Cervical spine. Atypical cervical vertebrae, OA and AA joints, always follow Type I laws where rotation and sidebending occur in opposite directions in both neutral and non-neutral positions. However, this law does not apply to the typical cervical spine C2-3 to C7, as there is no physiological neutral position within the context of this definition, although there will be rules that govern its behavior.
  - Appearance: This is the sweeping, gentle compensation in the spine. Scoliotic appearance.
  - Etiology: Occurs either above or below the primary motion loss to allow the patient to carry him/herself upright. Therefore it starts out as a neuromuscular compensation (dysfunction).
  - Acute Type I's: Type I's will “go away” when the Type II primary motion loss is regained. Therefore Type II's must be treated first!
  - Chronic Type I's: Over time they may become more structurally dysfunctional (requiring joint mobilization), even though it is compensatory to the primary dysfunction.
  - Presentation: Occurs only in groups of three or more segments, with these segments exhibiting the same motion loss. Otherwise, suspect multiple, sequential (‘stacked’) Type II's.
- B. **Fryette's 2<sup>nd</sup> Law.** When any part of the spine (excluding O/A, A/A joints) is in a non-neutral position (i.e.: full flexion/extension with facets engaged), rotation and sidebending occur to the same sides. Type II dysfunctions follow Fryette's 2<sup>nd</sup> law. These are considered Primary dysfunctions and follow non-neutral mechanical principles.
- Application of this law in the lumbar and thoracic spine may be described as “non-neutral mechanics”
  - The typical cervical vertebrae (C2-3 to C7) always follow this law (in

neutral as well as full flexion/extension). Type I mechanics do not apply to these vertebra!

- iii. Prevalence: This is the primary motion loss that affects the spine.
- iv. Etiology: Can be trauma induced, or any repetitive, prolonged or forceful movement in a ROM that the joint gets 'stuck'.
- v. Factors: It is usually a combination of joint surface and surrounding soft tissue dysfunction (structural dysfunctions). Can also assume that neuromuscular control into this lost ROM is impaired (neuromuscular dysfunction).
- vi. Assessment: Type II's may occur unilaterally, bilaterally, or in several segments concurrently ('stacked' type II's). This means that the function of each side of each spinal segment must be assessed.

- C. Fryette's 3<sup>rd</sup> Law. "Motion in one plane limits motion in all other planes of motion."

## II. Types of Spinal Dysfunctions

Mechanically, the position that the joint is "stuck in" is considered the positional fault (PF). The motion that is lost to the joint is considered the motion loss (ML). The ML is always in the opposite diagonal to the PF. Motion losses are described as Major (> 50% motion loss), Minor (10-49% loss), or End Range (<10% motion loss). A brief discussion is provided to facilitate the learning process.

Documentation: Level and motion loss. In documentation, place more emphasis on getting the level(s) and motion loss correct. E.g. 'loss of flexion, rotation and side bending to the right at L5 (FRS<sub>R</sub>) with Type 1 compensation above (sidebent right, rotated left)'

### A. Upper Cervical Spine (OA,AA joints)

- i. **OA ER<sub>R</sub>S<sub>L</sub> Positional Dysfunction:** OA joint is extended, rotated right and sidebent left. The motion loss is flexion, rotation left and sidebending right (FR<sub>L</sub>S<sub>R</sub>).
- ii. **OA ER<sub>L</sub>S<sub>R</sub> Positional Dysfunction:** rotation and sidebending are the opposite of above.
- iii. **OA FR<sub>R</sub>S<sub>L</sub> Flexion Positional Dysfunction:** OA joint is flexed, rotated right and sidebent left. The motion loss is extension, rotation left and sidebending right (ER<sub>L</sub>S<sub>R</sub>).
- iv. **OA FR<sub>L</sub>S<sub>R</sub> Flexion Positional Dysfunction:** rotation and sidebending are the opposite of above.
- v. **AA R<sub>L</sub> Positional Dysfunction:** The atlas is rotated left on the axis. The motion loss is atlas right rotation.
- vi. **AA R<sub>R</sub> Positional Dysfunction:** The atlas is rotated right on the axis. The motion loss is atlas left rotation.

### B. Lower Cervical (C2-3 to C7), Thoracic, and Lumbar Spine



- i. **FRS Positional dysfunction:** if the transverse processes of the segment become symmetrical during spinal flexion, and asymmetrical during extension, the segment is said to be “stuck” in a flexed position. During extension motion, the transverse process on the side of the dysfunction will remain deep (or anterior) and rotated to the opposite side. For example: the transverse processes of L5 become symmetrical in lumbar flexion and the right transverse process remains deep during lumbar extension motion. In this case, the PF is L5 FRS<sub>L</sub> (L5 is **F**lexed, **R**otated and **S**idebent **L**eft). The ML is L5 ERS<sub>R</sub> (**E**xtension, **R**otation and **S**idebending to the right).
- ii. **ERS Positional faults:** When the transverse processes of the segment become asymmetrical in flexion and symmetrical in extension. The transverse process on the side of the dysfunction will be posterior (“shallow”) and rotation will be to the same side. The PF of L5 ERS<sub>L</sub> will have a motion loss of FRS<sub>R</sub>.

### C. Biomechanics of the Ribs

#### i. Breathing motions

1. Pump handle: Upper ribs, increased A/P dimension
2. Bucket handle: Middle and lower ribs
3. Caliper action: Floating ribs

#### ii. Rib movement

1. Internal rib torsion with vertebral flexion: Ribs will move down and forward with vertebral segment flexion (exhalation).
2. External rib torsion with vertebral extension: Ribs will move up and backward with vertebral segment extension (inhalation).
3. Reciprocal effect: Motion losses in ribs can cause motion losses in vertebral segments and vice-versa.

