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Strength and Conditioning Strategies to Reduce the Risk of Lower Back Injuries Associated With the Golf Swing

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summary

Many golfers continue to play the sport without a proper warm-up, and are in poor physical condition, increasing the risk for injury to the lower back. To reduce the risk for injury it is crucial that individuals become informed on the risks associated with golf. Education is critical in the prevention of golf injuries, and should begin when one is initially introduced to the sport. Strength and conditioning specialists can assist in this process by ensuring each client has a sound grasp of the mechanics of the golf swing and the vulnerable areas of the body prone to injury.

The mechanics of the golf swing have been identified by the medical community as a possible cause

of a variety of injuries, including injury to vulnerable areas in the lower back (6). Unfortunately, there is limited information about the seriousness of golf injuries and how to reduce the incidence of them. In a study of 1,444 recreational golfers conducted by McCarroll et al. (9), the back was reported as the most commonly injured part of the body. Lower back pain as a result of a golf swing often arises from two different sources: (a) overuse of muscles in the trunk and (b) poor physical condition of these muscles (10, 11). While each swing by itself appears to be risk-free, the accumulation of swings results in trauma to the different regions of the body directly associated with the golf swing (10, 11). Perhaps, if golfers spend sufficient time getting their bodies into satisfactory physical condition, the risk for injury would diminish (9). The purpose of this article is to provide strength and conditioning specialists with information concerning the proper mechanics of the golf swing, along with strength and conditioning strategies to modify the risk for golf-related injuries.

Mechanics of the Golf Swing

A serious golfer spends hours bending over the ball, thereby creating an excessive strain in the lumbar area of the back. When a golfer swings the club the

lumbar area continues to be strained because of the forward flexion of the spine (9). This motion may cause wear-and-tear injuries in various regions of the lower back and trunk. As the lower back rotates, the front of the body rotates in a similar manner. The muscles of the lower back are therefore dependent on the strength of the trunk muscles (10, 11). The larger arc of the golf swing allows for a greater distance for the golfer to build club head speed. This increased club head speed at direct impact with the ball in combination with additional trunk rotation, leads to a higher injury rate in the trunk and lower back (9).

Fitness and Golf

Individuals who are physically active have a reduced risk for lower back pain than those who are less active. Physical inactivity has been associated with reduced strength of the muscles of the trunk, and a direct correlation has been established between inactivity and chronic lower back pain (1). With more than 21 million recreational golfers of all ages and fitness levels playing golf, the chances of these golfers developing lower back pain if they are not in sound physical condition will increase (6). Unfortunately, many golfers continue to play without a proper warm-up, and are

Table 1
'Super Six' Stretches

Stretch	Muscles utilized	Description of activity
Side bending	Hips, sides of back	Arms overhead, lean to one side until you feel a stretch, and hold this position for at least 30 seconds.
Hip rotation	Hip, pelvis and thighs	Sitting on a bench or in a golf cart, one leg should be placed on the ground for stability. Grasp the knee of the opposite leg and pull the knee up to the chest region toward the opposite shoulder. Repeat with the opposite leg. Hold each stretch position for at least 30 seconds.
Hamstring stretch	Hamstrings (posterior thigh)	One leg should be placed on a bench or golf cart. Bend forward at the hips, not at the waist, until a comfortable stretch is felt in the posterior thigh. Repeat with the opposite leg. Hold each stretch position for at least 30 seconds.
Back extension	Spinal groups	Stand and place both hands on hips with both thumbs pressed firmly against the lower back. Bend backward (extension) until a comfortable stretch is felt. Extension exercises of the lower back can cause some discomfort. Consult physician prior to performing these exercises if a history of lower back ailments is present.
Back rotation	Spinal groups and shoulders	Stand or straddle a bench and sit with arms extended laterally. Turn waist until a comfortable stretch is felt and hold the position for at least 30 seconds. Repeat on the opposite side.
Shoulder stretch	Shoulders and upper arms	Stand and clasp hands behind the back with arms straight. Move arms posterior and superior until a comfortable stretch is felt.

Chappuis, L.J., and D.G. Johnson. The 'super six' stretches for golfers. *Phys. Sportsmed.* 23:87-88. 1995.

in poor physical condition, increasing their risk for injury.

Golf requires a player to be both flexible and strong; two health-related components of physical fitness that can be emphasized in a proper conditioning program (9). An integral step in reducing a golfer's risk for injury is to strengthen the muscles that are most frequently used in swinging a golf club. The erector spinae and abdominal oblique muscles play a vital role and are utilized most in the golf swing. It is not surprising therefore that the majority of golf injuries occur at the location of these 2 large muscle groups. These muscle groups function to initiate and control the body while the golfer is performing the swinging motion. The repetitive swinging of the golf club can lead to fatigue in these muscles, perhaps increasing the risk for injury not only to the back, but also to secondary muscles as well (9). Strength and conditioning spe-

cialists, along with golf instructors and golf coaches at the scholastic and intercollegiate levels, must implement conditioning programs that focus on strengthening these 2 large muscle groups.

It has been hypothesized that strong back muscles may reduce the risk for golf-related injuries (10). In order to execute the golf swing correctly, an individual has to transfer power and strength from the legs up through the body and out through the club. To accomplish this task one needs to have tight rigid control of the trunk muscles to protect the back during the phases of the golf swing, which include the back swing, the downswing, impact, and the follow-through.

