

Why do we need the tail in golf swing? A survey of injury segment in coach class golfers

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Abstract

The purpose of this study was to find out coach class golfers injury segments relate to kinetic sequence and counter-movement. The kinetic sequence of the golf downswing start from segments of sole, ankle, knee, hip, lower back, upper back, (neck), scapular, shoulder, elbow, wrist, palm. Follow the counter-movement principle separate those connect to next segment to mobile or stable groups.

381 coach class golfers were collected in 6 years surveyed for injured segments. Total of 714 injured segments were reported. The percentage ranking order of the mobile segments group consists of upper back 14.7 %, wrist 13.6%, shoulder 10%, ankle 6%, and hip 3%. The stable segments group consists of lower back 17.4%, elbow 17.2%, scapula 7%, knee 6.7%, neck 2%, palm 1% injury rate. The trunk area consists of lower back 124 cases (17.4%) and upper back 105 cases (14.7%). The upper extremity consists of the elbow 123 cases (17.2%) and wrist 97cases (13.6%), lower extremity knee 48 cases (6.7%) and ankle 45 cases (6.3%) as the most two injured segments for each extremity division.

Base on the data, we suggest that the golf coach look into the body segments of physical limitation in mobility or stability groups, and understand each segment's potential of injury before training to minimize injury with better performance.

Introduction

The tail is part of the body that corresponds to the sacrum and coccyx in mammals.

Cats and kangaroos use tails for balance.

During golf swing human may need the extra vertebrates for balance and performance.

Most top golfers appreciate the basic fundamental golf swing. The importance of grip, athletic posture, set-up and balance may seem trivial but can not be exaggerated.

Good basics take a while to master, but the long-term benefits to golf performance are worth of golfer put more dedication.

Literature Review:

Cochran and Stobbs (1968) expounded a theory of golf swing as a double pendulum.

The self reported lifetime cumulative incidence of back pain was 63 % among 196 Dutch novice man golfer. (1994 G.A.Van Der Steenhoven)

The ultimate goal for a golfer is to achieve proper speed, accuracy and consistency by bringing a large number of segments into action in the correct sequence. (Milburn, P. D. Summation of segmental velocities in the golf swing. *Med Sci Sports Exerc.*,14: 60-64.1982).

How has biomechanics contributed to the understanding of the golf swing? (C.J. Dillman 1994).

There are multiple levels to conduct analysis for golf swing. The center of rotation of the swing study by Sounder & Owens demonstrated that novice players did not move backward or forward during the shot as elite players.(Sander, RH and PC Owens) Hub movement during the swing of elite and novice golfers.(*Int. J. Sport Biomech.* 8:320-330,1992).

Strength Training and Injury Prevention for Professional Golfers.(J.H. Hellström 2002).The most injury prone sites for elite golfers are the lower back, the hand/wrist, and the shoulder.

Golf Injuries in Scotland (M.J. McNicholas 2002). 18 sports medicine clinics across Scotland report golf-related injuries from 1990 to 1995. There were 286 injuries in 280 individuals. The anatomical areas most commonly affected were the upper limbs (45%) and torso (21%).

The epidemiology of golf injuries in Victoria , Australia : Evidence from Sports Medicine Clinics and Emergency Department Presentations (Carolin Finch 2002)

(N=34) lumbar spine/lower back 24%,elbow 18%,knee 18%, neck/cervical spine 15%, shoulder 6%, hand/finger 6%, other 13%.

Low Back Injury in elite and Professional Golfers: An Epidemiologic and Radiographic study (H. Sugaya 2002). In total 154(55%) professional golfers reported a history of low back pain of sufficient intensity to miss at least one tour event, or to play at an unsatisfactory level as a direct result.

Frequency of injuries to body part by number (N=281, cases=458)

Lower back 154(34%), neck/high back 93(20%), elbow 45(10%), shoulder 44(10%), wrist 42(9%), knee 26(6%), ankle 20(4%), fingers 7(2%), toes 7(2%), foot 6(1%), others 14(3%).

Many golfers reported right-side pain that was aggravated from impact through follow through.

Moreover, elite golfers with low back pain exhibited asymmetric degenerative changes on the lumbar spine in comparison to not golfing control group. The laterality of symptoms and

asymmetry of radiographic findings characterized low back injuries, suggesting related to the asymmetric motion of the golf swing.