#### iii. Spinous processes. Rule of three's

1. T1-3 & T12: SP is at same level as corresponding body
2. T4-6 & T11: SP is ½ level below the corresponding body
3. T7-9 & T10: SP is one full level below the corresponding body

### D. Biomechanics of the Sacroiliac Joint and the Symphysis Pubis

#### i. Dysfunctions of the Symphysis Pubis

1. **Shear.** Can occur in all axes of motion
  - a. Very common dysfunction; should be corrected first

#### ii. Dysfunctions of the Innominate

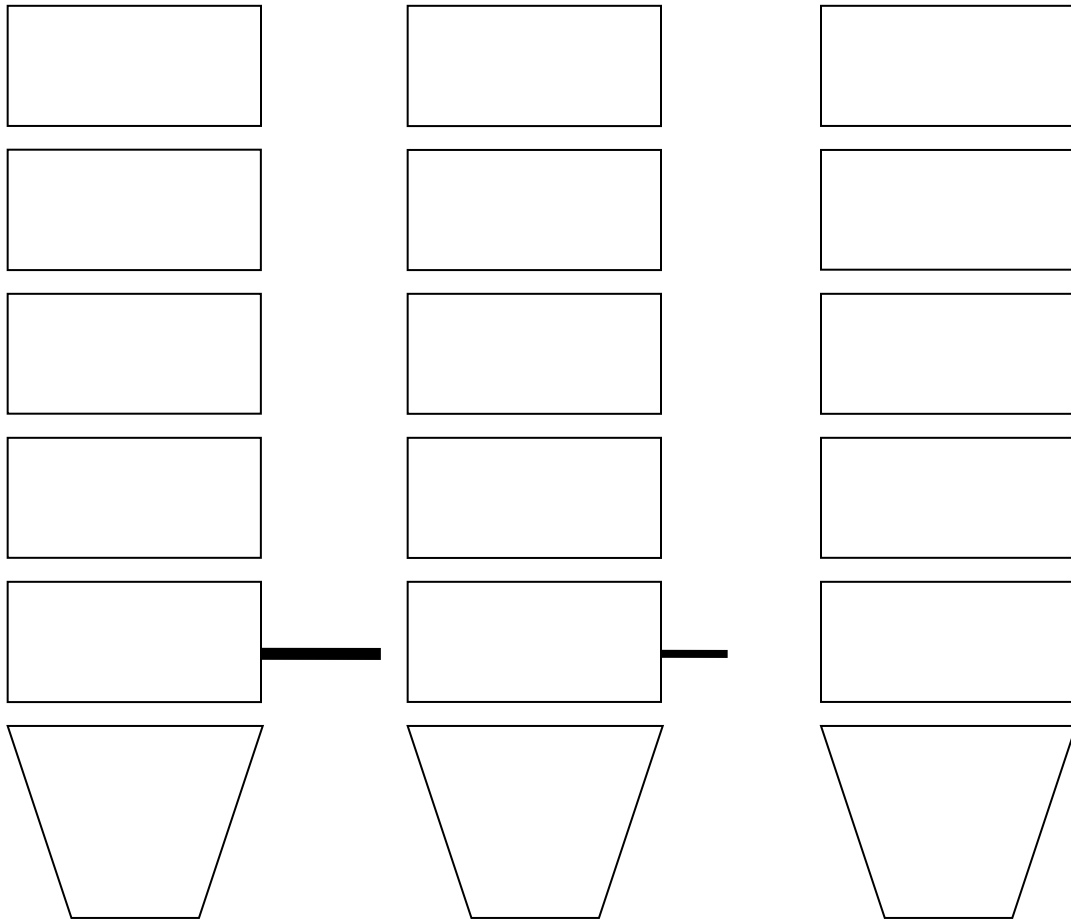
1. **Torsions.** Most common problem
  - a. Motion loss of anterior rotation
  - b. Motion loss of posterior rotation



2. **Flares.** Rare, may be associated with femoral torsions
    - a. Inflare: Suspect shortening of iliacus
    - b. Outflare: Will see with major pelvic trauma
  3. **Subluxations.** Motions that occur off normal axes. Suspect with history of trauma (fall to ground) or chronic problems resistant to treatment.
    - a. Upslip - Motion loss of inferior glide. Typically unstable w/weight bearing, post-reduction
    - b. Downslip - Motion loss of superior glide. Typically reduces with weight-bearing.
- iii. **Dysfunctions of the Sacrum.** There are ten dysfunctions as described by Greenman. Two bilaterals, four torsions, and four unilaterals.
1. **Bilaterals.** Motion occurs about the mid-transverse axis (MTA).
    - a. **Bilateral Sacral Flexion.** PF: bilateral sacral flexion. ML: bilateral sacral extension.
    - b. **Bilateral Sacral Extension.** PF: bilateral sacral extension. ML: bilateral sacral flexion.
  2. **Torsions-** motion occurs as a rotation on either the left oblique axis (LOA) or the right oblique axis (ROA). See Appendix A for further description of sacral axes.
    - a. **Forward Sacral Torsions:**
      - i. **Left on left:** right sacral base is in left rotation on LOA, left sacral base is stable. PF: right sacral base flexion. ML: right sacral base extension.
      - ii. **Right on right:** left sacral base is in right rotation on ROA, right sacral base is stable. PF: left sacral base flexion. ML: left sacral base extension.
    - b. **Backward sacral torsions:**
      - i. **Right on left:** Left sacral base is in right rotation on the left oblique axis. PF: Right sacral base extension. ML: Right sacral base flexion.
      - ii. **Left on right:** right sacral base is in left rotation on right oblique axis. PF: left sacral base extension. ML: left sacral base flexion.
  3. **Subluxations-** Sacral sidebending is the hallmark of this type of non-physiological (off normal axis) dysfunction. This group represents the most difficult to correct in that they often present with an ilial dysfunction (e.g. ML posterior torsion right), which may require simultaneous correction with the sacral motion loss (e.g. ML right sacral base flexion and sacral side bending to the right). In other words, two joints in 3 planes of motion will need simultaneous correction. See Ando paper for specific adapted evaluations and treatments.
    - a. **Unilateral Sacral Extension:** Involved sacral base moves into extension, coupled with sacral sidebending to the opposite side.

