

Effective Strength Training for Golf: What's the Right Approach?

Harvey Newton

Newton Sports, PO Box 1453, Ormond Beach, FL 32175, USA
E-mail: harveynewton@newton-sports.com

INTRODUCTION

Golf's growing popularity is hard to miss. It is evidenced by the number of new golf courses popping up, golf magazines and instructional books gracing the shelves of bookstores, golf instructional shows on television, and huge media coverage of major tournaments. Additionally, a great deal of research and development goes into newly designed clubs manufactured of exotic materials, different (hopefully more effective) balls, and a myriad of teaching tools and drills; all aimed at shaving a few strokes off one's game.

In recent years the acceptance of supplemental physical training, particularly in the area of strength training and conditioning, has taken hold. A recent article in an on-line, golf-fitness magazine [1] offers some reasonable insight into what can sometimes be described as inappropriate resistance training for golfers. The authors blast many who are simply lumped into the profession of "personal trainer," especially if the said trainer has no golf experience. However, this piece also butchers much of the legitimate jargon associated with resistance training and further clouds the topic for novices in the weightroom. The authors list what they call their "deadly sins," [1, p.26] basically what they judge to be inappropriately prescribed exercises. One, the 'overhead deadlift' ("lifting weights and holding them above the head like a weightlifter") [1, p.26] certainly brings a smile to those of us in the strength and conditioning profession, as no such lift exists.

Much is made, especially among those marketing themselves as golf conditioning specialists, about prescribing "golf-specific" exercises *only*, or in combination with light to moderate resistance training. The argument is made that such training reduces the likelihood of weightroom injury and helps avoid the creation of "bulk" (whatever this undefined term may mean). As a result, golfers undergo dozens of non-traditional lifts designed usually to mimic the golf swing. This makes sense to many, but is it the best means of resistance training for golf?

Recent research [2] demonstrated that a scientifically-based, periodized resistance training program that included mostly common weightroom exercises and a variety of repetitions produced the usual results of increased club head speed (without a negative effect on consistency) and improved flexibility. A similar training protocol [3] had earlier demonstrated that a periodized strength (low repetition) training

program, combined with a plyometric medicine ball protocol produced increased club head speed and driving distance. The study reports no injuries and suggests that such training does not result in unwanted muscular hypertrophy.

The purpose of this article is to discuss the matter of effective resistance training for golf, with particular reference to the pioneering Frank Stranahan, in order to stimulate commentary from fitness professionals on the use of strength and power training for improved performance in golf.

TERMINOLOGY

It may be appropriate to explain some of the most general resistance training terminology just to avoid further confusion. As strength training increases in popularity, a failure to speak one fairly common language simply adds confusion to the scene.

In modern history, the idea of lifting weighted objects from the ground to overhead began with the advent of the sport of *weightlifting* in the 1896 Olympic Games. For dozens of years, this was the only form of progressive resistance training engaged in and the number of athletes involved was small. By the middle to the last century, and largely due to the introduction of “lifting weights” in the training and rehabilitation process of our service personnel during World War II [4], use of external resistance took on new directions.

Competitive *bodybuilding* began around the time of World War II. Here users lifted weights, but not to measure strength. The goal of bodybuilding was simply the pursuit of muscular hypertrophy. Frequently, exercises targeting individual muscles were utilized instead of weightlifting’s goal of using the entire body in a coordinated fashion. The above-mentioned article [1] wisely points out that golfers (or any other athletes) are unlikely to benefit from isolated muscle strengthening and development.

Up until the late 1950s, an occasional athlete might “lift weights” to gain strength or power, or to prevent injury in their chosen sport, but this practice was frowned upon by most coaches and medical personnel. Then, 20 or so years after bodybuilding began to gain in popularity, American football became the first organized sport to specifically prescribe *strength training* as a means to performing better on the field. Now the goal was neither the development of muscle mass nor the lifting of maximum weights in a competitive arena. The objective was simply to improve performance in a chosen sport or game.

Further confusing the public, in the 1960s we saw the advent of the sport of powerlifting, correctly referred to by the British as “the strength set.” Unfortunately the Yanks won out and the sport has remained labeled as a misnomer, in which power plays only a small role.

