

A Three-Week Conditioning Program for Improved Golf Performance

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To be a successful golfer, one must perform hundreds to thousands of swings each week.¹ Due to the volume of repetitive training, golfers may be at risk for development of neck, shoulder, and torso injuries.² Consequences of neck injuries include pain, inflexibility,

and poor body alignment, which are factors that may influence golf swing mechanics and reduce club-head speed and ball-striking distance.³ A golfer with a neck injury may not be able to keep the head still during the backswing and downswing phases. Ballard et al.⁴ recommend that a golfer should maintain his or her head in a steady position from

the ball address, throughout the back swing and downswing, until the ball is hit. This “head still” technique is essential to keep the eyes on the ball until club-head impact,⁵ which enhances swing control.^{6,7} It is also essential to minimize lateral sway, which is influenced by the vestibular system.⁸ Visual focus and vestibular control may improve golf performance.

Several conditioning programs have been recommended to improve muscle flexibility and strength of shoulder and torso regions.³ There is a paucity of literature that is relevant to neck muscle inflexibility and the inability to maintain a “head still” position, however. The purpose of this report is to present a 3-week conditioning program for improvement of the ability to maintain a “head still” position; improvement of muscle flexibility of the shoulder, torso, and neck; and improvement of core muscle strength for enhancement of golf performance.

Case Report

A 19-year-old male amateur golfer (height, 5 ft. 10 inches; weight, 173 lbs; ranked #62 among NCAA golfers in 2007; handicap index, HCP, < 10), who started playing golf at 7 years of age, complained that left shoulder stiffness restricted the follow-through of his golf swing. He stated that problem was due to muscle tension and pain that had a gradual onset. He also complained of reduced torso rotation throughout the swing. His coach observed that he was failing to keep his head still during the backswing. His club-head speed (51 m/s; 113 mph) had decreased substantially in comparison to its value five years previously, when he was 14 years old (55 m/s; 122 mph).

KEY POINTS

- ▶ Muscular inflexibility may cause pain and affect a golfer's swing mechanics.
- ▶ Neck muscle inflexibility would hinder the “head still” ability.
- ▶ “Head still” position during swinging may enhance balance and eye-line of the golfer.
- ▶ Improving muscle flexibility may allow proper head position during the golf swing.

Range of motion (ROM), muscle tightness, and trigger point sensitivity were assessed by a physiotherapist. The examination revealed a significant decrease in the ROM for the following: (a) external rotation of the right shoulder (~ 60 degrees, measured with 90 degrees of shoulder abduction and 90 degrees of elbow flexion); (b) right lateral flexion of the torso in the low back region and left lateral flexion of the torso in the thoracic region; and (c) torso rotation (right side = 30 degrees and left side = 60 degrees, measured in a seated position). No deficiency in cervical motion was noted. The muscles of the shoulder, torso, and neck regions were manually assessed for tissue thickness, immobility, and pain (Table 1).⁹ Shoulder kyphosis and weak low back musculature were apparent.

Evaluation

Body alignment, muscle pain, flexibility, head position, and golf swing performance were evaluated before and after administration of a conditioning program. Muscle tension pain was reported by the golfer, and muscle flexibility was assessed by a clinician, both of which were rated on a 4-point scale (0 = none, 1 = mild pain /

inflexibility, 2 = moderate pain / inflexibility, 3 = severe pain / inflexibility).¹⁰ Golf swing performance indicators were drive distance and club-head speed, which were measured by a golf coach at a driving range. Club-head speed was measured with the portable speed radar device (Sports Sensors, Cincinnati, OH).

The golfer actively performed the following movements to end-range: forward torso bending, lateral torso bending, torso rotation, horizontal shoulder extension, and shoulder flexion. Forward and lateral side bending were quantified by measuring the vertical distance from finger tip to the ground; horizontal arm extension was measured as the distance between the tips of the middle fingers. While performing the overhead squat test, shoulder flexion (with minimal subscapular movement) was quantified as the horizontal distance between the finger tip and the frontal plane (Figure 1). A digital video camera (30Hz, positioned overhead to capture images perpendicular to the plane of motion) and software that permits measurement of angles on video images (Dartfish, Fribourg, Switzerland) were used to quantify torso rotational displacement while the golfer actively performed the movement (Figure 2 & Figure 3).¹¹

The golfer performed five swings while attempting to maintain a “head still” position. The same golf club was used for all of the analyzed swings (Wilson

TABLE 1. MUSCLE INFLEXIBILITY AND TENSION-PAIN BEFORE AND AFTER THE CONDITIONING PROGRAM

	Location	Before	After
Inflexibility	Levator Scapulae	1	1
	Scalenes	1	0
	Pectoralis major	3	0
	Pectoralis minor	1	0
	Upper Trapezius	1	0
Tension-Pain	Erector Spinae L2-L3	1	0
	Erector Spinae L4-L5	1	0
	Left Anterior Deltoid	2	0
	Right Anterior Deltoid	1	0

Note. 0 = none, 1 = mild pain / inflexibility, 2 = moderate pain / inflexibility, 3 = severe pain / inflexibility.