- i. **Right unilateral extension:** PF: sacrum is sidebent left, rotated right. ML: right sacral base flexion, right sidebending.
  - ii. **Left unilateral extension:** PF: sacrum is sidebent right, rotated left. ML: left sacral base flexion, left sidebending.
- b. **Unilateral Sacral Flexion:** Involved sacral base moves into flexion, coupled with sacral sidebending to the same side.
  - i. **Right unilateral flexion:** PF: sacrum is sidebent right, rotated left. ML: right sacral base extension, left sidebending.
  - ii. **Left unilateral flexion:** PF: sacrum is sidebent left, rotated right. ML: left sacral base extension, right sidebending.

# Pictogram 1



Flexed

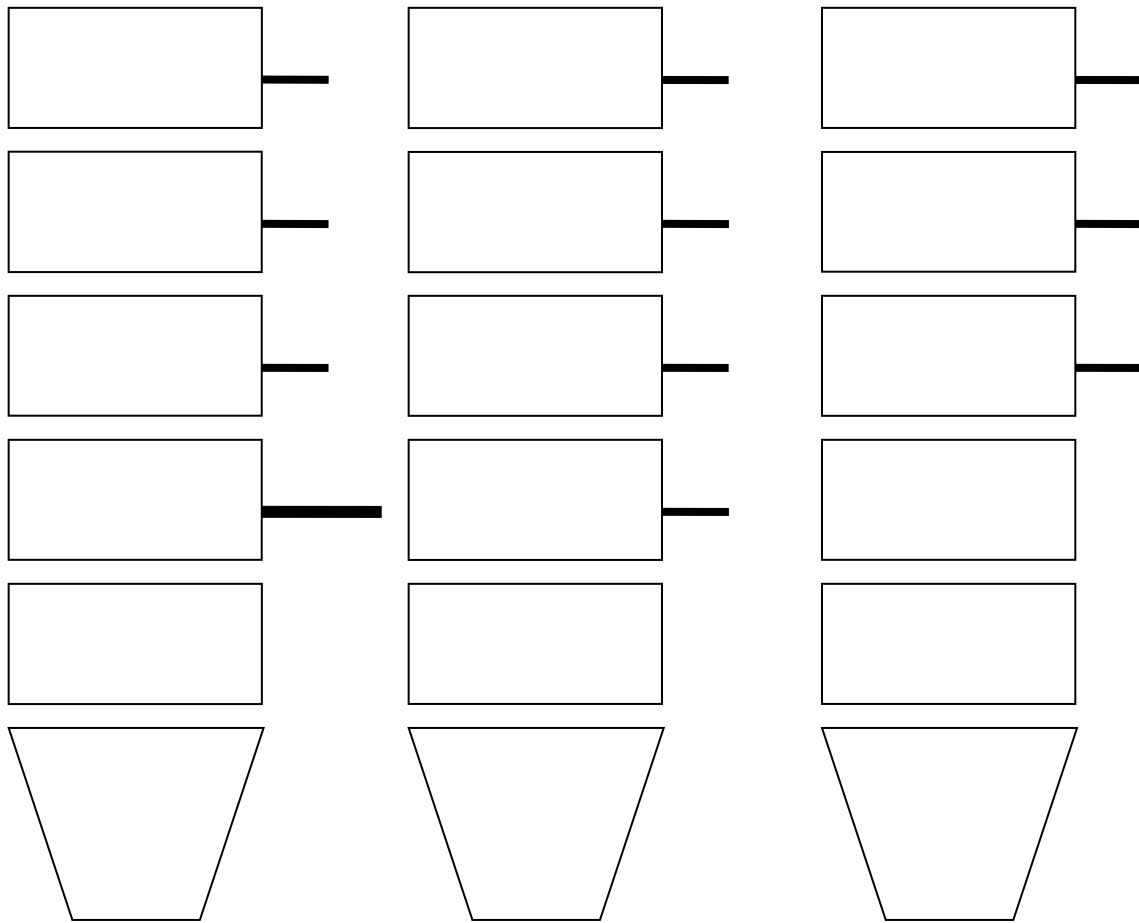
Neutral

Extended

Type 2 Positional fault \_\_\_\_\_ Motion loss \_\_\_\_\_

Type 1 Positional fault \_\_\_\_\_ Motion loss \_\_\_\_\_

## Pictogram 2



Flexed

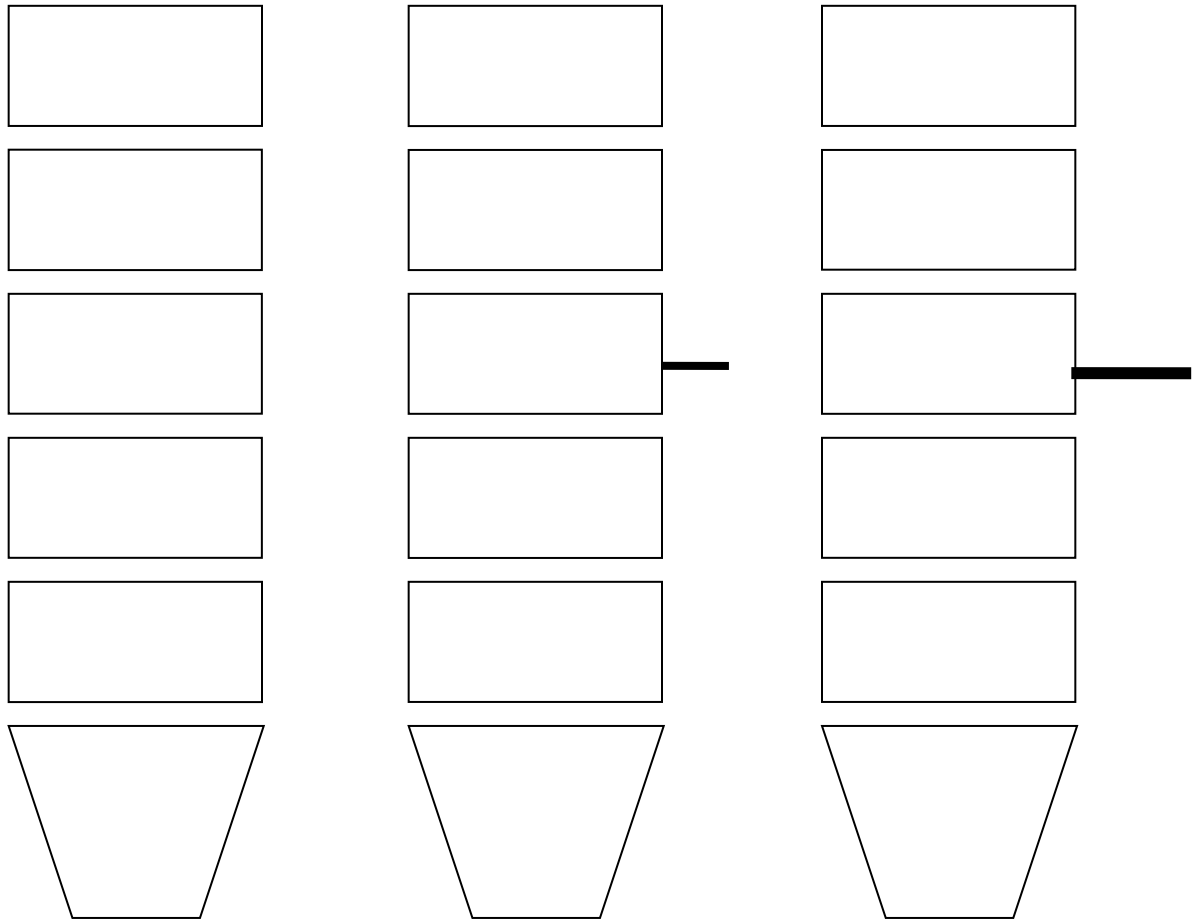
Neutral

Extended

Type 2 Positional fault \_\_\_\_\_ Motion loss \_\_\_\_\_

Type 1 Positional fault \_\_\_\_\_ Motion loss \_\_\_\_\_

### Pictogram 3



Flexed

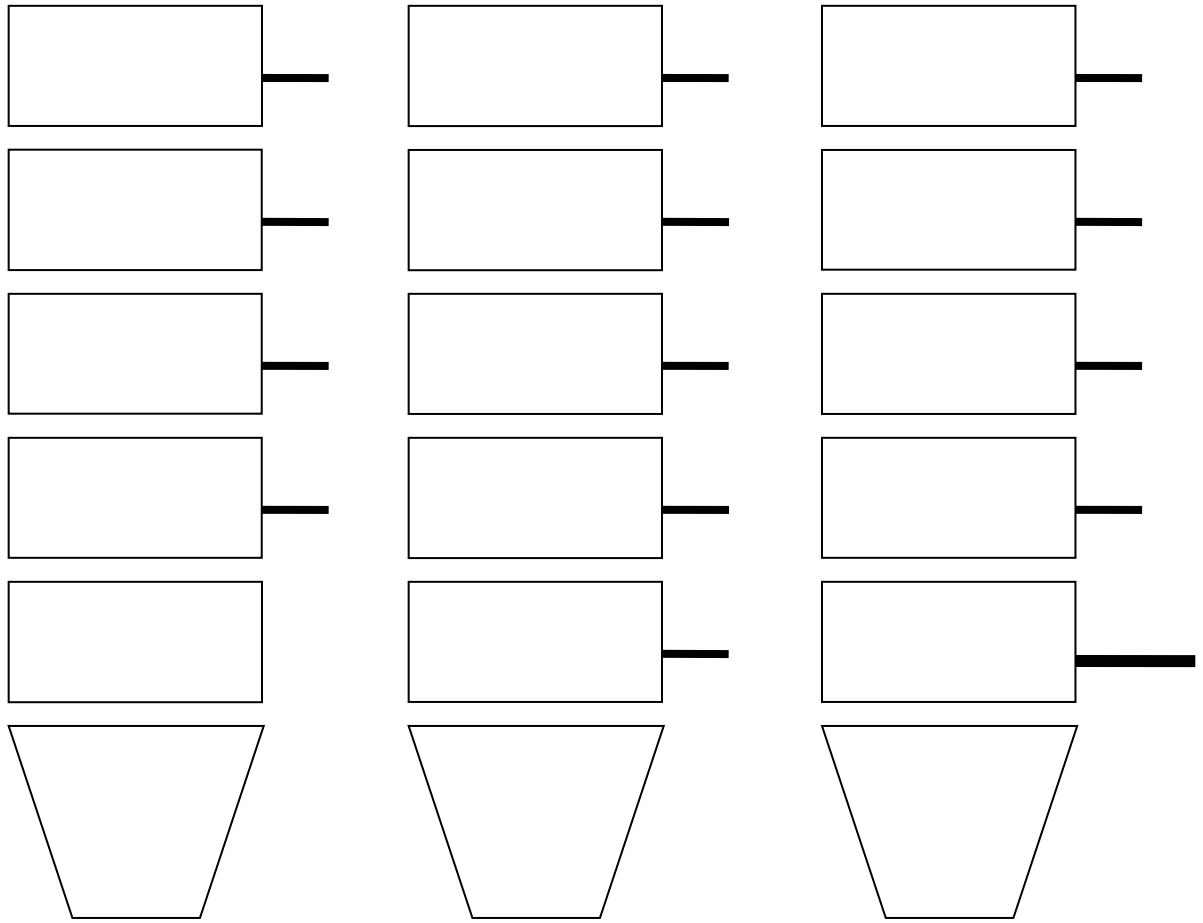
Neutral

Extended

Type 2 Positional fault \_\_\_\_\_ Motion loss \_\_\_\_\_

Type 1 Positional fault \_\_\_\_\_ Motion loss \_\_\_\_\_

# Pictogram 4



Flexed

Neutral

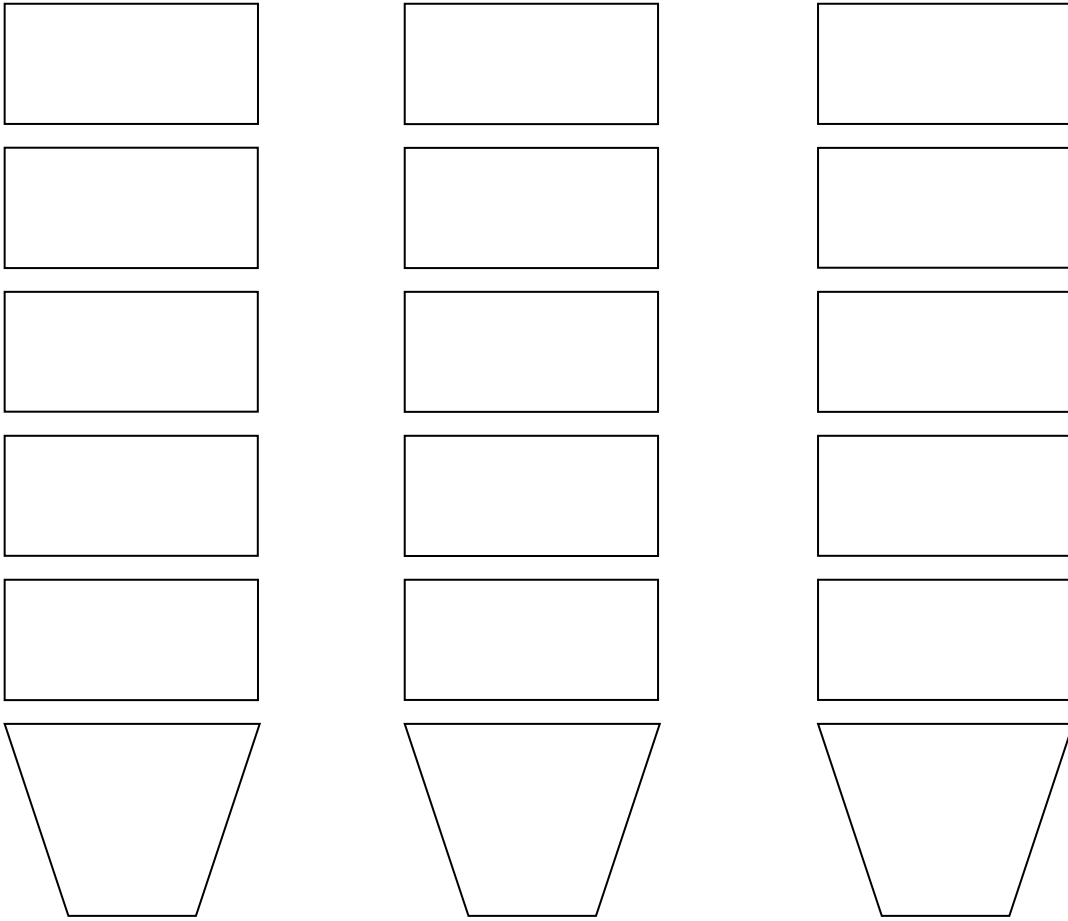
Extended

Type 2 Positional fault \_\_\_\_\_ Motion loss \_\_\_\_\_

Type 1 Positional fault \_\_\_\_\_ Motion loss \_\_\_\_\_



# Pictogram 5 (Blank)



Flexed

Neutral

Extended

Type 2 Positional fault \_\_\_\_\_ Motion loss \_\_\_\_\_

Type 1 Positional fault \_\_\_\_\_ Motion loss \_\_\_\_\_

# SPECIAL TESTS

Proficiency in the following tests is expected as a pre-condition to independent evaluations. Special tests that are unique to Ando & Aston Physical Therapy will be described in this section. Tests that are not described may be found in your Magee text, Orthopedic Physical Assessment. A copy of this text is located in our facility, if needed.