In the 50 or so years since scientific resistance training methods first gained in popularity and acceptance, most popular sports have come to recognize the worth of a sound “strength training” plan for improved athletic performance and injury prevention. Not all sports jumped on board immediately or enthusiastically. Athletes engaged in endurance sports such as cycling, distance running, triathlon, etc. still tend to shy away from serious strength training. American boxers, long the leaders in their sport, fought for many years the notion of anything other than hitting the heavy bag and doing an inordinate amount of “roadwork.”

Fast-forward to today's world of resistance training and we note in the recent movie, *Rocky Balboa*, that explosive moves such as the clean-and-jerk and plyometric training have made their way into our hero's modern training regimen. What effect would such training have on golf? After all, golf, like boxing, is ultimately a power and accuracy sport.

LOOKING BACK

Frank Stranahan, one of the world's most outstanding golfers of the late 1940s and 1950s, was a pioneer who embraced true strength training (and weightlifting) for improved performance. As reported in the April 1958 issue of *Strength and Health* [5], the "bible" for resistance training during most of the latter half of the 20th Century, Stranahan never shied away from heavy weights (See Figure 1). His strength-training program generally consisted of four moves:

High pull (now called "power") snatch
Squat
Deadlift
Sit-ups

For readers unfamiliar with the Snatch, this is an extremely explosive move that raises the barbell from a resting spot over the feet to overhead. Experienced weightlifters execute the Snatch in less than one second. That is a remarkably short time to raise a weight often in excess of one's own bodyweight several feet in the air.

Stranahan, weighing 175-180 lbs, reportedly worked up to about 200 lbs in his Snatch exercises, sometimes employing what competitive weightlifters call a "split" technique to hoist heavier weights. He snatched a total of 8-10 sets, utilizing five or fewer reps, a generally accepted requirement for truly improved strength.

The Squat calls for a loaded barbell to be held across the upper back while the athlete flexes ankles, knees, and hips to descend to a position where the tops of the thighs are at or below parallel to the ground. Stranahan utilized five or so sets, all sets with five or fewer reps. The article reports the author losing a bet when Stranahan performed three repetitions with 385 lbs.

The Deadlift is executed by raising the barbell from the platform, as in picking up a heavy package. The lifter stands up completely, raising the weight with hip, leg, and torso strength, until the barbell rests along the thighs. Much heavier weights are utilized in the Deadlift, a non-explosive, "whole body" exercise. Stranahan again employed strength-building low repetitions (fewer than six) and worked up to heavy single efforts *over 400 lbs!* He repeated these lifts for five to 10 sets, apparently utilizing a "straight grip" without the aid of pulling straps or other techniques. Done this way, the Deadlift develops an extremely strong grip.

Stranahan finished off his twice-weekly workouts with Sit-ups. With wisdom ahead of his time, perhaps, he did not place a great deal of emphasis on this move, placing a set of 20 repetitions about every third set while doing his primary lifts.


Stranahan had experience as a competitive weightlifter, having officially lifted 235 lbs in the Press (no longer a competitive lift), 225 lbs in the Snatch, and 300 lbs in the Clean-and-Jerk. In powerlifting, minus the Bench Press, his best was 410 lbs in the Squat and 510 lbs in the Deadlift.

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WEIGHT TRAINING
FOR THE GOLFER

WATCH
THOSE
HIPS




Headlines Frank Stranahan on the green ready for action.

how


FRANK STRANAHAN


Trains for Golf


By LEO STERN



The photo shows the ripped but muscular physique of the champion golfer, Frank Stranahan. Other photos reveal the type of training he does—with very heavy weights, too.







prosa. It just isn't supposed to happen, but Frank did it more than once. In the play-for-pay game there are two classes: those who play the tournament circuit all year long, and the club pros who give lessons and play in only a few tournaments. Either way, the pros play golf every day and are constantly practicing to improve. Since joining the professional ranks, Frank has proved that his wins as an amateur were not flukes and has kept up with the best. For example, his golf earnings in 1956 were in the vicinity of \$17,000, most of which was won in tournament play. He is also under contract to the McGregor Sporting Goods Company as an advisor. At the conclusion of the 1956 season, his 17th ranked professional golfer in the nation. This is indeed a select rating to be achieved by a newcomer competition with the more than 300 members of the Professional Golfers Association.

