

Physical Testing and Assessment

Strength and Conditioning Field Test Protocol

This package contains the tests that are performed by elite players as part of a well-designed player development program. These are field tests that are easy to implement, highly reproducible, and are reflective of the physical requirements of golf.

The physiological assessment consists of a number of tests designed to evaluate the players' individual general fitness levels in the following areas:

1. Descriptive characteristics
2. Balance
3. Flexibility
4. Core strength
5. Strength and power
6. Cardiovascular fitness

These tests can be used a) to determine the effectiveness of current physical training programs, b) to identify specific areas for improvement, c) to provide normative reference data for players and coaches, and d) to assess the players' general fitness.

This chapter outlines each of the exercises, and contains a form for recording test results.



DESCRIPTIVE CHARACTERISTICS

Height

Equipment: Measuring tape

Protocol: Have the athlete stand with their back to a wall, and ensure that the heels, gluteal muscles, shoulders, and head are touching the wall. Instruct the athlete to take a deep breath and then measure their athlete height while they are holding their breath. Ensure that the athletes are standing and extending themselves to their full height. Measure in centimeters.

Purpose: Changes in growth and development can affect an athlete's ability to perform complex movements such as the golf swing. Monitoring growth can help an athlete and coach interpret their performance. Changes in height may also necessitate adjustments in equipment. Measuring height can also help coaches to educate their athletes about the importance of holding proper posture.

Golf correlations: Driver & iron ball speed and distance, score, putting.

Sitting Height

Equipment: Measuring tape

Protocol: Have the athlete sit with their back to a wall and ensure that the hips, shoulders, and head are touching the wall. Instruct the athlete to take a deep breath and then measure their height while they are holding their breath. Ensure that the athletes are sitting with legs straight and extending themselves to their full height. Measure in centimeters.

Purpose: Same as standing height, but helps coaches detect changes in length of the upper body and lower body which is of great importance during growth periods and for golf club fitting.

Golf correlations: Driver & iron ball speed and distance, score, sand shots, putting.

Arm Length

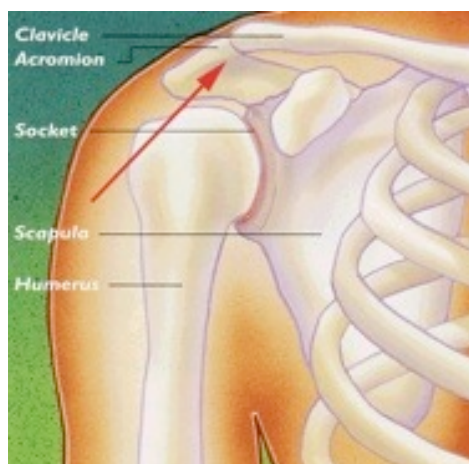
Equipment: Measuring tape

Protocol: Have the athlete stand in good posture. Instruct the athlete to look forward and then measure the athlete's arm length from the acromio-clavicular joint (see figure - use your fingers to feel the bump on the top of the shoulder) to the tip of the index finger. Measure both arms. Measure in centimeters.

Purpose: Changes in growth and limb length can affect an athlete's ability to perform complex movements such as the golf swing. Monitoring growth and changes in body segments can help an athlete and coach interpret their performance. Changes in arm length may also necessitate adjustments in equipment.

Golf correlations: Driver & iron ball speed and distance, score, sand shots, putting.

Physical Training for Golf Performance Manual



BALANCE

Static Balance Test

(see Chapter 4 for balance training information)

Equipment: Stopwatch.

Protocol: Stand on one foot (first the backswing leg and then the follow-through leg). Place the foot of the untested leg against the lower part of the support leg. Next, place the hands on the hips. Slide the foot up the lower leg so that it sits just below the knee. Raise the heel of the support foot from the floor to start the test and attempt to maintain balance for as long as possible. Do not remove the hands from the hips or allow the heel to touch the floor. Record the best time (in seconds) out of three attempts. *Note that this test can be repeated with the heel on the floor and eyes closed to provide information on balance control of the eyes vs proprioception in the lower legs.*

Purpose: This test assesses a golfer’s balance. Balance is a critical component of a properly executed golf swing, especially while hitting the ball from unfavorable lies, sand traps, and soft playing surfaces.