## I. Upper Extremity

- a. Finkelstein's test
- b. Phalen's/Reverse Phalen's test
- c. Neurotension tests
- d. Speed's test
- e. Impingement test

## II. Spine

- a. Vertical compression test
  - i. Position patient in a natural relaxed posture. Tester stands behind patient with hands on patient's shoulders between acromion and first rib. Apply gentle sustained pressure downward through the patient's trunk. Observe the translation of force segment to segment. An efficient response is one in which the pressure translates evenly to the base of support or feet. An inefficient response is one in which the pressure causes the spine to sidebend, backward bend, shear or rotate. The end-feel should be springy, not hard. A hard end-feel indicates a holding pattern or an alignment dysfunction.
- b. Elbow Flexion Test
  - i. Same position as vertical compression test. Have patient bend elbows and maintain a 90o angle of flexion while the therapist applies a downward pressure through the distal end of the forearm. Note: The patient's forearms may be either supinated or pronated, with position being supination. The examiner should note where the patient efforts to maintain elbow position (shoulder girdle, cervical, thoracic, lumbar spine or forearms). The examiner the note the amount of force generated against the resistance and balance in response to the force. In an inefficient state, the patient will attempt to maintain the position with global muscles and will often give in the arms, shoulder girdle and spine. The patient will also frequently fall forward as the force is applied. An efficient state is one in which the patient can maintain the elbow position through automatic activation of the core allowing the shoulder girdle and spine to remain stable and balance to be efficient.
- c. Lumbar Protective Mechanism (LPM):
  - i. Have the patient stand in a stride stance position. Stand facing the patient in the diagonal which aligns with the patient's stride position. Place your hands on the anterior aspect of the patient's shoulders and ask the patient to maintain the position while you quickly and with appropriate force push backward in the diagonal. The therapist should push quickly and with moderate strength to assess initiation. IF the LPM muscles contract appropriately and maintain the initial position, apply increased pressure to assess strength and maintain the pressure to

assess endurance. The test is repeated in the same diagonal with the therapist pulling from the posterior aspect of the patient's shoulders. The test is repeated in the opposite diagonal after the patient has switched his foot position.

### III. Low Back

- a. Quadrant test
- b. Straight leg raise
- c. Neurotension (Slump) test
- d. Prone knee bend
- e. Marcher's/Stork test
- f. Standing and Sitting flexion test
- g. Sit-Slump Test

### IV. Lower Extremity

- a. Thomas test
- b. McMurray's test
- c. Appley's compression test
- d. Anterior drawer (knee/ankle)
- e. Posterior drawer (knee/ankle)
- f. Lachman's test
- g. Varus/Valgus stress test
- h. Calcaneocuboid and talonavicular laxity tests

### V. Neck

Subcranial ligamentous testing may be conducted on each patient prior to the implementation of further evaluative procedures to ensure safety of cervical ROM. This is particularly true of patients who have:

1. Sustained trauma to this region
2. A history of rheumatoid arthritis
3. Down's Syndrome
4. A long term history of "steroidal drug use"
5. "Ligament laxity" in other articulations

Vertebral Artery Screening. We screen for vertebrobasilar signs and symptoms that would indicate that a patient is either safe or unsafe for ROM treatment.

Signs of VBI (what we see)

1. Nystagmus
2. Gait disturbances
3. Horner's syndrome. Signs found in all patients on affected side of face include [ptosis](#) (drooping upper eyelid from loss of sympathetic innervation to the [Müller](#) muscle<sup>[1]</sup>), upside-down ptosis (slight elevation of the lower lid), and [miosis](#) (constricted pupil) and [dilation](#) lag. [Enophthalmos](#) (the impression that the eye is sunk in) and [anhidrosis](#) (decreased [sweating](#)) on the affected side of the face, loss of [ciliospinal reflex](#) and blood shot conjunctiva may occur depending on the site of lesion.

Symptoms of VBI (what the patient reports)

1. Dizziness/vertigo

2. Diplopia
3. Tinnitus
4. Nausea
5. Drop attacks
6. Dysarthria
7. Dysphagia
8. Occipital headaches
9. Facial paraesthesia
10. Tingling in the upper limbs
11. Pallor and sweating
12. Blurred vision
13. Light-headedness
14. Fainting/blackouts

Dizziness is a common presenting complaint with multiple etiologies that must be distinguished from dizziness arising from VBI. It has been suggested that questioning about nausea during VBI testing is as important as enquiring about dizziness. Diagnosed VBI is an absolute contraindication to HVLA techniques to the cervical spine.” Gibbons P Manipulation of the Spine, Thorax and Pelvis An Osteopathic Perspective 2004 Churchill Livingstone pp.25-26

- a. Quadrant test
- b. Foraminal Compression test (Spurling’s test)
- c. Vertebral Artery test
- d. Alar ligament test
- e. Transverse Cruciform ligament test
- f. Short neck flexor strength testing.
- g. Transverse Ligament Tests
  - i. Sharp-Purser Test: Patient is positioned in a seated, neutral posture with the therapist contacting the anterior forehead/cranium with one hand while making firm contact on the sp of C2. Apply firm P→A pressure. Negative test end feel should be abrupt and not give. With excessive motion/guarding/crepitus or reduction of any cardinal signs, then therapist should consider instability.
  - ii. Cranial Atlas lift: Patient is positioned in a supine, neutral posture. Concurrently lift occiput and atlas. Negative test end feel should be abrupt and not give. Excessive translatory motion, reflex spasm, crepitus, then therapist should consider instability. Monitor for cord compression signs.
  - iii. Atlas-Axis shear testing: Patient is positioned in a supine, neutral posture. Therapist contact is TP of atlas and opposite TP of axis. Shear atlas on fixed axis or shear both together simultaneously. Repeat for the other side. Negative test end feel should be abrupt and without give. Reflexive guarding, excessive motion, and crepitus should alert therapist to consider instability.
- h. Alar ligament tests
  - i. Cranial Side tilt: Patient is positioned in a supine, neutral posture. Therapist contact should be right and left lateral aspects of C2 sp with the