It is always keen and at a fever pitch is a true test of a man's ability, nerve, and stamina—especially when a single mistake can cost him several thousand dollars. In a round of golf is there to four hours of pressure without a one-minute lull. It takes a golfer to ruin the whole round and maybe even a top golfer one necessarily must spend countless hours practicing to improve his overall game. The long, well-hit ball and the accurate putt are the only factors the golfer must consider. He must be able to judge the rise and fall of the turf, the grain of the greens, and know how atmospheric conditions will cause the ball to react, and compensate for them. He must accurately figure windage

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and make the proper allowance for it. Only after all of these factors have been considered and evaluated is he ready to make his shot. If after all this the ball is addressed properly and a perfect shot gotten off, the personal satisfaction felt by the golfer usually manifests itself on his visage in the form of a wide and toothy smile. If on the other hand after all these calculations something goes wrong—well, the man might well "blow his top." The strain is mental, not physical. You occasionally hear those who contend that golf is an old man's game. They couldn't be more wrong. I would suggest to those who harbor this fancy that they go out and play 72 holes with perhaps a few thousand dollars riding on the lowest score—then let them pass final judgment on the game!

Physically golf requires strong hands, wrists, and legs for driving power, plus more than a little sheer endurance. A man cannot take the strain of walking at a fast clip for four or more miles a day, all the while concentrating on just what has to be done as each new and varied situation presents itself, without

(Continued on page 19)

Figure 1. Frank Stranahan

Courtesy of *Strength and Health*

Contrary to the reservations expressed by most of today's golf conditioning "experts," Stranahan neither gained excessive muscular bulk nor became inflexible. Rather than damaging his golf game, heavy strength and power training improved his game to the point that he is described as the "world's most prolific amateur golf champion" from 1936 until 1954, with 70-plus amateur championship wins [6].

LOOKING FORWARD

In his era, Frank Stranahan was likely alone as a golfer employing true strength and power training methods for improved golf performance. It would be many years before mainstream golf began to look to the world of strength and conditioning for advice.

But, Stranahan might find himself alone with his approach even today, as so much of the sports performance field is heavily influenced by a conservative, "let's not really try to get too strong" attitude reflective of the rehabilitation profession. Of course, if Stranahan were training heavy and winning in today's tournaments, perhaps even the "exercise police" would have to reconsider the pros and cons of his training methods.

Far too much of today's so-called golf-specific resistance training emphasizes what is known as "core" or "functional" training. These terms cannot be clearly defined or universally agreed to in most professional circles today. Usually this consists of lots of rehabilitation-oriented workouts that focus on unbalanced surfaces, abdominal training, or what most true strength coaches would refer to as other "personal training" types of workouts filled with gadgets.

While such training can be beneficial to core musculature and is certainly challenging and fun, recent research [7] indicates that such unstable surface training reduces up to 70% of the muscle activation of the primary movers and reduces external force production. Numerous legitimate experts in the area of strength and conditioning question the need for such training for many individuals. Noted sport scientist Tudor Bompá recently stated the following:

Core strength, or the strength of the midsection of the human body (abdomen, low back muscles, and the trunk) is also a preferred target of some individuals who promote novel training concepts and gimmicks.

However, in referring to core strength some individuals go far beyond decency, racing against each other to fabricate and promote the most ridiculous exercises.

Also, these new exercises for core strength are not necessary in any means, as in many cases weight training exercises take care of core strength via the overflow of activation/irradiation mentioned above. [8]

Where does a serious golfer, golf coach, or golf conditioning trainer turn in order to optimize results, while minimizing either injury or wasting time?

CONCLUSION

As with most approaches to maximizing performance via resistance training, there is no

simple answer. Much depends on the individual in question and his or her own strengths and weaknesses. Certainly a well-rounded, periodized resistance training program makes the most sense, but this requires a flexible, not rigid, approach to such training.

