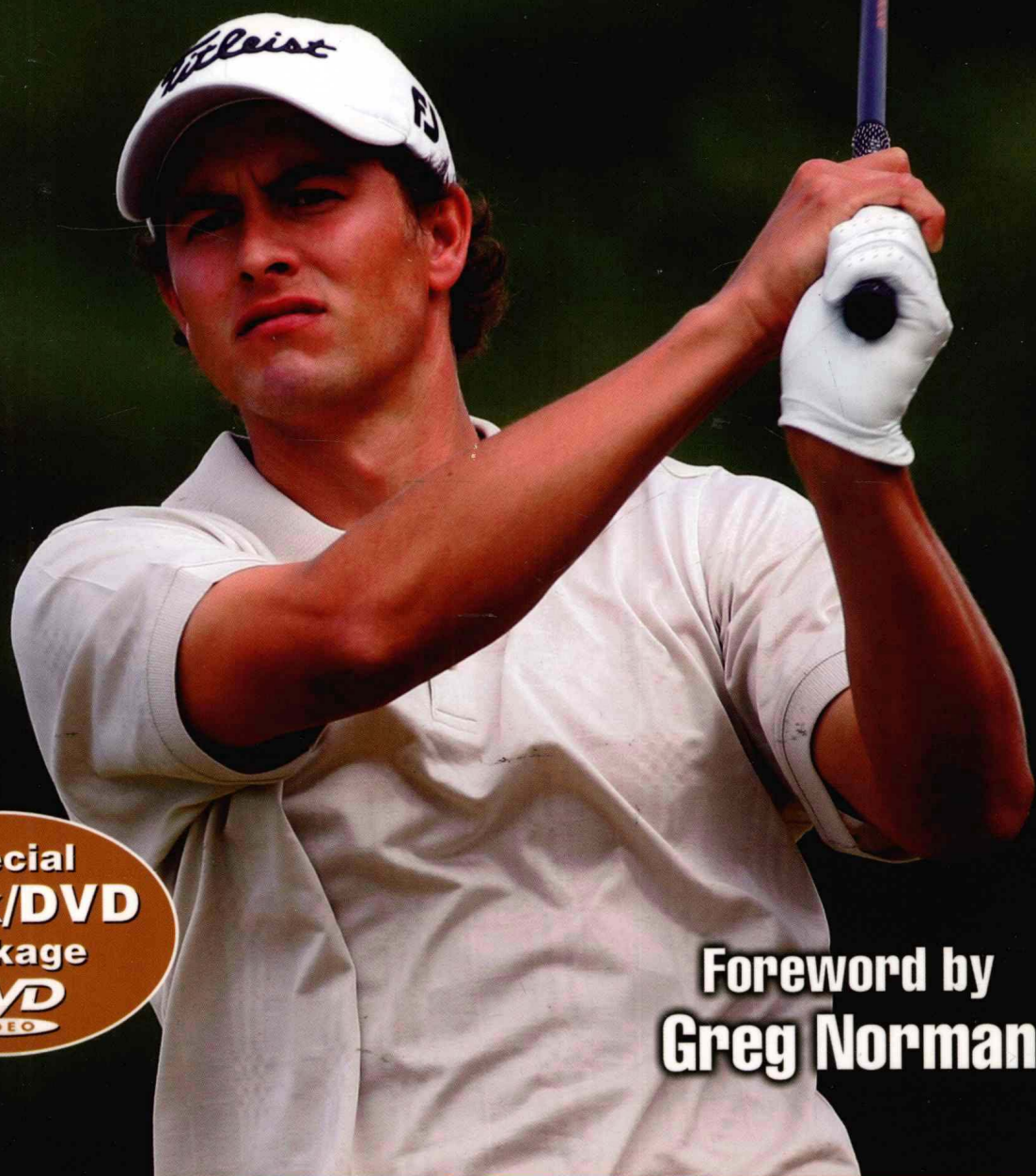


# COMPLETE CONDITIONING FOR GOLF



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Foreword by  
**Greg Norman**

**Pete Draovitch • Ralph Simpson**

# **COMPLETE CONDITIONING FOR GOLF**

**Pete Draovitch, MS, PT, CSCS**

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To my family, especially Debbie and Victoria, who provide balance,  
offer support, and truly recognize what is important.  
Thank you for letting me be a part of your lives.