How the body segment relates to the golf swing. Have a better understanding of human body as it relates to the game of golf. The golf swing is one of the most difficult movements to reproduce in an efficient and powerful manner. Regardless of whether you are young or old, female or male, beginner or professional golfer. Understand the golf swing mechanics is vital to progress into corrective way.

Golf injuries-common and potentially avoidable (AJ Fradkin J Sci Med Sport 2005;8:2:163-170). A total of 522 golfers participating in the Victorian Women's Pennant Competition in Victoria, Australia golf injury within the previous 12 months, low back 58(31%) out of 185 cases being the most commonly injured body region were studied. Lower back 58(31%), shoulder 31(17%), elbow 19(10%), knee 13(7%), foot 13(7%), forearm 11(6%), thorax 9(5%), wrist 8 (4%), pelvis 7(4%), hand/fingers 6(3%), ankle 6(3%), neck 2(1%), thigh 2(1%).

A survey of golf injuries in 193 amateur golfers of 61 cases (M.E. Batt Br J Sp Med 1992:26(1)) wrist 16(26%),back 13(21%), elbow 8(13%), muscular 7(11%), knee 4(7%), shoulder 4(7%), ankle 3(5%), hand 2(3%), neck 2(3%), foot 2(3%).

Low back pain in professional golfers. The role of associated hip and low back range-of-motion deficits (Vijay B. Vad 2004 The American Journal of Sports Medicine, Vol. 32, No.2) 42 professional male golfers had 33% previously experienced low back pain. Range-of -motion deficits in the lead hip rotation and lumbar spine extension correlated with a history of low back pain in golfers.

Golf and upper limb injuries: a summary and review of the literature (A.J. McHardy and H.P. Pollard Chiropractic & Osteopathy 2005, 13:7). At the top of the backswing, the wrists are in radial deviation, with the right wrist also displaying sub maximal extension. The wrist accounts for 13-20% of all injuries in amateurs and 20-27% of all injuries in professionals in golf injury epidemiology studies. Elbow 25-33% injuries in amateurs, 7-10% injuries in professional. Shoulder 8-18% injuries in both groups. An understanding of how the body moves and the muscle activity achieved during the golf swing helps us to understand why these injuries occur.

When golf hurts: musculoskeletal problems common to golfers (L.T. Wadsworth Current Sports Medicine Reports 2007, 6:362-365)