One can certainly question the wisdom of exercising on resistance training machines or in utilizing only lightly weighted objects. In the former example, golf is played with the feet on the ground and ground-based resistance training should be the main focus. Similarly, using only light objects assures that the acquisition of significantly increased strength is retarded. Strength, in conjunction with speed, is the way to improved power. Power is what most golfers want to gain, not in the gym, but when connecting with a long shot.

In other words, there is a time for nearly all facets of scientific resistance training. In preparation for more serious strength development, lifting light and moderate resistances a medium number of repetitions (eight to 12) makes sense. The utilization of heavier weights moved either slowly for added strength or quickly for improved power is the classic means of achieving peak performance at the right time in the competitive calendar.

Key in the rationale for such training is the actual strengthening of the so-called core musculature in a way not unlike that needed in golf. If we look at exercises such as the Squat or the Power Snatch or Power Clean, especially performed from a “high hang” position, we see the emphasis on a rigid body posture and the sequential transmission of power to the extremities (legs and arms).

And, as you know so well, this is exactly how the golf swing is executed. Is this golf-specific resistance training? It is certainly much more specific to developing power than merely struggling to maintain one’s balance on an unstable surface and possibly lifting a light weight in the specific pattern of a golf swing. Frank Stranahan trained for strength and power with exactly the opposite approach suggested by today’s gurus. Was he wrong? Is today’s approach perhaps in need of more critical thinking? Let’s remain open to all options and encourage the exchange of science-based opinions on how to most effectively train golfers for improved performance.

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Effective Strength Training for Golf. What's the Right Approach?

A Commentary

Robert Mottram

Golf Health & Performance Center,
Mission Hills Country Club, Rancho Mirage, CA 92270, USA
Email: GolfPT@aol.com

INTRODUCTION

There does seem to be an exorbitant amount of people in the last several years referring to themselves as a specialist in physically training golfers. I am aware of numerous “certification programs,” where orthopedic evaluations, corrective exercise prescriptions, swing analysis and a variety of “golf-specific” movements, exercises and drills are taught. Most of these weekend golf-trainer seminars are designed and taught by those in the health and medical field where isolated and therapeutic exercises are frequently used. Trainers and health care professionals are taught to perform a detailed body analysis then recommend corrective and preliminary exercises. But often the programs spend too much time at those levels. Few of these programs would appear to include strength and power exercises.

STRENGTH AND POWER TRAINING FOR GOLF

But why is there some confusion with strength training for golf with all these golf certification programs? Back in the early 1990's very few trainers and strength coaches saw enough business in golf to pursue its players. Golf has a poor history of resistance training, set up by the fear and ignorance that lifting weights would injure or interfere with the delicate nature and precision of the golfer. As Mr. Newton points out, Frank Stranahan and a handful of others like Gary Player and Jerry Barber, were definitely a rare and laughed at group. Stranahan's Olympic and power lifts are techniques that require some qualification and practice. Although these exercises, in my opinion, remain the best for complete strength and power development, something golfers could all use more of, it may take some time before a player can develop those lifting skills. But with practice, like learning to hit a driver straight, one could improve and perfect those techniques. It might also be said that trainers that do not preach and teach those complex lifts many times have never performed those exercises themselves, therefore, find them difficult to teach.

More professional golfers nowadays are getting involved with the types of basic lifts and body development that previous generations avoided. Noteworthy examples

are Tiger Wood and Annika Sorrenstam, who are the most successful and longest hitting players amongst their competitors. They both lift heavy weights. Increased strength does help with improving the potential for a stronger and faster swing. Injury prevention is another benefit of strength training.

Although there are many smaller golfers playing at the elite level, I cannot imagine any who would not want to be stronger and faster. Lifting of light weights, lying on their backs or sitting in machines will not accomplish an increase in useful strength and power for golfers.

CORRECTIVE AND GOLF-SPECIFIC EXERCISES

Having said all that, I will say there are times when not lifting heavy and fast has its place. Most golfers, at all levels, have numerous physical limitations, asymmetries and imbalances. Time and effort should be spent to address these issues before getting into more of the complex and intense lifts. The purpose of certain sport-specific exercises are many times directed toward positional and movement awareness drills.