End points: The test ends when the player a) returns their heel to the ground (balance leg), b) removes their hands from their hips, or c) removes the non-balance leg from the balance leg.

Golf correlations: Greens in regulation, chip shots

Heel Up Balance Strength Test



Eyes Closed Proprioception Test



SINGLE LEG BALANCE TEST STANDARDS

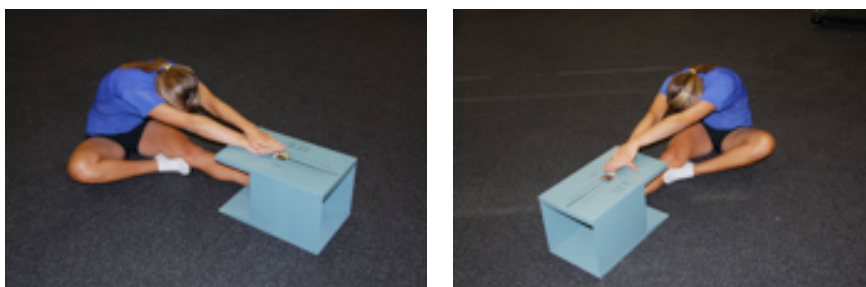
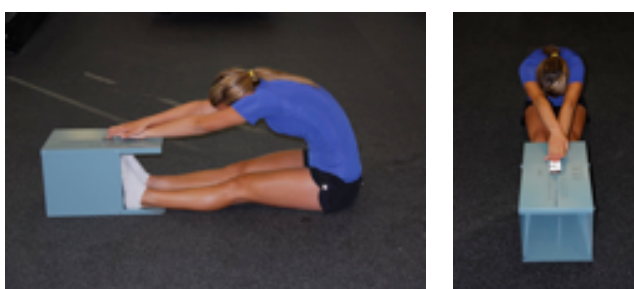
GENDER	EAGLE	BIRDIE	PAR	BOGEY	DOUBLE
MEN	60 seconds	45 seconds	30 seconds	20 seconds	10 seconds
WOMEN	60 seconds	45 seconds	30 seconds	20 seconds	10 seconds

FLEXIBILITY

Sit and Reach (refer to Chapter 5 for flexibility and stretching training information)

Equipment: Sit and reach box or measuring tape

Protocol: Have the athlete sit with both legs extended and together, knees locked, and toes pointed upward. Shoes are off for this test. The athlete should then reach forward with both hands together while exhaling and stretch out as far as possible along the box. The reach must be held for at least 2 seconds. The measurement is taken as the distance reached beyond the box in cm (or a negative value in cm if they can't reach their toes). The test should be repeated twice for each of the right, left and both legs, with the highest value for each taken as the score. Record the scores to the nearest 0.5 cm.



Purpose: This is a measure of the flexibility of the hamstrings, shoulders, calves, and back. Flexibility is important for the execution of proper swing mechanics, and for prevention of injury and lower back pain. Flexibility is also important to allow for proper set up at address and to have no physical limits during the swing. Also free spinal rotation can help a golfer develop maximal power during the swing. This also helps identify imbalances in flexibility between sides of the body.

End points: The test ends when the player a) bends their test leg knee, or b) is unable to hold the stretched position for the required two seconds.

Golf correlations: Driver & iron ball speed & distance, score.

SIT AND REACH FLEXIBILITY TEST STANDARDS

GENDER	EAGLE	BIRDIE	PAR	BOGEY	DOUBLE
MEN	20 cm	15 cm	10 cm	5 cm	can't touch toes
WOMEN	22.5 cm	17.5 cm	12.5 cm	7.5 cm	can't touch toes

POSTURE

Postural Assessment (refer to Chapter 6 for posture training information)

Equipment: No equipment needed.

Tests for proper posture are conducted with the athlete in a standing position. Typical problems that are observed in golfers are easily observed in this position.

Sagittal (side view) posture test

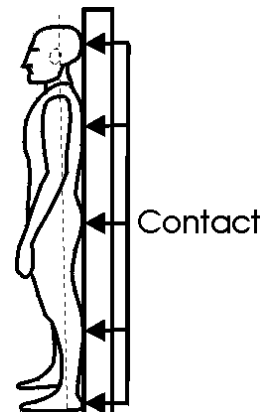
Protocol: The golfer stands against a wall with heels, buttocks, shoulders, and back of the head in contact with the wall. The dotted line in the diagram represents the ideal postural position with the ears over the shoulders, shoulders over the hips, arms hanging loosely at the sides, hips over knees and knees over ankles.

