



Detecting motor-pattern breakdowns

Injury prevention is an important element of postural and musculoskeletal screening.

Motor-pattern analysis is the third and final aspect of our musculoskeletal screening process. Having undergone functional testing and a muscle-imbalance assessment, the postural and motor-pattern analysis examines a person's movement in common golf positions.

Your individual movement patterns form a type of road map, which is a reaction to daily function, behaviour and underlying congenital conditions. Overuse, muscle imbalances have a significant influence on these patterns. Basically, they result from doing one thing, one way, all the time.

Think about your signature and the way you write. Everybody is different and so we all write with our own individual style. It's our own motor pattern! If you were asked to write, "I must not miss school" on a notepad 2,000 times, then your writing would be affected by the amount of repetitions. This can be exacerbated if you are tired, write too quickly or are under stress. However, you can improve upon your signature with proper tuition (coaching) and quality repetition (training). And it's the same with the golf swing.

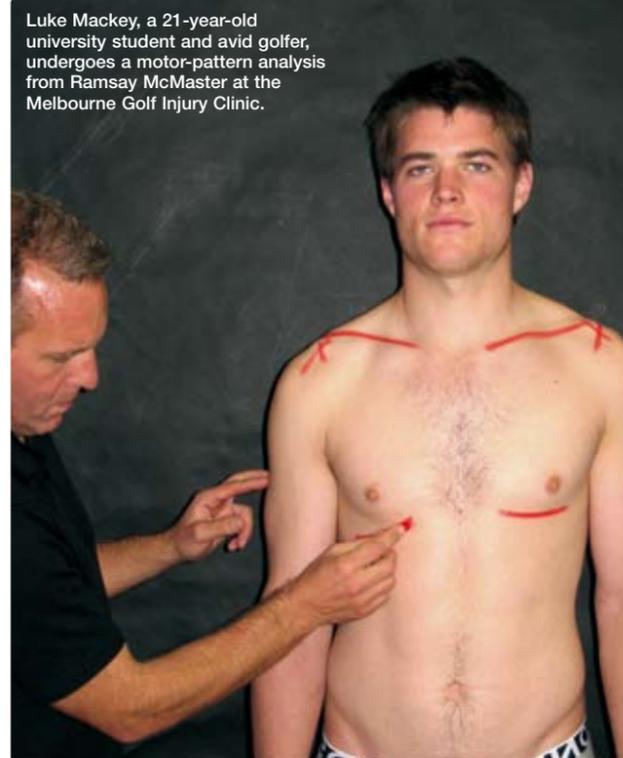
In collaboration with international researchers, the Melbourne Golf Injury Clinic has screened more than 9,000 golfers in the past 15 years and through this work identified 14 motor patterns that can break down in a golfer's body. The 14 patterns fall into three stages: primary, secondary and tertiary. Primary motor patterns (poking chin, kyphosis, scoliosis, sway back and fixed flexion) are the most serious and indicative of major problems.

A golfer with seven or eight motor-pattern breakdowns (*see panel*) is unable to function consistently and will eventually succumb to injury. That person may play a few great holes, shoot an impressive score or even have a good tournament result. But that form won't last for any significant length of time because they're relying on 'eyeball co-ordination' for success. An example of this was Kenny Perry at this year's Masters. Towards the end he struggled to keep his good golf pattern and started to try to control his swing in the playoff.

Coach and physio

The process for motor-pattern analysis normally starts with a golf coach collating information about a pupil's body positions. For instance, the coach can't get the player into a desirable position during the swing. It could be an inability to maintain a certain position under load/pressure or due to a lack of endurance.

Common examples include: golfers constantly shuffling around to find their spine angle posture at address; can't get their right arm and hip loading up on their backswing; commonly swaying their hips; or can only hit a few shots with



Luke Mackey, a 21-year-old university student and avid golfer, undergoes a motor-pattern analysis from Ramsay McMaster at the Melbourne Golf Injury Clinic.

ROHAN CLARKE (2)

the same ball flight until they start to get more draw or fade than they want.

Then it's over to the physio to assess the golfer by looking at the musculoskeletal frame and motor patterns that the golfer performs with their body and golf swing. Muscle tightness, joint stiffness, previous injuries and postural breakdowns are all considered in the diagnosis.

In the above photograph you'll see I've drawn lines upon a golfer's body. These markings indicate spine angle as well as muscle definition. They make it easier to follow movement patterns while the subject performs 18 dynamic tests that I like to carry out in a motor-pattern assessment using video analysis. Once the testing is finished, we should have a reasonable understanding of the individual's potential motor-pattern breakdowns and how they're likely to impede their golf swing.