Lower back pain associated with frequent swinging of a golf club may be reduced if proper steps are taken to stretch and strengthen the muscles most frequently used. By strengthening the erector spinae

and abdominal muscles a golfer can possibly play for longer periods of time, and lessen the likelihood of fatigue that contributes to lower back pain, discomfort, and possible injury (4, 9).

Warm-Up

A proper warm-up should always be included prior to swinging a golf club, regardless of age or ability. The warm-up should consist of activities to increase blood flow to the muscles used in the golf swing; specifically, the abdominal oblique and erector spinae. A proper warm-up increases tissue temperature and heart rate, in addition to elevating the body's metabolism. Other physiological advantages of warming up include an increase in flexibility and speed of contraction, and relaxation of muscle fibers (8). An effective warm-up also increases the rate at which oxygen is delivered to the working muscles (8), resulting in increased circulation, which

affects the body movement associated with the golf swing (5).

Activities that can be utilized in the warm-up include calisthenics such as jumping jacks and running in place for 10 to 15 minutes prior to swinging a golf club. Once the warm-up has been completed and core body temperature has increased, each golfer should proceed with a variety of stretches (See Table 1). Stretching has often been cited as an activity that not only reduces the risk for injury but could enhance performance. However, current research documents that the kinematics associated with a variety of movements could be impaired by static stretching. In a recent study by Knudson et al. (7) in which the kinematics of the vertical jump were examined, they discovered that 55% of subjects in their sample had lower vertical velocities after stretching. Therefore, stretching could hinder golf swing performance.

Strengthening Exercises

A good stretching program should always be combined with regular strengthening exercises (9). Many individuals consider muscle strengthening and muscular endurance to be the most important components of an exercise program. Unfortunately, many golfers limit their muscle strengthening and endurance to a few muscle groups in their exercise regimen (8), when in fact, many muscle groups should be included in a sound strengthening program. These muscle groups include the abdominals, lower back extensors, hip flexors and extensors, hip adductors and abductors, and the muscles of the anterior and posterior upper extremities. These muscle groups should be regularly exercised on a consistent schedule to prevent possible injury associated with the golf swing. The following list of strengthening exercises can prepare the body for the kinematic motions involved in the golf swing and can help to protect the vulnerable areas of the body during all phases of the golf swing. The golf swing

requires the body to have a strong stabilization level of core training. These exercises will enable the golfer to strengthen the stabilizing muscles associated with the lumbo-pelvic-hip complex in a training room, gym, fitness facility, or in the comfort of one's own home. All exercises were adapted from Clark and Corn, 2001 (3).

Prone Isometric Abs

- Lying face down on the floor with feet together and forearms on the ground, hands clenched in a fist at shoulder level.
- Draw abdominals inward and squeeze the gluteal muscles and lift the body off the floor forming a straight line from head to toe resting on the forearms and toes. Hold this position, then slowly return the body to the ground with the chin tucked and back flat.

Prone Isometric Abdominals With Hip Extension

- Lying face down in the prone position with the feet together and forearms on the ground, hands clenched in a fist at shoulder level.
- Draw abdominal muscles inward and squeeze the gluteal muscles while lifting the body off the floor until there is a straight line from head to toe. Extend one hip by activating the gluteal muscles and lifting one leg off the ground, putting the leg in triple extension (hip, knee, ankle plantar flexion). Hold this position, then slowly return the body to the ground with chin tucked and back flat.

Floor Prone Cobra

- Lay face down on the floor with arms in front of the body and palms facing down.
- Activate gluteal muscles and abdominals, and retract the scapula toward the midline of the body, lifting the chest off the floor while keeping the chin tucked. Hold this position, and then slowly return upper body to the floor.

Floor Two-Leg Bridge

- Lay flat on the floor, knees bent, feet flat, toes pointing straight ahead and arms by sides.
- Activate gluteal muscles and raise hips off the floor to form a straight line. Hold this position and slowly return the back to the ground.

Quadruped Arm Opposite Leg Raise

- Begin on all fours with the abdomen drawn in and the chin tucked.
- Slowly raise one arm with the thumb pointing skyward and the opposite leg pointed away (triple extension). Keep the arm and leg straight while lifting to body height. Hold this position, and then return the arm and leg slowly to the ground, while maintaining proper alignment. Repeat alternating sides.

The following two exercises require a stability ball or therapeutic ball.

Ball Crunch

- Begin laying on the stability ball (ball under the lower back) with the hands on hips, knees bent to 90 degrees, feet flat on the ground, and the toes pointing straight ahead. Allow the back to extend over curve of the ball.
- Draw the abdominals in, and slowly crunch upper body forward, raising the shoulder blades off the ball, and tucking the chin to the chest. Hold this position and slowly lower the upper body back over the ball.

Ball Bridge

- Lay on the back with a stability ball between the shoulder blades. Allow knees to bend, keep feet pointed straight ahead, shoulder-width apart.
- Draw abdomen in, activate gluteal muscles, and lift pelvis until knees are bent 90 degrees and a straight line can be drawn from shoulders to knees. Hold this position, and slowly lower pelvis back toward the ground.

Conclusion

Many golf enthusiasts of varying abilities hit a bucket of balls on the practice range or play 18 holes without any concern for injury. To reduce the risk for injury it is crucial that individuals become informed on the risks of the sport. Education is critical in the prevention of golf injuries, and should begin when one is initially introduced to the sport. Strength and conditioning specialists can assist in this process by ensuring each client has a sound grasp of the mechanics of the golf swing and the vulnerable areas of the body prone to injury. Given that golf is one of the most popular lifetime sports, there are obvious long-term benefits for education at an early age to promote a long life of injury-free, physical activity. ♦

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