Typical problems can be identified using this test:

Forward head posture – in this case the head and chin protrude forward. This can lead to poor head position at address and an inability to maintain proper eye contact with the ball.

Rounded shoulders – golfers are usually stronger through the chest than in the back, and this leads to the shoulders being pulled forward. The arms will hang in front of the hips and the shoulders will be visibly rounded forward.

Thoracic Kyphosis, or Lumbar Lordosis – the natural curves of the lower back can easily be assessed. Other problems encountered by golfers include thoracic kyphosis which is an exaggerated curve in the upper back, or lumbar lordosis which is an exaggerated curve in the lower back. Any deviation from the natural curves in the spine can result in improper swing mechanics and will predispose an athlete to injury.



Frontal (front view) posture test

Protocol: The golfer stands normally and the assessor observes the athlete from either the front or the back. Evenness and balance of the shoulders, hips and knees are noted. As the golf swing is performed in one direction only, golfers are highly likely to exhibit imbalances that are observed with this test. The specific observations that are made with this test are:

Is the head straight?

Are the shoulders level?

Do the arms hang to the same level?

Are the hips level?

Are the knees level and do both kneecaps face forward?

CORE STRENGTH AND ENDURANCE

Front Stabilizer (see Chapter 6 for core strengthening exercises)

Equipment: Mat, stop watch

Protocol: The athlete lies on their stomach, and places the hands and elbows on the ground in “prayer” position. They then raise their body off the ground using their arms and toes as pivot points. The body must stay in a straight line and in a neutral position. Remind the athletes to breathe during this test. The result is the maximum amount of time that the position can be held without movement (i.e. the hips are raised, lowered). The test can be stopped if the athlete reaches five minutes.



Purpose: To assess core strength and stability in a position where many joints and muscles are activated.

End points: The test ends when the player a) returns their body to the ground, b) moves their core body in any way (no re-shifting or repositioning), c) allows their hips or head to “sag” towards the ground (2 warnings are allowed for “sagging”).

Golf correlations: Driver & iron distance, chip shots, sand shots.

FRONT STABILIZER TEST STANDARDS

GENDER	EAGLE	BIRDIE	PAR	BOGEY	DOUBLE
MEN	270 seconds	240 seconds	200 seconds	160 seconds	120 seconds
WOMEN	240 seconds	180 seconds	120 seconds	90 seconds	60 seconds

Side Stabilizer

Equipment: Mat, stop watch

Protocol: Have the athlete place themselves on their side, with their elbow on the ground directly below the shoulder. They then raise their hips and hold their body in a straight line and in neutral position. Remind the athlete to breathe during this test. The result is the maximum amount of time that the position can be held without movement (i.e. the hips are raised or lowered, or if a bend occurs at the waist). The test can be stopped if the athlete reaches five minutes. The test should be repeated on both sides of the body with a rest interval of at least three minutes between tests.



Purpose: To assess core strength and stability in a position where many joints and muscles are activated.

End points: The test ends when the player a) returns their body to the ground, b) moves their core body in any way (no re-shifting or repositioning), c) allows their hips or head to “sag” towards the ground (two warnings are allowed for “sagging”). Note any twisting in the body.

Golf correlations: Driver & iron distance, chip shots, sand shots.

SIDE STABILIZER TEST STANDARDS

GENDER	EAGLE	BIRDIE	PAR	BOGEY	DOUBLE
MEN	100 seconds	90 seconds	80 seconds	70 seconds	60 seconds
WOMEN	90 seconds	80 seconds	70 seconds	60 seconds	50 seconds

POWER (MUSCLE SPEED)

Vertical Jump (refer to Chapter 8 for strength and power training information)

Equipment: Measuring tape, wall

Protocol: The athlete may wear shoes for this test. The athlete starts facing sideways to a wall. Standing erect with feet flat on floor, have the athlete reach as high as possible up the wall in line with the body and inhale. This provides a baseline from which the vertical jump heights will be measured. The athlete then performs a jump by sinking down to 90-degree knee angle and then jumping and touching the wall as high as possible. Ensure that the athletes pause after lowering themselves to a 90-degree knee angle before they initiate their jump. The distance between the standing height and jump height is recorded as the height of the jump. This test is done first using both legs to jump and then using the right leg only, and then the left leg only. The higher of three attempts is recorded (in centimeters) on each of both, right and left legs. Allow the athletes at least 30 seconds recovery time between jumps. Note squat jump (no arms) and countermovement jump (arms) technique below.