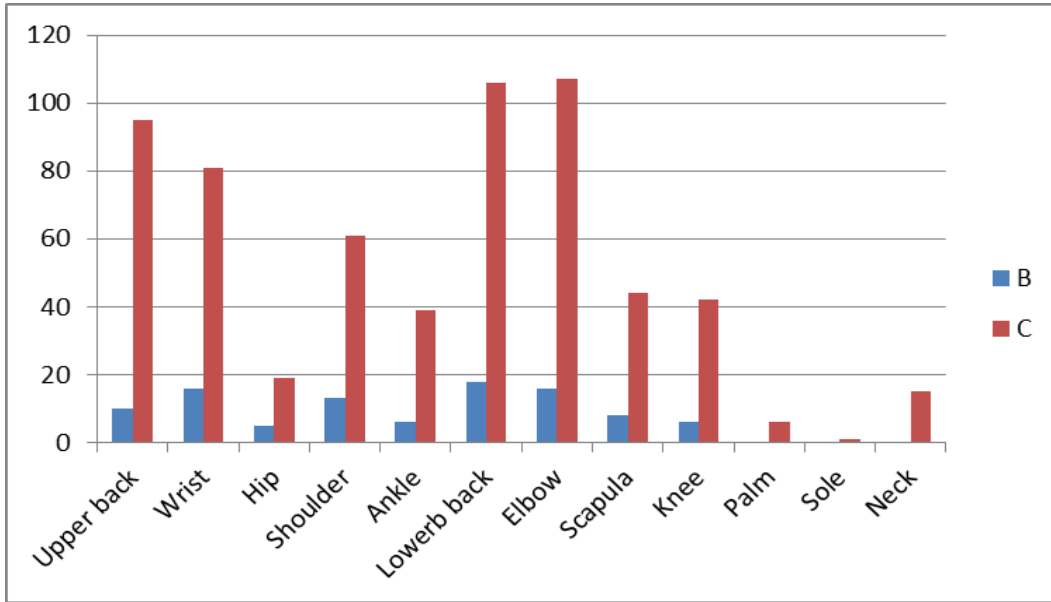
Data and Result

Years of Experience

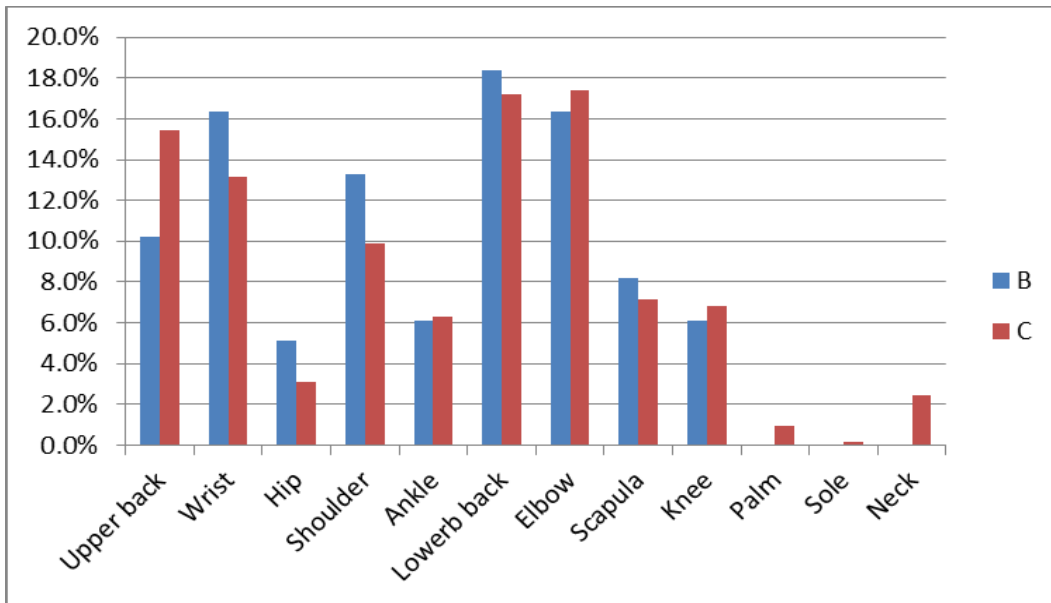
Coach Class	Male	Female	Golf Coach Class Years of Experience					
			5 or less	<10	<15	<20	<25	<30
JUL/2006	38	1	6	13	12	8	0	0
AUG/2006	28	3	0	8	8	10	0	5
SEP/2006	44	7	15	22	8	5	1	0
APR/2007	41	1	17	15	7	2	0	1
AUG/2007	40	4	10	19	12	3	0	0
OCT/2007	28	0	0	17	8	2	1	0
JUN/2008	29	3	13	13	5	1	0	0
SEP/2008	31	3	6	13	8	5	0	2
APR/2011	43	3	4	27	12	2	1	0
MAY/2012	29	5	6	15	10	3	0	0
Total surveyed	351	30	77	162	90	41	3	8
percentage	381		0.20	0.425	0.236	0.108	0.01	0.02