- 3<sup>rd</sup> finger. Introduce cranial side tilt to the right and left. Avoid sidebending through mid-cervical spine. Perform test in craniocervical flexion and extension as well as neutral. A positive test will have a delayed or absent rotational response of C2. To be considered a truly positive then should be positive in all 3 positions.
- ii. Fixed axis test: Patient is positioned in a supine, neutral posture. Therapist contact is lateral aspects of C2 sp. Perform a cranial side tilt of the occiput while blocking the C2 sp on the opposite side of cranial side tilt. Negative test end feel should be firm and abrupt. Positive test indicators are soft and/or spongy end feel with accompanying muscle spasm or guarding.
- i. Tectorial membrane test
    - i. Clunk test: Test has three stages. Patient is positioned in a supine, neutral posture. Stage I = neutral with long axis distraction with forehead and occiput. Stage II = OA flexion with long axis distraction. Stage III = Fixed axis with thumb and index finger and long axis distraction. Negative test end feel should be firm and arresting. Positive test end feel will be delayed, absent, or spongy.
  - j. Vertebral Artery test
 

Before test, screen patient for dizziness, light headedness (esp. with ADL's or craniocervical extension and/or rotation), drop/blackout attacks, arteriosclerosis, CVA, or high cholesterol.

    1. Extension: Perform suboccipital extension for 15 sec, monitor for 7 signs of VBI.
    2. Combined motion: Perform craniocervical rotation to the right in the extreme of combined extension and sidebending to the right for 15 seconds. Monitor for 7 signs of VBI.
  - k. Hautard's Test: Patient is in a sitting position with arms flexed to 90° palms up, have them actively go into ERS for 15 seconds. Watch for the 7 Ds and arm movement. The seven D's are:
    1. Distress/apprehension
    2. Dizziness (Vertigo)
    3. Dysarthria (Slurred Speech)
    4. Diplopia/Nystagmus
    5. Dilatation (Unequal dilation of the pupils)
    6. Drop attacks/fainting
    7. Distal paraesthesias

## Hypothesis-Oriented Algorithm for Clinicians (Annotated)

- A. **Reference.** Rothstein, JM, and Echternach, JL: Hypothesis-oriented algorithm for clinicians. *Physical Therapy* 69:1388-1394, 1986.
- B. **Introduction.** This informal flow sheet is intended to help organize and prioritize the assessment and treatment procedures such that efficiency is gained, but not at the cost of thoroughness. The italicized comments are some of the thoughts that accompany the specific tasks of data gathering that steer the assessment/reassessment and treatment process.
- C. **Purpose.** This algorithm is designed to assist the clinician in ordering the process of program design and review.

1. Collect initial data (e.g. interview, history, chart review, subjective evaluation)
2. Generate a problem statement
3. Establish goals
4. Perform examination (collection of data, objective evaluation)
5. Generate working hypotheses about how goals are met or why they can't be met at the present time (establish testing criteria for each hypothesis) **OR**  
Referral to other practitioner (if no hypotheses can be generated)
6. Ask whether goals are viable,  
If NO, modify goals (go back to establish goals above)  
If YES, proceed
7. Plan re-evaluation methodology (schedule dates for re-evaluations)
8. Plan treatment strategy based on hypotheses (overall treatment approach)  
**OR**  
Seek consultation, if needed, for additional management resources
9. Plan tactics to implement strategy (specifics of treatment plan)
10. Implement tactics (treatment)
11. Reassessment: Have goals been met?  
If YES, discharge patient  
If NO, are tactics (treatment) being implemented correctly?  
If NO, improve implementation, go back to 8 above.  
If YES, are tactics appropriate?  
If NO, change tactics, go back to 7 above  
If YES, is the strategy correct?  
If NO, change strategy, go back to 6 above  
If YES, are hypotheses viable? (i.e., if testing criteria have been met and goals are not met, new hypotheses are needed)  
If NO, generate new hypothesis  
If YES, consider consultation, or refer out

- D. **Initial data.** Critical elements include information regarding:

1. Chronicity, severity of functional loss, age, premorbid status. Speed and extent of recovery.
2. Goals of patient, physician, environment (work, home etc.), and payor.

- Compatibility of goals
3. Interventions to date.
    - a. Applicability and thoroughness of exam, treatment. Don't repeat exactly.
    - b. New angles, what to rule out. Preliminary list of contraindications.
  4. Type of referral source.
    - a. Orthopedists better at ortho tests and Dx than medicine, include more "special questions" to rule out non-neuromuscular disease.
    - b. Internists better at disease tests and Dx than orthopedic tests and Dx, include more "special tests" for P.T. Dx
  5. Patient's knowledge of problem, desire to attain goals above, cognitive and communication status. What I have to work with, reliability and compliance to rehabilitation.

*Based on the initial data, I'm already developing an impression of what the problem is, goals, and working hypothesis solidified in the process below. I've made a preliminary decision about the thoroughness and aggressiveness of the evaluation, and to a lesser extent, the treatment process.*

- E. Problem List.** As I list the problems, I'm prioritizing based on number and type of problems, my skills and resources, any restrictions on treatment time, length of treatment period, patient's input.
- F. Goals.** I make sure that the list includes what is desired by the patient, discussing viability of these goals, and offer any other goals that have not occurred to the patient.
- G. Examination.** This is where it gets both creative and analytical at the same time. *Intuition is developed with training and experience. This can be described as dysfunction pattern recognition*
  1. The order of assessment varies slightly, here is a sample:
    - i. **Observation** of static posture, dynamic tests to determine relative involvement of soft tissues, joints, neuromuscular control
    - ii. **Joint assessment.** AROM and overpressure will give you a ton of information on pain, neuromuscular control and joint condition. If AROM limited perform PROM looking for capsular patterns and involvement, indicating greater need for specificity in accessory joint ROM testing (& Rx with joint mobilization), or generalized restrictions in ROM indicating that passive physiological testing and treatment (isometric technique) will be effective.
    - iii. **Resisted isometric muscle testing.** In musculoskeletal patients, strength testing is typically limited more by pain than neurological deficit. Therefore, be especially careful about weakness not attributable to pain inhibition or apprehension, indicating neurological deficit. At this point, the rule out tests for spine involvement should definitely be performed. This should then be followed up by specific manual muscle testing, and a

more thorough sensation and reflex testing than usual.