—*Pete Draovitch*

To my mother and father for teaching me the value of hard work  
and to Susanne and Alie Jade, you fill me with love and laughter;  
you are my life.

—*Ralph Simpson*

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**Total Running Time . . . . . 90 minutes**

# Foreword

**O**ver the years, technological advances have led to incredible changes in the game of golf, yet not until recently has attention been paid to how changing your physiology can improve your game.

Corporate, university, clinical, and private centers now exist for collecting data, conducting research, and providing programs dedicated specifically to maximizing the body's potential as it relates to golf. That wasn't the case just a few years ago. In fact, in the early 1990s I was one of the first professional golfers to employ a therapist to handle my performance and rehabilitation needs.

While programs for professionals and recreational golfers are vastly different, the goal of any program should be the same: to change body composition and improve the efficiency of the neuromuscular system.

Although research has shown that improving one specific component of fitness may improve clubhead speed, driving distance, or perhaps consistency, I am of the belief that fitness in golf encompasses much more. For example, while someone with above average power may benefit from additional strengthening, his or her needs may suggest more balance, flexibility, or neuromuscular training.

For more than 15 years I have put my trust in Pete Draovitch and Ralph Simpson. They have conducted myriad scientific screenings, performed clinical exams, identified problems, administered care, offered advice, and developed cutting-edge programs based specifically on my goals and needs. This had a profound impact in helping me continue to play golf at the highest level into my 50s, at a time when three decades of practice and tournament competition began to take its toll on my body.

Regardless of your ability, age, gender, or fitness level, this book will provide you with practical, easy-to-implement solutions for improving your physiology and improving your game.

*—Greg Norman*

# Acknowledgments

I thank Wayne Westcott for his contributions to this book and for serving as the ultimate example when it comes to being a professional. I am proud to call him a colleague.

I thank Ralph Simpson for agreeing to help write this book. I only hope someday I will be able to remember as much as he has forgotten.

I also thank Bill Foran, Mick Smith, Kevin O'Neil, Ryan Vermillion, Sam Miller, Gray Cook, and Paul Smith who constantly challenged me while we professionally grew at the U.

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I thank physicians John Uribe, Frank Cook, George Paletta, Marc Philippon, Bryan Kelly, Jim Bradley, Joe Maroon, Rich Hawkins, Bonnie Nye, Norton Baker, Mark Holland and Richard Steadmann who were able to show me exactly what it means to practice sports medicine and trusted me enough to oversee the care of their patients.

I thank teaching pros Rick Smith, Butch Harmon, and David Leadbetter who always had the time and showed patience when answering simple questions about golf swing mechanics.

I thank all of the coaches I have worked for, especially Thad Turner and Art Steeves who taught me that getting things done yesterday sometimes wasn't enough. I thank all of the fitness equipment representatives who were willing to share new products and design ideas, especially Steve McGee of CDM Medical, Dan Goldstein of Dynamic Balance systems, and Chris Welch of ZenoLink

Thanks to my patients who are who I was, what I am, and what I will become.

I thank Greg Norman for his friendship and support over the years. His commitment to the game of golf resulted in him allowing his body to be used as a public medical, rehabilitation, research, and performance laboratory for the benefit of all those who would come after him.

I thank the staff at Human Kinetics, who are truly the most professional and patient staff. Thanks for once again making it as easy as possible.

—*Pete Draovitch*



Several professionals, patients, and friends were supportive and helpful over the years in developing the information in this book, and to them I say thank you for the inspiration.

My orthopedic mentor, Erl Pettman, has been a driving force in my professional life since 1988 and continues to challenge me to be a better clinician.

Scott McCarron, Tom Watson, Fred Funk, Jim Furyk, David Toms, Tom Byrum, Brad Faxon, Notah Begay, Steve Pate, and Howard Twitty were more than helpful over the years with a lot of the early protocols, and to them I offer my gratitude and respect.

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I thank teaching pros Hank Johnson, Greg Morrison, and Casey Paulson for their open minds and the opportunities they helped create. Michael Breed, head pro at Sunningdale Country Club in Scarsdale, New York, and *Golf Digest* Top 100 instructor, provided input on swing flaws and their possible resultant shots and has always been a great sounding board.

The continued support and enthusiasm of Satini "Coach" Puailoa are much appreciated. To my friends and colleagues Steve McGee, Pete Draovitch, Keith Kleven, Boyd Bender, Troy Huseby, Scott Riehl, and Steve Pavlet, I say thank you for your honesty, professionalism, open minds, dedication to our profession, and especially your friendship.