Success factors: Ensure that the athlete’s arms remain crossed over their chest and are not used to generate momentum or jump height, and that the arm that will be used to reach up only does so at the last possible moment.

Purpose: To measure power in the lower limb. This is the amount of force an athlete can generate from neuromuscular pathways and muscle strength in a short amount of time (similar to generating force in a golf swing). Muscular strength and power are important determinants of performance in many sports, especially golf. The test can also identify differences in strength between the right and left legs.

End points: The jump is acceptable when the player a) does not use their arms for the jump, b) begins from a 90-degree knee bend, and c) holds the bend for two seconds before jumping.

Golf correlations: Driver and iron distance, score, greens in regulation, sand shots (sand shots men only)

VERTICAL JUMP TEST STANDARDS (BOTH LEGS)

GENDER	EAGLE	BIRDIE	PAR	BOGEY	DOUBLE
MEN	50 cm	45 cm	40 cm	35 cm	30 cm
WOMEN	40 cm	35 cm	30 cm	25 cm	20 cm

VERTICAL JUMP TEST STANDARDS (SINGLE LEG)

GENDER	EAGLE	BIRDIE	PAR	BOGEY	DOUBLE
MEN	30 cm	26 cm	22 cm	18 cm	14 cm
WOMEN	26 cm	22 cm	18 cm	14 cm	10 cm

Seated Medicine Ball Throw

(refer to Chapter 8 for strength and power training information)

Equipment: Measuring tape, medicine ball (4 kg for men, 2 kg for women, 2 kg for < 14 yrs.)

Protocol: The athlete may wear shoes for this test. Have the athlete sit with their back to a wall, legs together and straight out in front of them. The medicine ball should be held at chest level with the elbows held out to the sides of the body at 90-degrees. Have the athlete throw the medicine ball as far as possible in a forward direction. The distance between the wall and the point where the medicine ball lands is recorded as the length of the throw. The longest of three attempts is recorded (in meters) as the result. Allow the athletes at least 30 seconds recovery time between throws.



Success factors: Have the athlete throw the ball from chest height while keeping the abdominal muscles contracted during the throw. Ensure that the body remains facing forward and square to the target line during the throw.

Purpose: To measure power in the upper body and overall co-ordination. This is the amount of force an athlete can generate from neuromuscular pathways and muscle strength in a short amount of time (similar to generating force in a golf swing). Muscular strength and power are important determinants of performance in many sports, especially golf.

Golf correlations: Driver and iron distance, score, greens in regulation.

MEDICINE BALL THROW TEST STANDARDS (4KG MEN, 2 KG WOMEN)

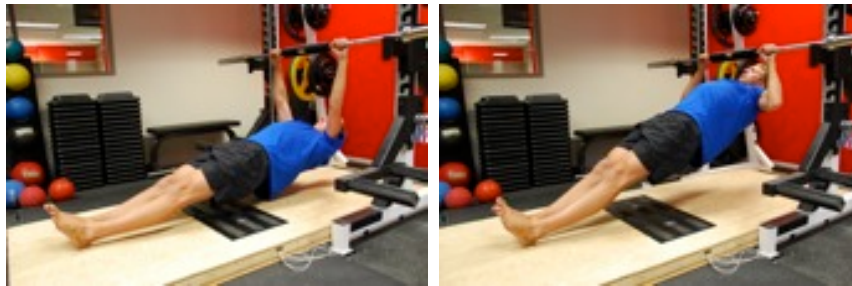
GENDER	EAGLE	BIRDIE	PAR	BOGEY	DOUBLE
MEN	6 meters	5.5 meters	5 meters	4.5 meters	4 meters
WOMEN	6 meters	5.5 meters	5 meters	4.5 meters	4 meters

STRENGTH (MUSCLE FORCE & ENDURANCE)

Pull-Ups

Equipment: Squat rack & bar, dynaband, stop watch.