- iv. **Cutaneous sensation and reflex testing** is usually done on a scanning basis. The majority of the time the patient has alluded to some lack of sensation in the subjective evaluation.
- v. **Special tests.** Can be confirmatory if you feel that you have a good medical diagnosis, can be more P.T. diagnostic if you don't. The more of these tests you know (or at least the areas susceptible and therefore testable), the more accuracy you bring to your assessment and the whole health care intervention process. Get a good reference book! Remember, NO ONE knows them all, especially the entrapment and neural adverse mechanical tests. Communicate your findings with the referring physician!
- vi. **Soft tissue assessment.** This will always be an important aspect of your assessment and treatment. You will be able to gather information about the condition of the contractile and inert tissues. This should include static and dynamic assessment and treatment in a variety of positions, ideally with concurrent AROM, PROM and/or functional activities. This may be a little complex at first, but the goal is an integrated movement segments, not just softer end feels while supine. Pay particular attention to scars at all levels, especially early in the rehabilitation process, don't let them mature!

**H. Working Hypothesis.** This where you come out and put a name on the pattern(s) that the results of the examinations(s) have formed. Further testing should be planned to confirm and refine your hypothesis.

**I. Reevaluation methodology.** How soon do you expect to see a significant change? This change should be something that both the patient and the therapist can see, measure and feel good about. 2 weeks/4-6 visits should be adequate for 80% of the dysfunctions you will likely see on an outpatient basis, 1 month or 2-3 days reassessment strategies will account for the other 20%.

**J. Strategy.** Remember your priorities and time frames. Your efforts on specificity of manual techniques and exercise must be balanced with functional generality and servicing the patient's needs for education and functional training such that they can stay away from pain and dysfunction (and therefore us). This balance will be one of the most difficult components of your career to establish and maintain.

**K. Tactics.** These will tend to center around those skills that you are the most competent, and therefore most comfortable in utilizing. Consciously expand outside your area of greatest comfort (with help if necessary), e.g. consideration of utilization of all electrical stimulation parameters available to fulfill the strategy versus what you were initially trained in.

**L. Implementation.** As you begin to implement the treatments, do not forget to



retain balance in time and effort expended, such that the highest priorities are worked towards the hardest.

**M. Reassessment.** Consistency in the retesting specifics gives the most valid reassessment information. This includes full utilization of the initial evaluation as a baseline for indications of achievement of goals.

## Required Reading - Open Book Quiz

### LPM Article (Johnson)

1. What information does the LPM give you?
2. How can the LPM be modified for higher functioning patients?
3. What factors will affect the LPM?
4. What information does the Vertical Compression Test give you?

### Soft Tissue Mobilization (Johnson)

1. What information does the Elbow Flexion Test give you?
2. What is the difference between healthy and dysfunctional end-feels of soft tissues?
3. What is meant by “normal play” of soft tissue structures?
4. Name three “evaluation procedures” for skin and superficial fascial assessment.
5. Name and describe four “treatment hand techniques” for soft tissues restrictions.
6. Name and describe four “assisting hand treatment techniques” for soft tissue restrictions.

### PNF Article (Wardlaw)

1. Where are appropriate manual contacts applied during PNF?
2. Where should the therapist stand when applying manual contacts and resistance?
3. What is the “appropriate resistance” with PNF?
4. What are “Neuromuscular holding patterns”?
5. Which PNF techniques are useful for irritable symptoms?

### Principles of Manual Medicine (Greenman)

1. How many rotated/sidebent segments constitute a type I lesion?
2. Where would a type 2 lesion be related to a type 1 lesion?
3. In the case of an ERS L at L5 (positional fault)
  - a. At Ando & Aston, we document the motion loss. How would you document this?
  - b. In a major motion loss, what direction would L5 be rotated in the neutral position?

- i. What would happen during flexion testing?
    - ii. What would happen during extension testing?
  - c. In a minor motion loss, what direction would L5 be rotated in the neutral position?
    - i. What would happen during flexion testing?
    - ii. What would happen during extension testing?
  - d. What direction of sidebending and rotation would you see in a type 1 above? What position would you put the patient in to correct this?
  - e. What direction of sidebending and rotation would you see in a type 2 above? What position would you put the patient in to correct this?
4. In the Sims treatment position, what side is always up?
  5. What sacral dysfunctions do not occur along a physiological axis?
  6. What does the “Stork or Marcher’s Test” assess?
  7. Describe the difference between a physiological barrier and an anatomical barrier.
  8. Name three conditions that may require special precautions when using manual techniques.

**Evaluation and Treatment of Unilateral Sacrums with Concurrent Iliac and Coccygeal Dysfunctions (Ando)**

1. What is the most common coccyx motion loss?
2. What is the most common iliac motion loss?
3. What is the most common sacral motion loss?
4. Assuming that the stork test is an ilium on sacrum test, why is this article recommending the stork test be used in unilateral sacral cases?
5. What are the key differences in position findings and test findings between a backward sacral torsion (e.g. a right on left backward sacral torsion, and a unilateral sacral extension)?
6. In the correction of a unilateral right sacral extension, what position would you stabilize the right ilium in? Why is this important?
7. What is the order of treatment if you had a unilateral right sacral extension and a left rotated and sidebent coccyx?