Dynamic Chiropractic

SPORTS / EXERCISE / FITNESS

The Lumbar Spine & Low Back Pain in Golf

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The Study

Title: The Lumbar Spine and Low Back Pain in Golf: A Literature Review of Swing Mechanics and Injury Prevention
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Overview

Golf is a unique sport that is growing tremendously around the world. It can be played regardless of age, gender, or skill level (through "handicapping"). Between 1970 and 1990, the reported number of golfers in the United States alone more than doubled to 23 million. By the year 2000, there were more than 25 million golfers and 14,000 courses in the U.S. The World Golf Federation expects 55 million golfers by the year 2020.

Manual therapists should be aware that roughly 33 percent of golfers are over the age of 50, and this number will surely grow. These numbers all indicate the growing potential for a rising health care burden of the sport.

Golfers are prone to a number of injuries, with low back pain (LBP) being one of the most common. It is estimated that LBP accounts for 26-52 percent of golf-specific injuries. It is also estimated that up to 30 percent of touring professional golfers play injured at any one time. This study discusses the existing theories and literature surrounding the mechanics of a golf swing as they pertain to low back injury and the prevention and rehabilitation of potential golf-specific LBP.

Forces on the Spine During a Golf Swing

It is well-known that axial twisting is a risk factor for LBP - the golf swing combines this motion with compression, lateral bending and anterior/posterior shear. This combination of motions (compression, torsion and lateral bending) are also known risk factors for disc herniation. Kinematic studies have revealed that during a golf swing, the lumbar spine can sustain compressive loads of up to eight times body weight (about 6100 ± 2400N in amateurs and 7584 ± 2400N in professional golfers). As a comparison, similar studies on NCAA football linemen revealed compressive forces of ~8600N while hitting a blocking sled, and cadaveric studies have revealed that disc prolapse can occur at loads of ~5800N. Facet joints resist ~50 percent of shear; a golf swing has been shown to produce anterior/posterior shear forces of 596 ± 514N. (Loads of 570 ± 190N are able to produce pars interarticularis fractures in cadaver studies.)

The Golf Swing

Perfecting a golf swing is no simple task. In fact, it is one of the most complex athletic skills. The swing itself can be broken into four major components: backswing or takeaway, forward swing,

acceleration with ball strike, and follow-through. There are two general stylesof golf swing: modern and classic.

The "Modern" Golf Swing:

- Emphasizes a large shoulder turn with minimal hip turn.
- The restricted hip turn is accomplished by keeping the front foot planted flat on the ground throughout the swing.
- This method maximizes shoulder-hip separation, and is thought to *quiet*the lower body and increase the chance of striking with a square club face.
- This separation angle is known as the "X-factor" - measured via lines drawn through the axial orientation of the hips and shoulders at the end of backswing.
- This swing can be problematic, as it causes increased lateral bend (also called the "crunch factor") and exaggerated hyperextension on follow-through (also known as the "reverse C" position), which can lead to overactivation of the spinal extensor muscles.

The "Classic" Golf Swing:

- Aims to reduce the X-factor by raising the front heel of the foot during the backswing to increase hip turn, shortening the backswing, or a combination of the two.
- A small set of data indicates that a reduced backswing does not have a detrimental effect on club-head velocity or ball-contact accuracy, although further study is needed to confirm this.
- This reduces the separation between the shoulders and hips, thereby decreasing torque on the lumbar spine.
- This swing emphasizes a balanced, upright form that also serves to reduce the crunch factor.
- The end of this swing is characterized by an erect "I" finish with balanced shoulders.
- Case reports have indicated that this type of swing can reduce the incidence and recurrence of LBP; however, more research is required.
- The Crunch Factor and Further Points of Interest
- The *crunch factor*, although lacking clinical evidence to support its relevance, is defined as the product of lumbar lateral bending angle and rotational velocity. Further research is required to elucidate the utility and relevance of this measure.
- One epidemiologic and radiographic study of elite golfers[1]demonstrated that 55 percent of subjects had LBP, and those with LBP had significantly greater "trailing-side" vertebral body and facet arthritis when compared to age-matched controls.
- One study[2] showed that golfers with LBP consistently exceed their trunk rotation during swings compared to rotation in neutral posture at a controlled speed. This "supramaximal" rotation may cause excessive strain on viscoelastic structures surrounding the spine.
- In general, amateur and professional golfers utilize the "modern" swing in an attempt to maximize power and distance.
- Other common golf injuries include medial epichondylalgia (also known as golfer's elbow), hook of hamate fractures, rotator-cuff pathology, extensor pollicis brevis/abductor pollicis longus tenosynovitis, and knee injuries (which may not be as common, but can be severe - just ask Tiger Woods!).

Differences Between Amateurs and Professionals

- Professionals practice constantly with a consistent swing, leading to overuse injuries.
- Amateurs do not play as frequently, and often demonstrate multiple inconsistencies in their swing, leading to injury resulting from poor mechanics.

Lumbar Stabilization During the Golf Swing

- EMG studies performed on golfers have indicated that similar muscles are involved in stabilization during a golf swing as in various other athletic tasks - namely the

internal/external obliques (IO/EO), quadratus lumborum (QL), erector group (spinae/multifidi), and rectus abdominus (RA).
- Specifically, during a golf swing the muscles most active are: contralateral EO, ipsilateral IO and latissimus dorsi, QL and RA.
- In general, the takeaway phase has the lowest overall muscle activation, while the forward swing/acceleration has the highest.
- Studies have indicated that the gluteus maximus is a critical stabilizer of the hip during the golf swing, and contributes significantly to power generation during the swing.

Treatment, Conditioning and Prevention Strategies

- There is a paucity of golf-specific literature in these areas.
- In a small collection of case studies on LBP in golfers, training with the "classic" swing method, in combination with general trunk muscle stabilization exercise (McGill/Queensland), was recommended. However, the contribution of swing modification to symptom resolution cannot be conclusively outlined yet.
- Some evidence suggests that lack of lead hip flexibility is associated with LBP in a small group of professional golfers.[3]
- There is also some low-level evidence that golfers who stretch/warm-up for 10 minutes before playing have a lower risk of sustaining injury.

Conclusions and Practical Application

The relation of golf to LBP will surely be the focus of a growing amount of research moving forward, assuming the sport continues to grow at its current pace. Manual therapists should stay abreast of this literature so we can assist golfers in their conditioning and maintenance programs for the sport, and also to manage any injuries that may arise while considering the specific demands of the sport and its participants.

References

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