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## Power Development for Golf

Scot D. Morrison

*Washougal Sport and Spine*

Eric Chaconas

*University of St. Augustine for Health Sciences, echaconas@usa.edu*

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## **Power Development for Golf**

### **Running Title: Power for Golf**

#### **Abstract**

Golf is a popular sport attracting participation from all age groups. The strength and conditioning professional will often encounter golfers who are looking to improve their game through rotational power development. By gaining a sound understanding of the development of rotational power in the golfer the exercise professional will be better able to address this need. The purpose of this paper is to discuss power development principles, address golf specific power development, and give some specific exercise options that can be implemented.

Key words: Golf, power, exercise, rotational power, club head speed

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4 **Introduction**  
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6 Golf is a sport that can be played by almost anyone regardless of age, sex, or skill.  
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9 Worldwide there are an estimated 35 million golfers with approximately 26.5 million  
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11 participants in the US alone (2). With the wide appeal of this sport comes unique  
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13 demands that must be met in order for the golfer to be successful.  
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16 During the normal full golf swing high levels of force are required to accelerate  
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18 the club into the downswing and then again to decelerate during the follow through (3).  
19  
20 The golf swing is considered to be a sequential movement that begins developing power  
21  
22 in the lower extremity and increases this on up the chain till it peaks at the golf club  
23  
24 during impact. (13) Hume describes the kinetic chain sequence as initiated by the “legs  
25  
26 and hips followed by movement of the trunk and shoulders, and finally the hands and  
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28 wrists.” (25) Elite golfers do a better job of this summation of power, which is one of the  
29  
30 reasons for their greater club head speed. (13)  
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36 The literature has established strong support for the use of physical training in the  
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38 sport of golf (4-8). Due to the nature of the sport and the correlation between measures of  
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40 power and club head speed an important focus of training is on the development of power  
41  
42 (9). While the golf swing is a unique exercise it is important to approach the development  
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44 of power in a golfer the same way one would develop power in other sports. There are  
45  
46 basic principals that apply to power development and these should be adhered to while  
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48 also acknowledging the unique demands of golf.  
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55 **Testing for Power**  
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4 Power for golf can be measured with a variety of jump tests and medicine ball  
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6 throws. The seated med ball chest throw, standing rotational throw, squat jump, and  
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8 countermovement jump have been found to correlate well with club head speed (9,10).  
9  
10 Club head speed is an important means of assessing the interventions effect on the golf  
11  
12 game. With all other aspects being equal an increased in club head speed of 5.3Km/h has  
13  
14 been shown to result in 10 to 15 meters increased carry distance from the tee (12). The  
15  
16 role of the lower extremity in the golf swing is to generate force and transfer it through  
17  
18 the foot into the ground. This is termed the ground reaction force (GRF) and an ability to  
19  
20 load the rear foot and then transfer this GRF from to the lead foot during the downswing  
21  
22 is something that skilled golfers do better than those with a higher handicap and also  
23  
24 increases club head speed (11, 25). In addition to this weight shift highly skilled golfers  
25  
26 demonstrate better stability and increased transfer of force at impact (13).. The golfers  
27  
28 initial assessment should include a battery of these tests and they should be used regularly  
29  
30 to track progress. A complete description of these tests has been discussed elsewhere in  
31  
32 the literature (9,10,14)  
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### **Power Development Parameters**

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45 The three main components that interact together allowing for maximal power are  
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47 muscular strength, rate of force development, and the amount of force that can be  
48  
49 developed at high velocities of movement (15). In each of these domains the specific  
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51 exercise, the load used, the velocity by which it is performed, sets, reps, rest periods,  
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53 sequencing, and frequency are all parameters that are important to consider. A full  
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55 description of how to manipulate these variables is beyond the scope of this paper and  
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4 the reader is referred to the Haff et al article.(15) However in general the load will be  
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6 submaximal and the rest periods will be long enough to allow for complete recovery.  
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9 For power development a mixed methods approach is often recommended.(15,  
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11 17) This approach combines heavy resistance training with ballistic training to maximize  
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13 the training effect. A mixed methods program trains all aspects of power production  
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15 compared to strength training or ballistic exercise alone.  
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### 21 **Role of Strength**

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23 Strength is closely correlated with the athletes capacity to rapidly produce high  
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25 levels of force (15-17). A foundation of strength must be in place for the golfer to  
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27 develop significant levels of power (15), 17). Strength development can be sufficient to  
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29 develop power without the addition of any specific work (18) and a stronger golfer will  
30  
31 respond to the addition of specific power based exercises more optimally (16).  
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36 It should be noted that strength is relative to the individual and sport. Observed  
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38 increases in power resulting from strength work is assumed to come from increased  
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40 muscle cross sectional area as well as changes in neural drive (17). General guidelines  
41  
42 for strength development suggest that near maximum resistance levels should be utilized  
43  
44 with lower repetition ranges and longer rest periods (19). Exercise prescription for  
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46 volume must take into account a multitude of variables but general guidelines suggest  
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48 significant gains in as few as 2-3 sets performed 2-3 times per week (5,17,19,20).  
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### 54 **Role of Ballistic Training**