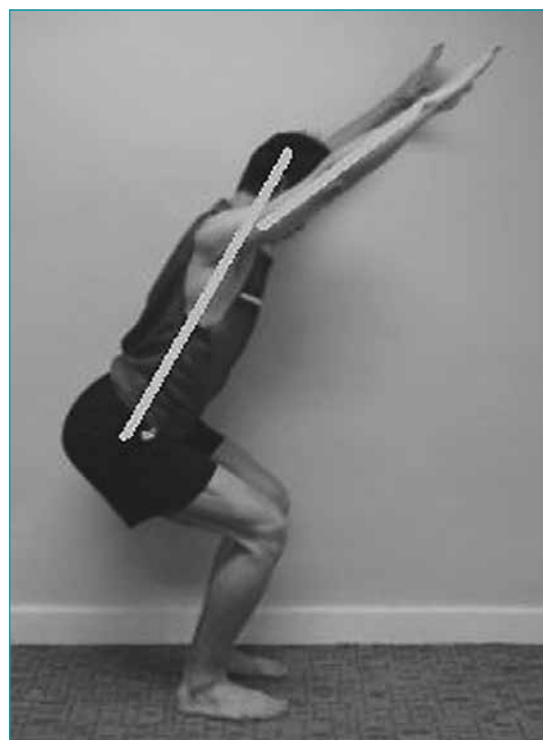


Figure 1 Shoulder flexion evaluation – overhead squat test.

Boron Graphite, Tour Grip P), both before and after administration of the conditioning program. The video analysis software was used to manually define the last frame of the backswing phase (i.e., club at the top position), a nose-to-chin line, and a line perpendicular to the ground. The angle between the lines was used to assess maintenance of the “head still” position during backswing (Figure 3).

Conditioning Program

The three-week conditioning program (15 sessions, three hours each) was tailored for the golfer was designed to enhance flexibility, strength, and the ability to keep the “head still” throughout performance of the swing. Equipment that was utilized included a

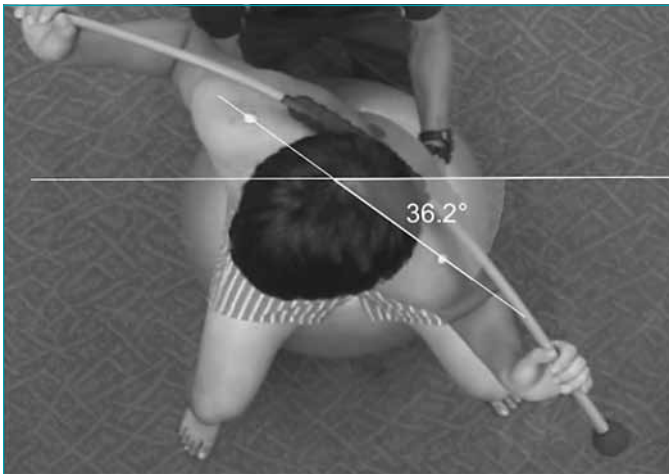


Figure 2 Right maximum torso rotation angle in relation to the pelvis.



Figure 3 The head rotation angle between the line of the nose-chin and perpendicular line at the end (top) of the backswing.

massage unit (Cellu M6; LPG Systems, Valence, France), a vibration training platform (Galileo 2000; Novotec Medical, Pforzheim, Germany), a balance training device (Balance Trainer; BOSU, Canton, OH), a resistive elastic band (Thera-Band [silver-heavy resistance; Hygenic Corporation, Akron, OH]), and a golf swing training device (SwingSetter Pro; David Leadbetter Golf Academy, ChampionsGate, FL). The conditioning program is outlined in Table 2.

During the first 10 sessions, mechanical massage was administered to flexibility in the neck (scalenes), shoulders (anterior deltoid, levator scapulae, pectoralis major), and thoracic and low back regions. The massage device components lift skinfolds between the motorized rollers, which is believed to improve the tissue flexibility and micro-circulation and to reduce the sensitivity of trigger points.¹² The massage was followed with manual stretching exercises.

Resistive exercises were used to improve strength in the shoulder and core muscles. Three sets of 20 repetitions of shoulder circumduction were performed against elastic band resistance. A vibration platform was used to enhance the activation of the core muscles. Three sets of 20 repetitions of torso rotation and flexion with a medicine ball were performed bilaterally.¹⁵ Seated torso rotation was performed, with the instruction to keep the head stationary during the exercise. A golf swing training device that provides feedback about grip, swing plane, and tempo without actual ball contact was utilized to facilitate improvement in swing mechanics.