Although these exercises do not develop great amounts of strength, they may improve the athlete's finer motor skills and control. Biofeedback and proprioceptive awareness can have its place in the gym when educating the golfer about the fundamentals of the swing. Slowing down movements and working on swing components are part of the training process to compliment the actual skill acquisition. It may be argued that the sport-specific transfer of golf-gym exercises is minimal to the actual swing event due to the significant difference in neuromuscular control. Yet, there are numerous golf development programs now being done indoors and include both the traditional weight resistance training and golf-specific movements.

CONCLUSION

Since Harvey Newton is discussing strength and power training improvements, I agree that conventional and proven resistance training, as Frank Stranahan had practiced, when done correctly, and in the correct phases, is still a winner for strength and power development. But correcting specific body issues and reinforcing certain positions and movements when tremendous amounts of strength are not required, then light weights and unstable surfaces can have a place beside the Olympic bar.

Effective Strength Training for Golf: What's the Right Approach?

A Commentary

David Lindsay

Sport Medicine Centre, University of Calgary,
2500 University Drive N.W., Calgary, Alberta, Canada TN2 1N4
E-mail: dlindsay@ucalgary.ca

INTRODUCTION

Harvey Newton sets out to make a case that a “well rounded” strength-training program is an important component to enhancing golf swing performance. However, he feels that much controversy exists regarding what constitutes optimal strength training for golf. Newton particularly questions the almost fanatical belief in so-called sport-specific strength training known as “core” or “functional” training using unstable surfaces to enhance performance. While he favours a balanced approach, Newton makes no apologies for his support of a more traditional strength and power training regime for optimizing golf performance.

SCIENTIFIC RESEARCH

Newton uses the example of Frank Stranahan, the original pioneer of weight training and weightlifting for golf, to support his view that traditional weight exercises such as dead lifts, squats, and power snatches offer considerable benefits for improving performance. While ‘case reports’ such as the one showcasing Stranahan are useful, they shouldn’t be interpreted as conclusive as the findings have not undergone the scrutiny of scientific investigation. For this reason, it is important to critically analyze the research literature on this topic to come up with more informed and definitive conclusions.

Electromyography research coordinated by Dr Frank Jobe and Marilyn Pink in the late 1980’s and early 1990’s provided an opportunity to learn about critical muscle activity during the golf swing. Their work essentially showed that the golf swing incorporated almost every major muscle in the body [1]. An interesting finding was the minimal involvement of the deltoid muscle group as opposed to the importance of the rotator cuff muscles in stabilizing the shoulder joint during the golf swing [1]. It could be argued therefore that almost any strength exercise would provide some benefit for golfer. Research studies have shown that fairly basic (i.e., minimally sport-specific) strength training programs can increase club head speed [2, 3, 4].

Fletcher and Hartwell [5] examined the effect of an 8-week training program, combining free weights and plyometric medicine ball exercises, on golf performance.

The plyometric exercises, involving eccentric / concentric spinal rotations, were felt to more closely approximate the actions of the golf swing and thus be more sport specific. Although their subject numbers were small ($n = 6$), the results of the study showed a significant increase in club head speed and driving distance at the end of the training period. Doan et al. [6] also completed a study examining traditional strength plus medicine ball exercises on golf swing performance. These authors also found a significant increase in club head speed at the end of the 11-week training program. What was interesting in this study was that strength training did not appear to have any adverse affects on putting performance.

Unfortunately no study has examined the potential benefits offered by the latest core exercises incorporating unbalanced surfaces. Given the rotational nature of the golf swing [7], it would be interesting to investigate whether sport-specific rotation exercises beyond medicine ball plyometrics would offer any additional benefits over traditional strength training methods.

CONCLUSION

While these studies are useful, a lot more research needs to be done. Until we gain additional information from scientific investigation, it would seem prudent to follow Newton's recommendation for a "balanced" approach to strength training for golf. Balanced would include some heavy weights, some speed work, some rotational exercises, some 'core' training and flexibility training.

It is interesting to note that my good friend, 5-time winner of the World Long Driving Championship – Jason Zuback, has more recently focused on 'Olympic' lifts (cleans, snatches, etc.) in his workout routines. Zuback, who also incorporates a variety of other strength exercises, believes the Olympic lifts played an important role in his being able to recapture the world title in 2006 after a 6-year hiatus. In summary, Newton should be complimented for highlighting the fact that golf and strength training (in almost any form) do appear to be compatible activities that would benefit any serious golfer.