Video analysis is incredibly useful because it allows us to analyse movement more effectively as well as storing information for cross-referencing. Referring to 'us', I'm emphasising the important relationship between the physiotherapist and golf coach, who is able to look at a golf swing and notice a swing tendency.

For instance, there might be a tertiary motor pattern breakdown such as 'reverse upper spine'. In a right-handed golfer, this is where the upper part of the spine moves towards the left leg rather than transfer over to the right side during the backswing. Therefore, the golf coach has the same job as the physiotherapist – to get the most efficient motor-pattern function for that individual golfer as well as to avoid injury and maintain a pain-free swing.

PATTERN CATEGORY	BODY TEST									
	1	2	3	4	5	6	7	8	9	10
PRIMARY MOTOR PATTERNS										
1 POKING CHIN										
Associated weak neck and shoulder girdle stability										
2 KYPHOSIS										
Associated weak neck and shoulder girdle stability										
3 SCOLIOSIS										
Associated multi-structural imbalances at specific spinal levels										
4 SWAY BACK										
Associated muscle/structural imbalances at thoracic/lumbar levels										
5 FIXED FLEXION										
Associated loss of joint mobility and range										
SECONDARY MOTOR PATTERNS										
6 CONTRALATERAL PATTERNS										
Associated cross-over breakdowns in Upper & Middle Body Segments										
7 WEAK TRUNK AND LOWER BODY SLING										
Associated weak lower thigh & deep abs										
8 WEAK AND LENGTHENED LEFT SIDE										
Associated poor left control of body segments										
9 WEAK AND SHORT RIGHT SIDE										
Associated shortening of right trunk & hip flexors w/ muscle imbalances in anterior										
TERTIARY MOTOR PATTERNS										
10 POOR LUMBO PELVIC CONTROL										
Associated weak lumbar abdominal & gluteal stabilisers										
11 POOR BALANCE										
Associated overall balance/poor centre of gravity, weight transference & lumbar pelvic control										
12 REVERSE PIVOT										
Associated poor weight shift										
13 REVERSE UPPER SPINE										
Associated poor upper spine movement										
14 HYPERMOBILITY										
Associated excessive movement in joints										

How long does it take to make a swing change?

In my experience some small improvements can be almost immediate but it takes about 30,000 quality repetitions (shots and simulated swings) during practice and competitive golf to consolidate a motor-pattern change. Since this is a swing change, it needs to be monitored by your golf coach and physio during the evolution cycle. It also needs to be evaluated for every club and shot-making skill (preferably using 3D-biomechanical technology for accurate feedback).

Your choice of training program

Once we've obtained information from all three musculo-skeletal screening procedures, we would work out what's realistic for the golfer. Some people want the 'works', a daily routine of exercises that can be integrated with a full golf-specific gym program. Others may prefer a quick golf-specific warm-up that is tailored to their motor patterns and feels.

The occurrence of motor-pattern breakdowns will dictate our approach. In extreme cases it may be necessary to address somebody's flexibility and posture before we even consider strength and conditioning. In most circumstances, golf-specific exercises are prescribed to change poor habits and motor patterns. A daily corrective routine isn't designed to fatigue or take up too much time. Usually, it's 15-30 minutes per day and the drills don't require expensive or cumbersome equipment.

We also recommend 'circuit breakers', which are quick counterbalance and postural drills to break up sedentary and/or flexed positions. For example, a computer operator can break the pattern of 'poking chin' by standing up and doing neck posture and spiky ball release drills for two minutes, every two hours of the working day. Tour players use circuit breakers to break up prolonged practice periods and travel.

We film all the exercises and copy them onto DVD, so the golfer has instructions to perform the drills properly and maintain correct form. The hard part with this stuff is that it takes time to change. But I guarantee it's worth the effort.

The best players in the world that we've screened have benefited greatly from motor-pattern identification. With a program of golf-specific training, these players tell us their body 'feels' the same every day before playing and practising – a significant factor for consistent performance. This means their feels are maintained during their golf swing and they have enhanced body awareness. It also means fewer motor-pattern breakdowns and subsequently fewer injuries.

For advice on golf-specific training, contact Ramsay McMaster on 0407 432 282. To purchase a golf-specific 'Fitness Survival Kit', call the Melbourne Golf Injury Clinic on (03) 9569 9448.