

# BIODYNAMICS

The MRI of Your Golf Swing – 3D Technology

# (GBD)

By Dr. Robert J. Neal and Karen Harrison

Have you ever had or known someone who has had an MRI scan for a medical condition? This amazing diagnostic procedure has really changed modern medicine by allowing doctors to look inside the body and see, not just the bones, but the soft tissues structures (muscle, tendon, fat, organs, etc.) as well. Now a similar phenomenon is happening in the golf industry.

One of the most exciting developments in golf during the last few years has been the recognition by golf instructors that 3D motion capture technology can assist them in at least two ways: Improving their teaching techniques and helping their students' to learn better swing mechanics.

This amazing technology, which most of us have seen in animated movies and computer games (think Tiger Woods golf game), uses tiny sensors to measure, in real time, the movement of different parts of the body. Just like an MRI in medicine, it allows golf coaches to see “inside the swing” and figure out the good and deficient characteristics of a golfer's swing mechanics.

With careful selection of the body parts to which sensors are attached, one can build up a basic or, with the addition of extra sensors, a complex model of the golfer as he or she swings the club. While most people have only ever seen this technology used in golf for long game analysis, it has also been developed for other facets of the game including analysis of the putting stroke and wedge layup shots.

# Biodynamics

The beauty of the 3D system of analysis is that it is suitable for golfers of all abilities (from novice to professional), it's simple to use and provides a wealth of data, when operated by well-educated instructors. With this dynamic assessment we can now focus on those parts of the movement that are problematic and not be distracted by movements that might seem unusual but are relatively unimportant. In other words, the task of "prioritizing the change" becomes simple.

Most importantly we now have a tool that allows us to assess the "efficiency" of a person's swing as it relates to their body motion. The concept of using the "timing sequence" as a measure of efficiency will be discussed in detail later but it basically refers to how much energy you produce in your body and how well you are able to transfer it to the club. One thing we do know is that all of the best ball strikers in the world have an efficient timing sequence and are able to translate good body speeds to high club head speed.

The Golf BioDynamics (GBD) System was developed in 2000 by Dr. Robert Neal, a former University Professor of Biomechanics in Australia. His research over the past 25 years largely focused on efficiency of body movements in a number of sports; however investigating golf was his passion. His-GBD system of analysis and subsequent technical intervention can be kept as simple or made as detailed and complex as the situation demands. For example, when working junior golfers, the technical information that is reported to the player is kept to a minimum,

but the instructor/coach is given the "full Monty" so that clear directions and guidelines can be set for the golfer. These directions are individual: that is, no two golfers will be given identical programs for improvement! At the other end of the spectrum, the System is also great for Touring Professionals, particularly since the measuring system is so accurate (to within a degree and 1/25th in) – very useful for "fine tuning"! It's all about helping the golf athlete reach their full potential. By analyzing your golf swing in 3D using the GBD system you will have an experience that is as close as possible to the services that touring golf professionals can access. You will discover:

- EXACTLY what you are doing in your golf swing (there is no guessing here!). In fact, we assign "numbers" to your movements (a quantitative measurement). Top Teaching professional Jim McLean agrees that this 'diagnostic step' must come first.

- The links between the technical faults in your swing and any physical deficiencies (strength, stability, flexibility, coordination, etc.) that may be preventing you from making a better swing. Now you can get expert advice and clear direction on exactly what kind of workout routine will benefit you and your golf game.

- How "efficiently" you move your body. Your "timing sequence" shows the speeds of different parts of your body (hips, shoulders, hands) and then how energy is transferred from the "core" out to the club.

- The MOST amazing feature of this system is the real time biofeedback! When operated in this mode, you are given instant audio (and visual) feedback



when you move into the correct positions or in the right sequence. It can actually speed up the learning process! Instructors and students alike love this aspect of the GBD system.

- Lastly, your instructor will link the "engine of the swing" (your body movements) with the club head and ball mechanics. This interaction will allow you to hit the ball more consistently and further than ever!

When Dr. Neal says that they describe your swing EXACTLY, they mean it! Students are given a 4-page report that details their address positions, backswing motions, and the downswing dynamics (positions, speeds and the timing sequence). The students "numbers" are then compared with a realistic "ideal" model (not just a touring professional) in the GBD Report. The "model swing", based on solid research, allows for some individual variation, so that a range of values for each parameter is considered acceptable. At set-up, the key issues are good alignment of the hips and shoulders and correct posture over the ball. If a golfer sets up



to the ball with poor posture or alignment, compensations are made that can negatively affect your swing technique. The thought is that good posture and alignment can be achieved by almost every golfer.

On the backswing you will find out how well you rotate your body (hip and shoulder turns) as well as that all important X-Factor number. As Jim McLean says, getting a good differential between the shoulders and hips at the top of the backswing creates torsion in your body and that is a key power source in the golf swing. It can also be an indicator of how flexible you are through the torso in rotation. You will also find out how “stable” you are as you make your backswing. For example, do you lift out of your posture on the way back? Or perhaps your hips “drop” when you take your weight onto the back leg.

Your ability to sequence the transition and downswing movements are also available in the report so that the efficiency of your swing is known. Data on weight transfer are inferred based on the lateral movements of the head, upper torso and pelvis. If you move your body well through the downswing you will finish in a great impact position. These numbers are also reported for each golfer. The last piece of information that is provided in the report is your swing efficiency. The timing sequence is a graph that depicts the speeds of the body segments on the downswing and highlights when the peak speeds occur. The timing of the peak speeds as well as many subtle nuances give insight into both physical issues of the golfer and their technical efficiency. Here are some insights about Dr. Neal, his system and his clients:

Who uses this technology?

Touring pros, aspiring amateur golfers, club golfers and even new players use this technology. The big difference is the ways in which it is used. Often, with touring professionals, they are measured when they are swinging at their best so if their ball striking declines, they can isolate exactly where the problem is. The biofeedback training is most valuable for those golfers who are trying to bring about changes to their swings.

What does it tell us that video does not?

By measuring what the body does, you have quantitative measurements. While video gives you good pictures, the golf coach still makes judgment calls on what is good and bad in the swing. Furthermore, by changing camera angles, the movement of a golfer on a video can look very different. It is very difficult to get the speeds of movement from video thus little insight into the timing and speeds of movement is available unless you are using a 3D motion capture system.

How is it done?

Small sensors are attached to the key body segments. As the golfer swings, data from the sensors are read by a computer and a fully rendered 3D animation is generated. Thus the golfer can see a “robot” swinging as he swings. Once a sufficient number of swings are captured, the report is generated and interpreted. This step only takes a couple of minutes. With the report available the coach can readily prioritize the actions required to fix the problems in the golfer’s swing. At that point the biofeedback portion of the experience really helps to allow golfers to get a feel for a different position, movement or sequence. If any physical issues are identified during the analysis process, additional screening tests may be conducted to isolate the extent of the physical limitation so that exercises at the correct level of difficulty can be prescribed.



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As an adjunct professor at Florida International University, she teaches nutrition courses and keeps up to date on the latest advances in nutrition. In her private practice Kathie especially enjoys educating people on the prevention of diseases through wellness.

Harper's Bazaar listed her as one of the top ten nutritionists in the country and she is often quoted in magazines and newspapers. As an expert in her field, she has appeared on several television programs.

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