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4 Ballistic training is the second aspect of the mixed methods approach. This form  
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6 of training allows the golfer to accelerate throughout the entire movement.(15)) This is  
7  
8 in sharp contrast to an exercise such as a bench press where up to 52% of the total  
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10 duration of the exercise has been shown to consist of deceleration (17). The full  
11  
12 importance of training at high velocity has been discussed in depth in prior reports (15).  
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14 When looking to train for high velocity it is important that the loads used for the ballistic  
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16 exercises are low enough that the golfer is actually able to perform the movement at high  
17  
18 speeds. Both the intent to move rapidly and the actual rapid execution of the exercise  
19  
20 have been shown to have a large effect on training outcomes (17). Therefore the selection  
21  
22 of an appropriate load and the use of verbal instruction that directs the golfer to maximize  
23  
24 velocity should be a component of the training program. When performed in this manner  
25  
26 ballistic exercises allow the athlete to train at or near performance speed with a very large  
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28 power output and high rate of force development which leads to into increased power at  
29  
30 game speed (17). Winchester et al looked at 8 weeks of ballistic resistance training  
31  
32 performed 3 times per week at loads between 26 and 48% of one rep max and found  
33  
34 increased peak power and rate of force development compared to a control (Winchester  
35  
36 2008). The observed increases in the rate of force development are caused by adaptations  
37  
38 in neural drive, the rate of activation, and inter-muscular coordination (17).  
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### 50 **Exercise selection**

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52 Lower body strength and power development is important for maximizing golfers  
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54 physical abilities. Golf is similar to other striking and throwing sports with the golfers  
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4 power development originating in the lower extremities and being expressed through the  
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6 trunk and upper extremity.  
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9 In conjunction with a strength training program plyometrics have been shown to  
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11 be beneficial for improving club head speed in golfers (4). There has also been some  
12  
13 interesting research that suggests that power development is also specific to direction  
14  
15 (14). Since golf is largely a sport of frontal plane motion translated into rotational power  
16  
17 the inclusion of exercises that develop this frontal power are warranted.  
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### 20 21 **Medial/lateral Jump** 22

23 The medial to lateral jump is performed with the athlete jumping onto a box in the  
24  
25 frontal plane as described in (figure 1a and 1b). To avoid excessive loading through the  
26  
27 lower extremity the athlete is instructed to step down from the box after each repetition  
28  
29 instead of jumping down. The athlete should be instructed to perform an explosive  
30  
31 movement from the ground and land in a controlled manner. Since golf is a sport that is  
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33 asymmetrical in nature it is important to perform an equal number of repetitions to both  
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35 sides.  
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### 40 41 **Medicine Ball Throw** 42

43 The medicine ball throw described in (Figure 2a and 2b) is a fundamental power  
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45 development exercise. The medicine ball is one of the most versatile exercise tools that  
46  
47 allows for power development at a velocity similar to sport specific speed. The rotational  
48  
49 throw has been shown to be closely correlated with club head speed (9) and programs  
50  
51 using various rotational throws have been shown to improve club head speed for golfers  
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53 (7,21). The rotational medicine ball throw reproduces the characteristics of the golf  
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55 swing by creating power from the lower extremity that is expressed in a rotary throwing  
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4 manner. It is important to use a weight that is light enough to allow for high movement  
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6 velocity. The strength and conditioning professional should also avoid instructing the  
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8 golfer to attempt to imitate their golf swing with this exercise. The goal is not to interfere  
9  
10 with the swing motor program but to develop general rotational power. Appropriate  
11  
12 verbal cuing would include a phrase such as “try to throw the ball through the wall”.  
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### 15 16 **Kettlebell Swing**

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18 The kettlebell swing (Figure 3a and 3b) has been shown to develop power,  
19  
20 strength and has been suggested as a viable alternative to more traditional methods such  
21  
22 as the power clean when looking for exercise program variety (22, 23). Inclusion of the  
23  
24 kettlebell swing offers the strength and conditioning professional an alternative means of  
25  
26 power development that may be easier for the golfer to perform at home or while  
27  
28 traveling. The kettlebell swing is executed with an emphasis on the hip hinge and the use  
29  
30 of the posterior chain for the execution of the exercise. Verbal instruction includes  
31  
32 “hike” the kettlebell between the legs on the downswing and “snap the hips forward” on  
33  
34 the upswing.  
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### 40 41 **Example Program**