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Effective Strength Training for Golf: What's the Right Approach

A Commentary

Tom House

National Pitching Association, PO Box 2350, Del Mar, CA 92014, USA
E-mail: thouse1@san.rr.com

INTRODUCTION

Three-dimensional motion analysis of athletes at the Titleist Performance Institute and the National Pitching Association reveal that swinging a golf club and pitching a baseball have similar kinematic signatures.

Over the last 20 years in baseball, we've proven that to be effective, strength-training protocols for pitchers must complement, or be cross specific, to the rotational/directional mechanics of their delivery. It would appear logical that strength training protocols for golf cannot be effective unless they also are cross specific to effective skill training protocols. It's equally logical for both pitching and golfing that there must be an effective assessment/screening process to identify strength, endurance, and flexibility problems before any training can be initiated.

Golfers, like any throwing/striking athlete, are only as efficient as their worst movement and only as strong as their weakest link. Performance and health are a function of their swing mechanics; useable strength endurance and flexibility; and practice, competitive workloads.

STRENGTH TRAINING MENU

Let's assume in this article that swing mechanics are efficient and an assessment/screen has identified any fitness issues. Now, our theoretical golfer and fitness professional can pick appropriate protocols from the following conditioning menu, prioritized in order of importance from foundation bodywork to fine-tuned, cross-specific implement work.

- Total body stability, mobility, flexibility, and durability work
- Hot spot, or weak-link work, focusing on muscle imbalances
- Total body resistance work in an explosive manner
- Total body resistance, rotational work for speed
- Body segment work for velocity of golf club using drivers of different weight

CONCLUSION

There isn't any one effective strength-training program for golf. However, there is an effective strength program that can be individualized for every golfer. The keys are:

1. Implementing an effective assessment/screening that can identify each golfer's strength, endurance, flexibility issues; then
2. Designing an individualized, cross-specific (to swing skill), conditioning program with the menu of protocol choices.

Finally, it's important to emphasize that strength training should never impede the timing or sequencing of biomechanical skill development and/or maintenance of any golfer's swing signature.

Effective Strength Training for Golf: What's the Right Approach?

A Response to Commentaries

Harvey Newton

Newton Sports, PO Box 1453, Ormond Beach, FL 32175, USA
E-mail: harveynewton@newton-sports.com

INTRODUCTION

I should begin by emphasizing that one should not attempt advanced resistance-training methods before initial steps are taken to correct any weakness or deficiencies. Tom House's commentary is an excellent overview of what golf-conditioning specialists should consider when introducing resistance training for golfers. Advanced resistance training methods, such as explosive weightlifting movements, have no place in a weightroom novice's training program, at least not in the early stages.

Nothing in the way of resistance training should ever impede golfer performance. For me, this may include such approaches as over-weighted clubs (due to a trainee's eccentric capabilities) and non-specific unbalanced training. When is golf played in an unbalanced environment?

In this response to the commentaries, it would first be helpful to distinguish between resistance training and strength training, as these terms cannot be used interchangeably.

RESISTANCE TRAINING VERSUS STRENGTH TRAINING

Resistance training includes a wide range of applications and resulting benefits. The lay public often quite simply lumps all forms of resistance training into the popular term, strength training. While strength training sounds appealing (after all, who among us does not want to be stronger?), all forms of resistance training do not literally improve one's strength.

At one end of our continuum we have the competitive sports of weightlifting and powerlifting. Despite the similar goals of lifting maximum weights in a competitive venue, it is crucial to understand the differences between these two disciplines and how either sport may contribute to improved golf performance.

Weightlifting involves lifting maximum, or near maximum, weights in an explosive (powerful) fashion. Weightlifters are noted for executing lifts (Snatch, Clean-and-Jerk) that register some of the highest rates of force production in sport. Similarly, weightlifters have long been noted for their outstanding flexibility. Powerlifting involves the Squat, Bench Press, and Deadlift, but is a misnomer in that

it is primarily about strength.