Protocol: The athlete starts by lying on their back with the shoulders directly below a bar that is set at a height 1 - 2" beyond their reach. An elastic band is suspended across the uprights parallel to and about 7 - 8" below the bar so that they will make a 90-degree angle at their elbows when they pull themselves up. In the start position (down) the golfer's buttocks are off the floor, the arms and legs are straight, and only the heels are in contact with the floor. An underhand grip (palms towards the body) is used and thumbs are placed around the bar. A pull up is completed when the chin is over the elastic band. The movement should be accompanied using only the arms, and the body must be kept straight. The result is the maximum number of repetitions in 60 seconds, keeping the hips and knees extended through each attempt. The athlete may rest between pull-ups but may not touch the ground.



Success factors: Ensure that the hips and / or legs do not touch the ground at any time during the test, even while the athlete is resting between pull ups.

Purpose: This test measures relative muscular strength and endurance of the back and arm muscles. It is importance for athletes to have excellent strength and stability in their upper body for posture and good execution of sport movements, and also for developing maximal power during the golf swing.

End points: The test ends when the player a) returns their body or hips to the ground, b) cannot maintain their core body in flat "plank" position, c) does not reach 90-degrees at their elbows on each pull-up.

Golf correlations: Driver & iron distance, score, chip shots, putting.

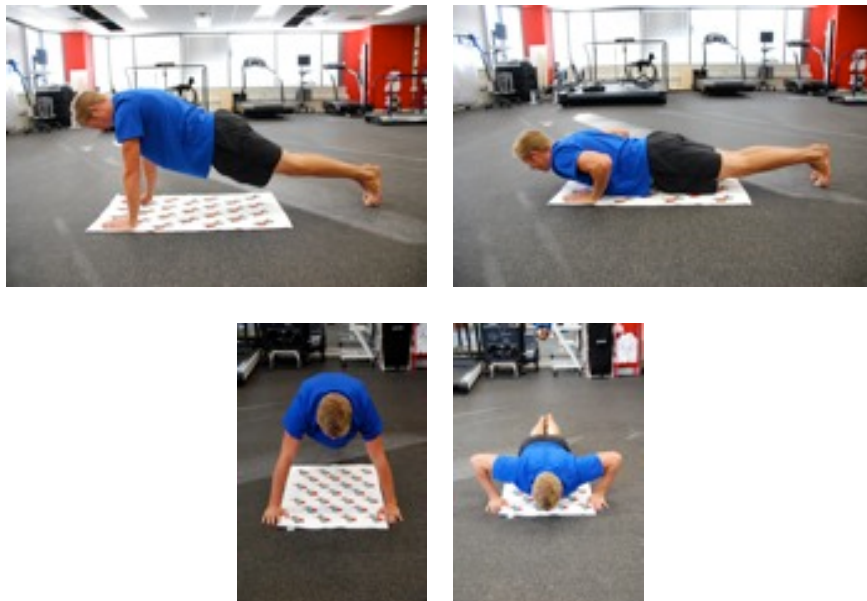
PULL UP TEST STANDARDS

GENDER	EAGLE	BIRDIE	PAR	BOGEY	DOUBLE
MEN	40 / 60 sec	35 / 60 sec	30 / 60 sec	25 / 60 sec	20 / 60 sec
WOMEN	26 / 60 sec	22 / 60 sec	18 / 60 sec	14 / 60 sec	10 / 60 sec

Push-Ups

Equipment: Mat, yoga block or small dumbbell, stop watch

Protocol: The starting position is to have the athlete lie on their stomach with the arms positioned at 90-degrees elbow flexion and hands facing forward. The athlete then pushes up by straightening the elbows and using the toes as a pivot point. The body must be kept in a straight line. The athletes then lower themselves until their elbows form a 90-degree angle, while making sure that the hips do not touch the yoga block or dumbbell (see figure). The result is the maximum number of repetitions the athlete can perform in 60 seconds.



Success factors: Ensure that the athlete maintains a straight body position (not lifting or lowering the hips) during the test, and that they lower themselves until their elbows form at least a 90-degree angle).

Purpose: This test measures relative strength and endurance of the chest and arm muscles. Arm strength is important for maintaining the proper angles between the body and arm during the swing.

End points: The test ends when the player a) returns their body or knees to the ground, b) cannot maintain their core body in flat “plank” position, c) does not reach 90-degrees at their elbows on each pushup.