Conditioning Program Outcome

The three-week conditioning program improved muscle flexibility and tension-pain ratings (Table 1). Measurements of flexibility also demonstrated improvements (Table 3). Before the conditioning program, the head rotation angle at the top of the backswing was 15 degrees. After completion of the program, the head rotation angle was 4 degrees.

After the conditioning program, the golfer's drive distance had increased 6.8%, from 265 m (290 yards) to 283 m (310 yards). His club-head speed increased 7.9%, from 51 m/s (113 mph) to 55 m/s (122 mph).

Discussion

Golf instructors advocate the maintenance of a stationary head position throughout performance of the golf

TABLE 2. CONDITIONING PROGRAM

	Description	Sessions
Tissue softening		
Neck and shoulder muscles	Supine mechanical massage, 5 min for each muscle	1 – 10
Back muscles	Prone mechanical massage, 5 min for each muscle	1 – 10
Manual stretching		
Seated neck rotation, lateral bending, extension	30s in each position (turn, tilt, extend head) x 2 sets	1 – 10
Seated torso rotation	Leg crossed with torso rotation in opposite , 30s on each side x 2 sets	1 – 10
Lateral torso bending	Standing, 30s on each side x 2 sets	1 – 10
Shoulder	Standing, across the chest, 30s x 2 sets	1 –10
Muscle strengthening exercises		
Core muscles	Standing on vibration platform, 30s (18 Hz), 60s (25 Hz), and 30s (18 Hz) in each position (slight knee bend, squat, lateral torso bending, and rotation)	6 – 15
Torso rotation	Lying on plate of balance device, 4.5 kg medicine ball moved side to side, 20 times as quickly as possible x 3 sets	6 – 15
Torso flexion	Lying on plate of balance device, 4.5 kg medicine ball moved from head to knee, 20 times as quickly as possible x 3 sets	6 – 15
Shoulder circumduction	Standing, resistive elastic band stretched by shoulder motion while secured at opposite end beneath foot, 20 times x 3 sets	6 – 15
Head alignment training		
Seated torso rotation	Seated on the balance ball, stabilize head movement during torso rotation with arms across chest, 20 times x 3 sets	8 – 15
Perform golf swing	Stabilize head movement while performing golf swing with feedback training device, 20 times x 3 sets	11 – 15

TABLE 3. FLEXIBILITY OF THE TORSO, SHOULDER, AND NECK BEFORE AND AFTER THE CONDITIONING PROGRAM

	Flexibility	Before	After	Improvement
Torso	1. Forward torso bending (cm)	3	0	3
	2. Right lateral bending (cm)	44	42	2
	3. Left lateral bending (cm)	48	46	2
	4. Left torso rotation (degree)	64	85	21
	5. Right torso rotation (degree)	36	68	32
Shoulder	1. Horizontal shoulder extension (cm)	177	181	4
	2. Shoulder flexion (cm)	14	9	5
	3. Shoulder flexion (cm)	16	11	5
Neck	1. Head-alignment at top of backswing (degrees)	15	4	11

swing.⁴ Inflexibility of the neck muscles may be a factor that interferes with maintenance of a stationary head position. Substantial improvements in drive distance and club-head speed were observed after completion of the conditioning program. Furthermore, the athlete did not engage in golf practice sessions during the conditioning period, which suggests that the improvements were directly related to the conditioning activities that were designed to improve flexibility, core strength, and maintenance of a “head-still” state during the swing.

During the backswing phase, the head tends to be passively rotated by tight neck musculature as the torso rotates. If the neck musculature is not sufficiently flexible, the passive displacement of the head’s orientation may affect vestibular control of body balance.⁸ Furthermore, poor visual fixation on the ball throughout the swing motion may adversely affect swing consistency.^{6,7} We suggest that improved range of motion at the neck and improved control of head position contributed to the improvement in drive distance and club-head speed.

Improvement of torso flexibility and strength may enhance postural balance and maximize rotational velocity, both of which may have contributed to improved swing performance.^{3,11,13} Prior to initiation of the conditioning program, the golfer reported shoulder pain that occurred at the end of the swing. This problem diminished after shoulder flexibility had improved. A future study might utilize a myometer, which quantifies muscle tone, elasticity, and flexibility.¹⁴

Conclusion

The results of this case study suggest that inflexibility of the neck muscles relates to the inability to maintain a “head-still” state during the backswing phase of the golf swing. Improvement of the flexibility of the neck musculature and increased core muscle strength are more likely to improve golf swing performance than simply instructing a golfer to make a conscious effort to keep the “head still” during the backswing. ■

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