The reader should note here that merely lifting weights does not increase strength. Strength development is a matter of repetitions and intensity. Generally, the higher the intensity (weight or effort), the fewer repetitions are possible, and the greater the gain in strength. So far on our continuum, all parties are focused on increased strength and/or power.

Bodybuilders generally lift lighter weights for a higher number of repetitions (8-12) than weightlifters and powerlifters, thus encouraging muscular hypertrophy. Neither strength nor power are goals of bodybuilding training. Bodybuilding's location on our continuum is greatly removed from that of strength/power sports and it involves an emphasis on joint-isolation exercise, i.e., focusing on the development of individual muscle groups.

At the opposite end of our continuum from pure strength and power sports we have those who engage in some form of resistance training, but use lighter resistances and perform a high (above 15) number of repetitions. This describes the resistance training of many in today's weight room. Numerous reasons are given for such training, most popularly the chant of "I don't want to bulk up." Unfortunately, many believe that high-load, low-repetition protocols will produce muscular hypertrophy. An article in *Golf Digest* magazine even attributed Tiger Woods' reported 25 lb increase in bodyweight to his lifting heavy weights six to eight repetitions [1]. Gains in muscular hypertrophy and added bodyweight are not this simple. It is somewhat unfortunate that so much attention is devoted to an exercise like the Bench Press, which cannot be considered either muscularly or energy-wise a very solid choice for golf specialization.

In truth, weightlifters and powerlifters (those training with the fewest repetitions) are not overly muscular. Bodybuilders, who have the most muscular bulk, are not extremely strong or powerful. Unfortunately, those who train with light loads and high repetitions, while perhaps gaining some benefit in terms of muscular endurance, suffer from a lack of strength gain.

Added to this end of the continuum is much of what today is described as functional, core or balance training. Much of this training has come from the field of rehabilitation and one of the first goals of rehabilitation is regaining muscular endurance. But for those not in need of rehabilitation, can this be considered to be the optimal spot on the continuum for improved sport-performance resistance training?

SAFETY ISSUES

Rob Neal correctly points out the dangers of embracing a form of training, such as explosive lifting, without a thorough knowledge and ability to safely and effectively teach the skills needed. His questions related to the current state of affairs with certifications and diverse training ideas are worthy of an article by itself.

Where does a serious golfer, golf coach, or golf conditioning trainer turn in order to optimize results, while minimizing either injury or a waste of time? This writer, an experienced strength professional and no stranger to golf, realizes that the worst advice possible is to encourage the weightroom novice to head to the gym and train like Stranahan or Zuback. Advanced resistance training is a goal, not an immediate remedy.

Training on unstable surfaces is currently in vogue, but its application to a stable surface sport like golf can be questioned. True, we want to improve strength and power in the body's so-called "core" area, but this is very effectively done through many traditional strength/power exercises that also pay big dividends in other ways.

Speed is improved through speed training. Learning to swing quickly, while maintaining optimal posture, is crucial to success. Swinging lighter or heavier clubs is often suggested as a means of improvement. With heavier clubs, however, one must examine existing strength levels and particularly the ability to safely control and decelerate large eccentric forces around the spine.

As the three commentators indicate, there must be a continuum of resistance training available. Golfers (and "trainers") must realize that different golfers are located at different spots on this continuum at any particular moment.

CONCLUSION

There is a time for nearly all facets of scientific resistance training. In preparation for more serious strength development, lifting light and moderate resistances a medium number of repetitions (eight to 12) makes sense. The utilization of heavier weights moved either slowly for added strength or quickly for improved power is the classic means of achieving peak performance at the right time in the competitive calendar.

Golf and strength coaches, along with sport scientists, are encouraged to explore all the many facets of resistance training in order to provide today's golfer with solid, safe, and scientific advice on how to improve their game. It must be acknowledged that any serious attempt at gaining increased strength and power for golf requires a good deal of elementary and intermediate instruction in the weight room. Gains in strength and power take no less time or effort than does perfecting the golf swing.

REFERENCES

1. Kaspriske, R., Tiger's Workout Revealed, *Golf Digest*, 2004, August, <http://www.golfdigest.ie/health/index.ssf/?features/gd200408tigerworkout.html>.