—*Ralph Simpson*

# Fitness Essentials for Golf

**I**s golf ready for fitness? Yes! What was once the exception is becoming the rule, especially given the success of motivated, talented golfers who practice fitness training. These players value physical fitness so much that two trailers—one for training and one for rehabilitation—appear on the PGA Tour, LPGA Tour, and the Champions Tour. These training trailers feature full-time training and rehabilitative staff who are available at all PGA Tour and major events. Trailers are equipped with the latest in aerobic and resistive equipment, including a variety of dumbbells, medicine balls, elastic resistance bands, free weights, and functional cable devices. However, many exercise programs could be designed to use the golfer's own body weight, elastic tubing, and stabilization balls.

The staff is composed largely of physical therapists and trainers, but physicians and chiropractors also play active roles in the system. The physical therapists provide the golfers with the expertise and knowledge to keep them on the course for improved physical performance and reduced injury risk.

Today's physically fit golfers appreciate the PGA Tour's trailers at tournaments. In fact, at one European tour event, a trailer was not available and at least one well-known golfer withdrew from the tournament. The trailer is a means for some participants to get through a long and demanding competitive season. The exercise trailer provides an important source of physical and mental stability for golfers at the highest level of a technical and often frustrating sport. In addition to the PGA Tour trailers and staff, individual golfers now employ their own trainers to travel with them as well.

Golf is a game in which a small advantage in one area, such as better fitness, can mean the difference between finishing first or finishing 20th. Scan the pro tour statistics and you'll see that the difference between golfers ranking first in the category versus 25th or 30th could be as small as a quarter of a shot difference in scoring average. Multiply that by four per round, however, to see that a small edge allows golfers to win by one shot, instead of losing by one shot. The other advantage to being fit is that, when the body feels and functions well, the mind is more able to focus on the task at hand—the next shot.

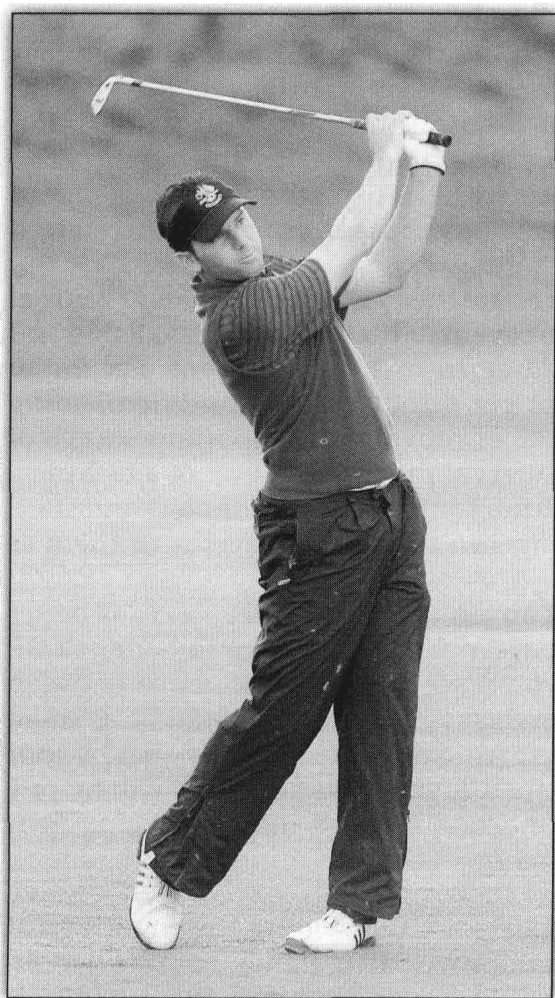
History has shown that most golfers are not willing to spend a great deal of time working out, even if it improves their games. For this reason, conditioning programs for golf should be efficient and should address the areas where they will most benefit performance and reduce injuries. Not too long ago, other competitive sports placed little or no emphasis on muscular development. In the 1960s, for example, few football teams participated in off-season programs for strength training. Today, players

engage in year-round strength training just to stay competitive. In the 1970s, basketball players were advised to avoid the weight room because strong muscles were incompatible with shooting ability. Now, basketball players continue their strength training on a year-round basis. Clearly, athletes of all sports are bigger and faster, and they spend more time at fitness than in the past.

