The following information is used to show how to detect and treat muscle
dysfunction to the hip and hamstring muscle.

If you have any queries regarding this information, please email me on
musmed@ihug.com.au
thank you.
Paul Conneely.

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A Technique for Measuring the Timing Sequence of the
Hamstring/Gluteal/Erector Spinae.

Correct firing sequence of these muscles is essential for:
1. Maximum power and reduction of fatigue.
2. Controlled power throughout the stride sequence.
3. Reduction of injuries, especially repeated hamstring ‘tear’ injuries.
4. Sequenced torso motion. That is pelvic and thoracic motions become separate
   sequences.
5. This applies to the person in the street too.

Remember that we follow the same laws of motion that all other objects on earth must
do.

This is often forgotten. We must obey the Third Law of Motion. The law states that for
every action there is an equal and opposite reaction.

This will become clear with the following example:
Take the quad muscles as having the power rating of 5 units.

The hamstrings are 3 units strong.

The gluteus maximus is 2 units strong.

Thus if the quads fire with 5 units of power there must be an equal 5 units found in the hamstrings and the gluteus maximus muscle. This sounds simple but very often what is found is that this simple formula is not being followed.

Thus to have the sequence without failing the third law of motion, the erector spinae is then activated to help repel the quad force.

This is an extremely common finding, as we will discover when we examine our patients.

If the erector spinae is involved incorrectly, there is:
- reduction of power in the drive phase
- there is often a reduction of stride length due to the late firing of the gluteus maximus muscle. That is the leg can fail to move into extension
- blocking of the ipsilateral lumbar and thoracic spinal motions. This produces reduced fluid motion of the stride on one or both sides
- recurrent low back pain due to the fact that only one erector is firing. This is an extremely common finding in all walks of life. It will easily explain why the patient gets the one sided back pain, as well as the creping pain up the back as the day goes on leading to the 4pm shoulder/neck pain, spasm and dysfunction. This classically gives the patient that terrible feeling that they need someone to stretch their shoulder and neck.
- recurrent hamstring ‘tears’.
- sidebending of the thoracic cage to the side of the firing thus making it from very difficult to impossible to run bends.
- anterior sheers of the pelvis with anterior pelvic tilt.
- the athlete is always in trouble with the coach for not doing what they are told to do despite their best efforts.
- The simple fact is that they cannot perform it. The laws of physics do not allow it.

I have a saying in my practice: “You stand the way you stand, because it is the only way you can stand.” The same applies to athletes, “you run the way you run ….”

Testing of muscle sequence timing is performed in the prone position (i.e. lying on ones stomach), with the patient having their head rotated towards the testing side (not compulsory but gives a better idea of what is happening) and \textit{slowly} raising a stiff straight leg from the bed.

\textbf{The Muscle Firing Sequence is as follows:}
- the calf tightens
- the hamstrings and the gluteus maximus fire together
- the lower erector spinae on the same opposite side fires (briefly)
- then the lower erector spinae on the same side fires strongly
- this followed by the upper erector spinae on the opposite side
- with the upper erector spinae on the same side fires.

**In basic terms:**
In all normal walking the hamstrings and gluteus maximus fire together as a single unit and then the erector spinae group.

If this does not happen then the patient/athlete is not performing to their muscle best. They begin to walk with their back and necks.

It is important to remember that the muscle firing sequence can change and does.

In athletes:
This is a classic tale: “I can’t start but can maintain my top speed after about 60 metres.”. I have found these athletes to have poor sequencing when the muscles were full of glycogen, i.e. healthy, but when the sequence is tested when the muscles are fatigued the sequence returns to normal.

The opposite also holds true.
Nothing is set in stone.

Check the opposite side, there can be and very often is a totally different firing pattern. There is no set abnormal firing pattern.

**How to Test the Ham/Glut/Erector Firing Sequence.**

**To test the right side:**

1. Lay your patient prone (belly down).
2. Stand at their right hand side
3. Place your left 5th finger gently on the belly of the hamstring.
4. Place your left thumb in the middle of the belly of the gluteus maximus.
5. Place your right thumb next to your left thumb.
6. Place your right 5th finger on their right erector spinae muscle.
7. Command them to slowly perform a straight leg raise.
8. Note the firing sequence. Call the hamstrings 1; glut 2; erector spinae 3.
9. Repeat the same on the opposite side.

Once you have completed this:
10. Place your left index finger on their right gluteus maximus muscle.
11. Place your right thumb on the right erector spinae and the third finger on the left erector spinae.
12. Command them to lift their right leg again.
13. Note the firing sequence.
14. Repeat the same procedure on the left side.
15. Note the firing sequence.

*Starting position.*

If your patient has normal firing sequences at rest, next get them to perform some fatiguing exercises and then re-test.