Golf correlations: Driver & iron distance, score, putting

PUSH UP TEST STANDARDS

GENDER	EAGLE	BIRDIE	PAR	BOGEY	DOUBLE
MEN	55 / 60 sec	50 / 60 sec	45 / 60 sec	40 / 60 sec	35 / 60 sec
WOMEN	32 / 60 sec	27 / 60 sec	22 / 60 sec	17 / 60 sec	12 / 60 sec

Grip Strength Test

Equipment: Hand grip dynamometer (order from www.pro1ultimatefitness.com)

Protocol: The starting position is to have the athlete standing tall and holding the hand grip dynamometer in their hand. The arm should be hanging straight at the side of the body and should be kept straight at all times during the test. The grip strength test is simply a single maximal contraction of the hand against the dynamometer. The result is the best of three attempts. Allow at least 30 seconds rest between tests. Repeat the test for both arms.

Success factors: Ensure that the athlete maintains a straight arm position during the test, and that the dynamometer is adjusted to fit each individual's hand size.

Purpose: This test measures relative strength of the forearm muscles. Forearm strength is important for sand shots and for hitting from unfavorable conditions such as long rough.

End points: The test ends when the player releases the pressure on the dynamometer.

Golf correlations: Driver & iron distance, score, putting



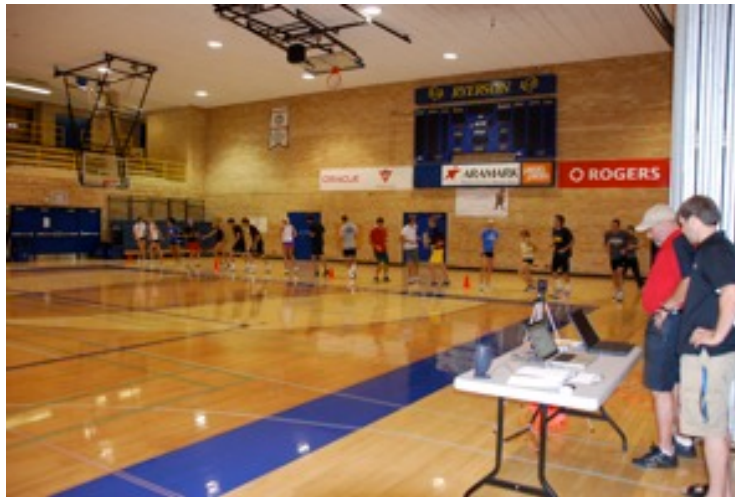
HAND GRIP TEST STANDARDS

GENDER	EAGLE	BIRDIE	PAR	BOGEY	DOUBLE
MEN	60 Newtons (Kg)	55 Newtons (Kg)	50 Newtons (Kg)	45 Newtons (Kg)	40 Newtons (Kg)
WOMEN	45 Newtons (Kg)	40 Newtons (Kg)	35 Newtons (Kg)	30 Newtons (Kg)	25 Newtons (Kg)

CARDIOVASCULAR FITNESS

20 Meter Shuttle Run Test (see Chapter 9 for cardio fitness training information)

- Equipment:** Method of playing the 20 Meter Shuttle Run test protocol mp3. Download software from <http://www.rugbycoach.com/fitness/test/20msrt.htm>.
- Protocol:** The athletes should perform a five-minute easy jog / run before performing this test. Mark two lines exactly 20 meters apart. The athletes should line up behind the first line. The audio instructions then guide the athletes through an exercise test of gradually increasing intensity, where the athletes must run from line to line at a faster and faster pace. The athletes may not begin the next stage until the audio beep is heard. Further, the athlete must cross the line before the next beep. The test ends when the athlete fails to cross the line before the beep in two consecutive stages. The result is the highest level where the athlete successfully crosses the line before the next beep.
- Purpose:** The 20 Meter Shuttle Run test is a measure of cardiovascular fitness. The benefits of improved cardiovascular fitness include a) improved resistance to fatigue, b) faster recovery after training and practice, within a round, and between rounds, c) improved tolerance for exercise in the heat and cold and across time zones, and d) improved general health, sleep, and immunity to illness.
- End points:** The test ends when the player a) does not cross the 20 meter line prior to the “beep” for more than two consecutive stages, b) does not completely cross the line each time.
- Golf correlations:** Driver & iron ball speed and distance, score, chip shots, putting.