Golfers, too, need to recognize the necessity of physical conditioning. The new breed of golfers and the body type on the professional tour are indicative of what is happening in golf. The young top golfers are leaner, more muscular, and more flexible than the generation of golfers before them. Fitness training can reduce physical limitations and help golfers optimize their swing pattern. Training enables more efficient transfer of

momentum, which translates into improved capability for striking the ball and increased club-head speed at impact.

Using a theoretical model that compares the energy requirements for baseball to those for golf, we discovered that the amount of energy transferred to a golf ball hit 300 yards (274.3 m) is about the same magnitude as the energy transferred to a baseball hit 300 feet (91.4 m) from a resting position. Consider that a 10-handicap golfer takes about 50 hard swings and another 50 to 75 practice swings, per round, with a club that weighs slightly less than a baseball bat. Compare this golfer to the baseball player who bats five times during a game and takes about 15 total swings, and you'll easily see the difference in swinging requirements. Furthermore, golfers walk about 8,000 yards (7,315 m) per round; a center fielder travels fewer than 2,000 yards (1,829 m), moving back and forth to the dugout between innings. Even when movements to run base paths or chase down fly balls are included, the total



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Today's professional golfers like Sergio Garcia recognize the importance of physical conditioning. They are leaner, more muscular, and more flexible than golfers of a generation ago.

distance traveled by a baseball player does not come close to that traveled by a golfer. The conclusion is that, although golf may require less intensity than baseball, the greater volume of activity provides higher overall energy costs. The baseball community has accepted physical training as part of its program. It's time for golfers to follow suit.

Is your fitness level appropriate for high-performance golf?

## **IMPROVE YOUR FITNESS— IMPROVE YOUR GAME**

Golfers who are physically fit can walk 18 holes of golf without feeling fatigued and stay focused throughout the game. Perhaps more important, a well-conditioned body can produce more powerful and coordinated swinging actions that result in longer drives that are better placed. Higher fitness levels also reduce recovery time, thereby letting golfers enjoy more frequent rounds of golf.

The repetitive nature of the golf swing predisposes both professional and amateur golfers to injury. To avoid or limit physical breakdown, add a preventive program of physical conditioning. The first steps are to recognize your own physical limitations and understand what you need to do to strengthen these areas. If left unattended, weaknesses certainly will lead to eventual breakdown. Become aware of potential problems and preventive measures. A successful training program should address cardiorespiratory endurance, postural imbalances, golf-specific strength, functional flexibility, balance, motor learning, and nutrition.

### **Cardiorespiratory Endurance**

Cardiorespiratory endurance is a good indicator of overall physical capacity, especially the ability to do more work, burn more calories, and recover better from activity bouts such as a round of golf. Although many golf courses require the use of a cart, several hours of play can leave you feeling quite fatigued on the last few holes. If you walk (which we strongly recommend whenever possible), you are likely to suffer an even greater decrement in performance unless you have a moderately high level of cardiorespiratory fitness. Playing golf, unfortunately, is not the best means for getting in better shape to play better golf. Instead, you will make much greater progress by specifically conditioning your cardiorespiratory system.

Usually called *aerobic conditioning*, this aspect of the exercise program requires about 20 to 30 minutes of moderate activity, 3 days a week. Walking, jogging, stepping, and cycling are all appropriate activities for improving cardiorespiratory fitness. The level of conditioning is closely related to the intensity of the exercise. For example, a slow walk that raises your heart rate only 20 beats per minute above its resting level (typically about 70 beats per minute) is unlikely to have much impact on your aerobic capacity. A fast walk or jog, however, that elevates your heart rate 60 beats per minute

above resting should have significant conditioning benefit. Performed on a regular basis, 20 to 30 minutes of moderate aerobic activity should make your heart a stronger pump, your circulatory system a more efficient blood transporter, and your blood cells better carriers of oxygen.

A simple formula for selecting appropriate exercise intensity is to train at about 70 percent of your estimated maximum heart rate. You can easily approximate this by subtracting your age from 220 and exercising hard enough that your heart rate is about 70 percent of this number.

## Estimating Your Maximum Heart Rate

John is 50 years old. His estimated maximum heart rate is therefore 170 beats per minute ( $220 - 50 = 170$ ). To attain cardiorespiratory conditioning benefits efficiently, John should perform aerobic activity (walking, jogging, stepping, cycling, etc.) at an intensity that raises his heart rate to about 120 beats per minute. Of course, this is just an approximation. If this level of training is difficult, it should be reduced; if this level of training is easy, it should be increased. General age-related maximum heart rates and the 70 percent levels for cardiorespiratory training are presented in table 1.