It is also important for the erector spinae sequence to be correct. If these are incorrect they will also need correcting.

**CORRECTIONS START FROM THE BOTTOM UP.**

One of the most common reasons for finding incorrect firing patterns in athletes is that they perform hamstring strengthening exercises without moving their leg into extension and thus turn off the gluteus maximus muscle simply because they never use it.

We have all seen the male gym junkie who has the biggest hamstrings in the world and no buttocks. They can stand straight up against a brick wall with their whole body touching. They perform these exercises all day long and thus develop these physiques.

The only problem is that when they suffer a small back injury they are often incapacitated for very long periods of time despite many attempts to return to the gym.

There is no use in asking your athlete to continue to train if they have incorrect firing patterns. There is no difference to refusing to correct a spelling mistake. It will be made free of charge every time you use that word. The same applies here. It is a learnt mistake and the learning has to change to correct it.

This may sound strange where to train is everything. Get them to think of it as a new method of training.

The correction process is an individual process. Some people can correct their firing patterns in a few minutes, others *never will correct* despite their best attempts.

I know of one soul who could not correct his firing sequence despite 6 months of treatment. This treatment also included expensive biofeedback machines. They still have chronic low back pain.
Correction Technique for Hamstring/Gluteus Maximus/Erector Spinae Timing Problems.

For correction of a left sided problem.

1. Lay your patient prone
2. Stand on their left side at the level of the knee
3. Place your left index finger on their hamstring. This to let you know if they contract the gluteus maximus too early, or more commonly, did not let it go from the previous repetition
4. With your left hand, flex their left knee to 90 degrees
5. With your left hand place it under their knee so that your fingers are pointing towards you and their foot is resting on your shoulder area
6. While monitoring the gluteus maximus, start to quickly raise and lower their knee with your right hand
7. After performing this procedure several times, between 7 and 12 repetitions (never the same each time) and on the upstroke, yell out ‘HOLD!’ and remove your hand
8. Count to 6 seconds and then yell, ‘relax!’”. Here they must drop and relax their leg immediately. This is a very important part of the retraining programme. Basically ‘all or nothing’
9. Move to the other side and repeat the procedure

The procedure should be repeated 6 times in one session. It is preferred to perform the exercise in the morning and at night if possible. You will see cheating (continued muscle tightening), while others almost turn blue trying to get their gluteal muscles to contract. They pull faces, hold their breath and have a worried look on their faces. Just wait and see.

Remember to encourage them. It can be unbelievably difficult to do and they do not like failure or seen to be failures.

Basically we aim to get the gluteus maximus to fire earlier and thus eventually marry up with the hamstrings.

If they move any other muscle they must stop and recommence the process. You must be in control of the correction process. No half measures are allowed.

Do not be surprised if your patient finds it impossible to contract their gluteus maximus. This is very common.
Detection of Abnormal Firing Sequence Between the Gluteus Medius/TFL/QL.

This is a test to detect muscle timing changes between the: Gluteus Medius, Tensor Fascia Lata (TFL) and the Quadratus Lumborum.

The gluteus medius should be activated first and for the longest time when performing this test.

Weakness of the gluteus medius is extremely common finding.

When it is dysfunctional the tensor fascia lata fires early as does the quadratus lumborum. Sometimes the quadratus lumborum and the erector spinae fire before the TFL and the gluteus medius. This is the worst-case scenario.

How to Test the Firing Sequence.

For the left group.
1. Place your patient in the sidelying position. Have them imagine that they are standing up straight.
2. Place your left index finger on the gluteus medius and the left third finger on the TFL.
3. Place your right thumb on the QL and the third finger on the erector spinae.
4. Ask your patient to slowly straight raise their leg.

The correct firing order is: 1 followed later by 2 and much later if at all 3 and last 4.

Any variation is incorrect. You will not see many correct firing patterns here.
Using your lower hand, place your thumb on gluteus medius and index finger on the TFL. The QL is palpated by the upper hand. Maintain your fingers in place while the patient raises their leg.

**Correction Technique for the Dysfunctional Firing Pattern of the Gluteus Medius/TFL/QL Sequence.**

For the left side.

1. Lay your patient right side down and place a pillow between their knees
2. Stand at the level of their hips
3. With your left hand, place it under their upper knee
4. Place your right index finger on their gluteus medius so as to detect cheating
5. Commence to bounce their leg up and down for as many as 12 repetitions
6. While having their leg in the air, yell out, ‘hold!’ and remove your hand
7. Count to six seconds and then tell them to collapse. For more information see the section of the gluteus maximus timing section.

Again the aim is to get to 20 six second repetitions. This may take several weeks.

I bring in the patient’s partner and train them to perform the procedure. It is the best method and only method.