42  
43 An example program is provided in (Table 1). This program would be  
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45 implemented as the foundational component of the golfers program and likely would  
46  
47 follow up a block that has emphasized strength development. The warm-up and  
48  
49 accessory exercises added to the program would be specific to the needs demonstrated by  
50  
51 the athlete. The program would be followed for 4-6 weeks as a power specific training  
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53 block and emphasis should be placed on progressing the intensity of the exercises  
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55 performed without excessive variation in the specific exercises.  
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4           The two strength exercises chosen, the front squat and single leg deadlift,  
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6 compliment the power work that the golfer will be performing. Sufficient hip and knee  
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8 flexion while performing the squat is important with deep front and back squats  
9  
10 producing greater transfer to the squat jump (24), which is highly correlated to club head  
11  
12 speed (9). A comprehensive program would include additional exercises that focus on  
13  
14 other aspects of performance outside the scope of this article. Basic principles of  
15  
16 periodization, load selection, rep ranges, and rest periods should be observed in the  
17  
18 implementation of these and any other exercises.  
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### 23 **Conclusion**

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26 The integration of power development into the golfers exercise program should include  
27  
28 both strength and ballistic training principles. By following these training principles and  
29  
30 utilizing exercises that combine the various power training methods will allow the  
31  
32 strength and conditioning specialist to design a program that will increase power in the  
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34 golf swing potentially resulting in lower scores.  
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7 APPENDIX  
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10 Figure 1a. Medial/Lateral Jump Initial Position: The golfer stands to the side of the box  
11 and goes into a single leg stance on the outside leg. The jump is initiated by dropping  
12 down on the right leg and then driving into triple extension to jump towards the box.  
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15 Figure 1b. Medial/Lateral Jump End Position: The athlete will land on the opposite leg  
16 from the one that was jumped off of. The landing on the box should be quiet and  
17 controlled with no loss of balance noted. Step down and repeat.  
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20 Figure 2a. Medicine Ball Rotational Throw Start Position: The golfer stands in an athletic  
21 stance grasping the ball with both hands and holding it to the side of the right hip.  
22  
23

24 Figure 2b. Medicine Ball Rotational Throw End Position: The throw is initiated with  
25 powerful double extension of the knees and hips with a weight shift from right to left  
26 while simultaneously rotating through the torso and throwing the ball towards the wall.  
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29 Figure 3a. Kettlebell Swing Bottom Position: Set up by standing with the feet slightly  
30 past shoulder width apart with the kettlebell set an arms length in front and on the floor.  
31 The swing is initiated with the golfer pushing the hips back while reaching forward to  
32 grasp the bell. Flexion at the knee is minimal but should be enough to allow for a neutral  
33 spine. The kettlebell is then pulled from the floor and swung back between the legs to  
34 load the hips for the swing.  
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37 Figure 3b. Kettlebell Swing Top Position: From the loaded position extend the hips  
38 crisply to swing the kettlebell up. At the top of the swing the golfer will be standing tall  
39 without excessive hip or lumbar spine extension. The downswing is initiated when the  
40 kettlebell reaches the peak of the swing. At this point the weight is actively pulled down  
41 and back between the legs. It is important to keep the arc of the swing close to the hips in  
42 order to minimize the load through the lumbar spine.  
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Table 1. Example Exercise Program

Exercise	Sets/reps	Load	Rest
Medial-lateral jump	3x6	BW	60-90 seconds
Rotational Med-ball throw	3x6	Light enough that exercise is performed at high velocity	60-90 seconds
Kettlebell Swing	3x8	Heaviest weight that can be lifted while maintaining hip speed	2 minute
Front Squat	4x6	8 rep maximum	90 - 120 seconds
Single Leg Deadlift	3x8	10 rep maximum	60 – 90 seconds

## **Power Development for Golf**

### **Running Title: Power for Golf**

Corresponding author: Scot Morrison, DPT, CSCS

1. Scot D. Morrison DPT, CSCS  
1392 NE Zelda terrace  
Jensen Beach, FL 34957  
772-713-6754  
[scotmorrnsn@gmail.com](mailto:scotmorrnsn@gmail.com)
2. Eric J. Chaconas, PT, DPT, CSCS  
1 University Blvd  
St. Augustine, FL 32086  
904-826-0084 ext 275  
[echaconas@usa.edu](mailto:echaconas@usa.edu)  
Fax: 904-827-0069

Scot Morrison is a Doctor of Physical Therapy candidate, strength and conditioning specialist, and certified golf fitness instructor through the Titlist Performance Institute.

Eric J. Chaconas is an Assistant Professor in the Department of Physical Therapy at the University of St. Augustine, St. Augustine, Florida.

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Supplemental Video File

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Supplemental Video File

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