**Table 1   Heart Rates for Cardiorespiratory Fitness**

Age (years)	15	25	35	45	55	65	75	85
Maximum heart rate (bpm)	205	195	185	175	165	155	145	135
70% training heart rate (bpm)	144	137	130	123	116	109	102	95

## Postural Symmetry

Postural symmetry is an important component of the golf game. Unfortunately, physical activities such as golf, in which one side of the body is used differently than the other side of the body, tend to promote postural imbalances that can impede performance and cause injury. However, it is important to determine whether the postural imbalance is a normal response to sport mechanics or whether it is because of pathological conditions. A solid conditioning program for golf strives for front-to-back and left-to-right body balance. Although this may never be fully achieved because of the sport mechanics, it should always remain a primary goal of any conditioning program for golf.

## Golf-Specific Strength

The strengthening program for golf should include work for the trunk, as well as for the muscles of the upper and lower body. Because the golf swing is not a simple, linear motion, you need to implement an integrated, multijoint strengthening program. Your hips and legs produce most of the force for a powerful golf swing. This momentum must be transferred

through a stable trunk to the upper body, which simultaneously delivers and counteracts the forceful striking action of the club. A successful swing, therefore, requires sufficient strength and coordinated actions among the major muscles that make up these different body segments. Of course, strong muscles also are essential for proper posture, which assures consistent swing deliveries and a stable head that maintains uninterrupted eye focus on the golf ball.

## **Functional Flexibility**

Flexibility is the one component of fitness that has been appreciated by golfers for many years. By enhancing joint flexibility, you can lengthen your golf swing and increase your club-head speed. Joint flexibility is determined by your movement ability and dictates the safe ranges for your swing patterns. Excellent flexibility alone does not guarantee a good golf swing. Inability to sequence movements at proper times may result in reaching maximum club-head speed well before impact, with a related loss of power and reduced driving distance.

## **Balance**

Balance involves a complex system of neuromuscular communication. It relies on feedback from the central nervous system, the eyes, the inner ear, and tiny message receptors in the joints and soft tissues. Balance is necessary in maintaining appropriate positions for your spine (trunk and torso) throughout the swing. If balance is not maintained during the swinging action, shoulder turn, weight shift, and force transfer may be affected and the shot outcome will be compromised. As people grow older, the sensory organs and balance systems become less sensitive. Therefore, it might be advantageous to everyone to make better postural balance one of the primary parts of a conditioning program.

## **Motor Learning**

Motor learning is simply teaching the neuromuscular system to perform a specific task in a consistent, reproducible fashion. Because the golf swing requires communication among all body segments, motor learning, or muscle memory, might be a key factor for further improvement. Several motor learning adaptations must occur for the body to become more functionally efficient, therefore enhancing golf performance and reducing injury risk. Teach your body parts to work correctly and sequentially, within the available range of motion for your golf swing.

The goal of motor learning, or computer-like programming of the neuromuscular system, is to develop the least stressful and most productive movement patterns for a successful golf swing. Movement can be defined as a series of muscular contractions, controlled by the nervous system and conditioned through the process of motor learning.

## Nutrition

Although most people do not consider golf to be an activity that requires power eating or a special diet, proper nutrition is certainly an important component of a conditioning program for golf. After all, appropriate eating patterns are necessary to maintain high levels of energy throughout a 4-hour athletic event. In addition, golfers involved in physical conditioning activities require better nutrition to maximize their fitness development.

Eating for good health is step one, because it applies to all areas of life. Eating for improved golf performance is step two, because sustained levels of energy can make a big difference in your playing ability, especially on the back nine.

Our recommended nutrition program is sound, sensible, and completely consistent with the United States Department of Agriculture's MyPyramid food guidance system. We emphasize eating appropriate carbohydrate foods for supplying and sustaining elevated levels of energy throughout your golf game.

## UNDERSTANDING THE SWING SEQUENCE

Because the golf swing is one of the most unnatural, complex, and explosive movements in sport, you need to prepare your body to perform this powerful athletic action as successfully and safely as possible. Better joint flexibility lets you swing in a fluid manner through a full range of movement. Greater muscular strength provides more striking force to drive the ball farther. Enhanced balance and coordination are the keys to control and will help you place each shot closer to your target area. Taken together, these fitness factors can make a big difference in your golf performance, playing satisfaction, and game scores.