20 M SHUTTLE RUN TEST STANDARDS

GENDER	EAGLE	BIRDIE	PAR	BOGEY	DOUBLE
MEN	Level 11	Level 10	Level 9	Level 8	Level 7
WOMEN	Level 9	Level 8	Level 7	Level 6	Level 5

STRENGTH AND CONDITIONING FIELD TEST RECORDING FORM

Name of Athlete: _____ Date: _____

Birth date: _____ Player Level: _____

Mass (kg): _____ Height (cm): _____

Sit height (cm): _____ Arm Length (cm): _____

Age: _____

Balance test (heel up): _____ (# sec R side) _____ (# sec L side)

Balance test (eyes closed): _____ (# sec R side) _____ (# sec L side)

Sit and reach: _____ (cm using both legs)

_____ (cm R leg) _____ (cm L leg)

Front stabilizer: _____ (seconds)

Side stabilizer: _____ (# sec R side) _____ (# sec L side)

Squat jump: _____ (cm 2 legs) _____ (cm R leg) _____ (cm L leg)

Countermovement jump: _____ (cm 2 legs) _____ (cm R leg) _____ (cm L leg)

*Squat jump = no arms, countermovement jump = jump using arms

Seated med ball throw: _____ (m)

Pull up: _____ (# reps in 60 seconds)

Push up: _____ (# reps in 60 seconds)

Grip strength: _____ (maximum force achieved)

Shuttle run test: _____ (highest level completed)

For analysis spreadsheets and group recording forms please contact Dr. Wells (greg.wells@utoronto.ca).

PHYSIOLOGICAL CORRELATES OF GOLF PERFORMANCE

Dr. Greg Wells has published a research study on the correlations between these physiological measures and golf performance. If you would like a copy of the research article please go to www.pubmed.com and search "Wells Golf". The results of the research are summarized here:

Golf is a very demanding physical game, not only in terms of precision and complexity of the golf swing movement, but also in terms of creating explosive power through a wide range of motion. Recently, the sport of golf has been revolutionized by players who have committed to optimal physical preparation including balance, flexibility, posture, core stability, strength, power, and cardiovascular training. Relationships between elements of conditioning (balance, flexibility, core strength, upper and lower body strength and power, and cardiovascular conditioning) and golf performance have not been reported. Therefore, the objective of the current research was to identify statistically significant physiological correlates of golf performance in elite amateur golfers.

A correlation study design was used to answer the primary research question to determine the correlation between physiological characteristics of elite golfers (balance, flexibility, core strength, peripheral strength and power, and cardiovascular function) and golf performance under laboratory conditions (ball speed (velocity), and ball distance (displacement) achieved using both a driver and a fairway iron) and under tournament conditions (average score, greens in regulation, short game measures, and putting accuracy).

The physiological tests were selected to provide a general assessment of fitness in broad categories including anthropometric characteristics, cardiovascular fitness, flexibility, balance, abdominal muscle performance, and upper and lower body peripheral muscle performance. Significant correlations between the measured physiological variables and golf performance were noted. Significant correlations between anthropometric measures such as height, sitting height, and arm length and driver and 5-iron performance as well as score were noted. This may be important for the development of talent identification programs, as height and limb length are largely determined by genetic factors. Interestingly, our results also suggested a relationship between aerobic capacity and total score short game (chip shot efficacy) and putting average, suggesting that over the course of a season, those golfers with the best aerobic conditioning are those that have better outcomes in these areas. There appeared to be correlations between putting distance after sand and chip shots for both males and females, suggesting that core strength and stability may be important for short game effectiveness, in addition to driver and 5-iron distance which was also significantly correlated to core strength. There was a positive association between sit and reach results and scoring average, suggesting that flexibility may be important for golfers. Balance appears to be related to the ability to execute shots from the fairway or rough as a golfer is approaching the green. The results of the peripheral muscle testing suggest that leg power (vertical jump), upper body strength (push and pull ups), and arm strength (grip strength), were all correlated with golf performance measures, although the strongest correlations were with measures of distance and total score.

This research presents a rationale for the inclusion of balance, flexibility, core strength, upper and lower body strength and power, and cardiovascular conditioning in golf training programs.