### Elements of a Golf Swing

The American Sports Medicine Institute (ASMI) in Birmingham, Alabama, breaks down the golf swing into five separate biomechanical phases or positions that are useful for designing a sport-specific program for golf:

Setup

Backswing

Transition

Downswing

Follow-through

Chris Welch, biomechanist with Welch-Etechnologies, uses his program and software package—the Zenolink System—to analyze the golf swing using body segments (hips, trunk, shoulders, and arms) organized into

functional links (hips-trunk, trunk-shoulders, and shoulders-arms). The main purpose of the Zenolink System is to determine specific forces and power outputs during the swing phases and how these factors relate to optimal club-head speed. The analysis allows you to determine objectively how your power might be leaking away.

The forces that act on the segmental components of the spine vary from individual to individual, depending on skill level and physiological factors. Preexisting conditions of the spine, such as degenerative joint disease, postural imbalance, or degenerative disc disease, will change the way swinging forces are distributed. Of course, if the physical demands exceed tissue function or recovery capabilities, the result will be a breakdown of the joint structure. Normal forces that affect the spine during the golf swing are as follows:

- Anterior and posterior sliding forces between the segments  
(shear forces)
- Lateral bending forces between the segments
- Twisting (torsional) forces between the segments
- Compressive forces between the segments

Research at the New Jersey School of Medicine has found that professional golfers demonstrate less sliding, lateral bending, and twisting forces than amateur golfers. Compressive forces were approximately eight times body weight for both groups. Neuromuscular firing of the trunk muscles revealed that professionals use less effort while performing the process of trunk coiling and uncoiling. In addition, the sequence of neuromuscular firing was different between the groups. These findings suggest that golfers with lower handicaps have more efficient swing patterns than those with higher handicaps. Dan Goldstein at Dynamic Balance Systems showed that golfers with lower handicaps impact the ball while their center of mass is within their stance width more consistently than those with higher handicaps. The key to how these spinal segments and muscular forces decrease in better golfers might lie in how well each person is able to pass momentum from one segment of the body to another.

This efficient passing of momentum, commonly called *kinetic linking*, can be improved through training. By increasing muscle strength while at the same time improving joint flexibility, balance, and coordination, golfers can develop more efficient and effective summation of momentum. This basically translates into increased club-head speed at impact, which results in longer drives.

## Analyzing the Golf Swing

Kinesiologically, much of the work on analysis of golf swing has been performed at the biomechanics laboratory at Tenet Medical Center in Englewood, California, under the supervision of a pioneer physician of





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Annika Sorenstam has one of the most powerful drives on the LPGA Tour. Forces generated by the lower body are transferred through the core to the upper body during the swing to generate driving power.

and knee during the golf swing was recorded before the peak muscle activity of the trunk and shoulders. This substantiates the importance of the sequential actions of the different components of the body for generating power.

To obtain the greatest benefit from proper sequencing of swinging actions, you need to have strong muscles in your legs, thighs, and hips to generate driving power. These lower-body forces must then be transferred, through well-conditioned midsection muscles, to the upper body. Strong muscles in your chest, back, and shoulder permit greater acceleration of the club while you maintain control through trained arms and forearms. There is perhaps no single action in sport that requires more overall muscular strength, joint flexibility, and movement coordination than a perfectly executed golf swing.

## Forces

Your feet generate forces when they push against the ground. These forces propel your body and create motion. The two types of forces important to the golf swing are *normal* forces and *shear* forces. Normal forces are displayed in the linear components of the swing; shear forces are apparent in the rotational components of the swing.

sports medicine named Frank Jobe. The analyses show that there is little activity of the trunk muscles during the backswing and relatively high and constant activity in these muscles throughout the remainder of the swing.

These results demonstrate the importance of the trunk musculature throughout the golfer's programs for performance enhancement, injury prevention, and rehabilitation. Studies of the shoulder demonstrated that the muscles of the rotator cuff acted predominantly at the end ranges of motion. The internal shoulder rotators were activated during acceleration, and the front shoulder muscles were activated during the swing and follow-through movements. The middle and rear shoulder muscles on the lead arm were extremely active, to stabilize the shoulder girdle throughout the swing. More important, peak muscle activity of the hip