B
Class

B, C class coach original injury data



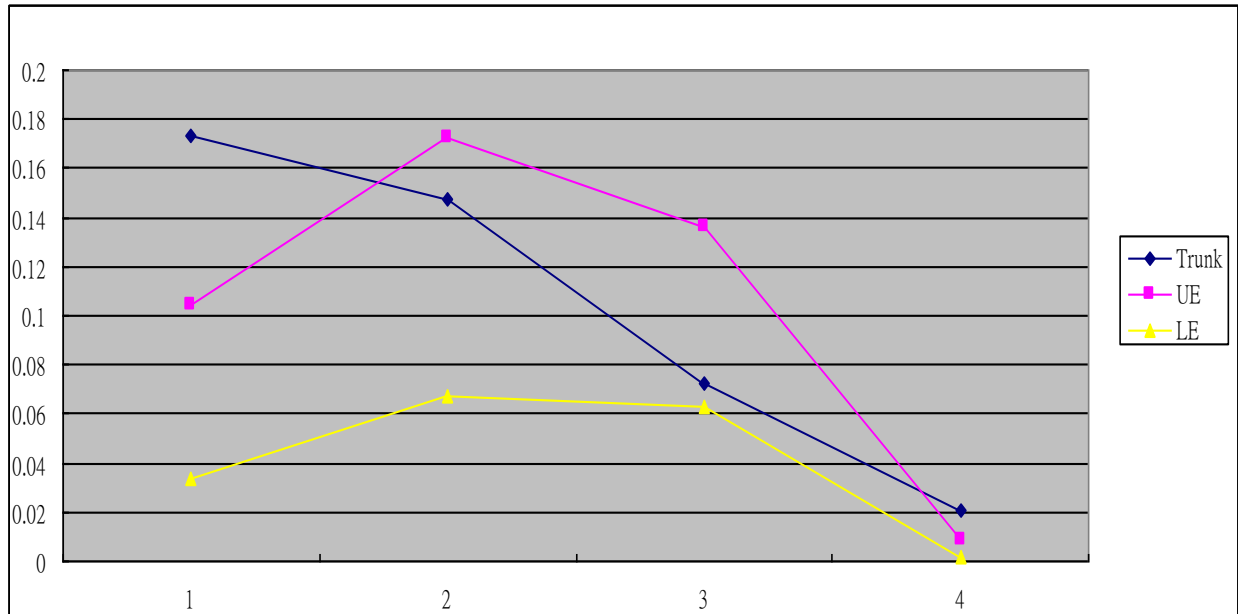
Percentage of B, C class injury rate



Mobile VS Stable

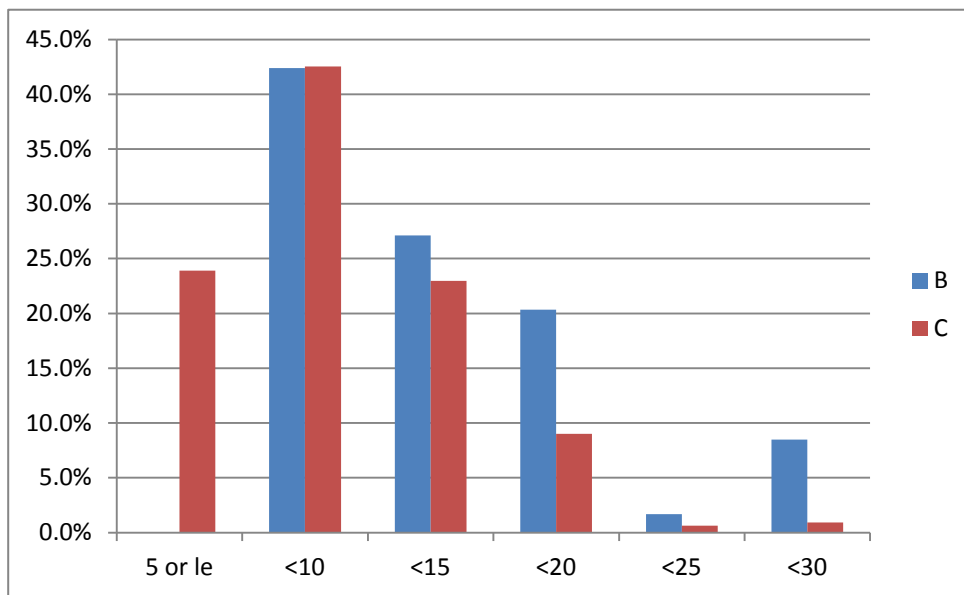
Upper back	Wrist	Hi	Shoulder	Ankle	Lower back	Elbow	Scapula	Knee	Pal	Sol	Nec	Tota
13	11	4	0	0	15	10	0	0	0	0	0	53
7	9	3	10	3	7	14	0	2	0	0	0	55
20	9	1	20	6	21	29	0	11	2	0	0	119
11	12	4	13	16	11	6	0	2	1	1	0	77
9	3	2	4	6	14	13	6	6	0	0	1	64
3	7	2	3	3	11	2	8	4	0	0	0	43
13	12	0	5	1	7	12	14	2	2	0	4	72
14	15	3	10	7	10	11	16	7	0	0	7	100
8	15	5	7	2	20	16	7	10	0	0	1	91
7	4	0	2	1	8	10	1	4	1	0	2	40
105	97	24	74	45	124	123	52	48	6	1	15	714

Injury rate on Trunk, Upper Extremity, and Lower Extremity



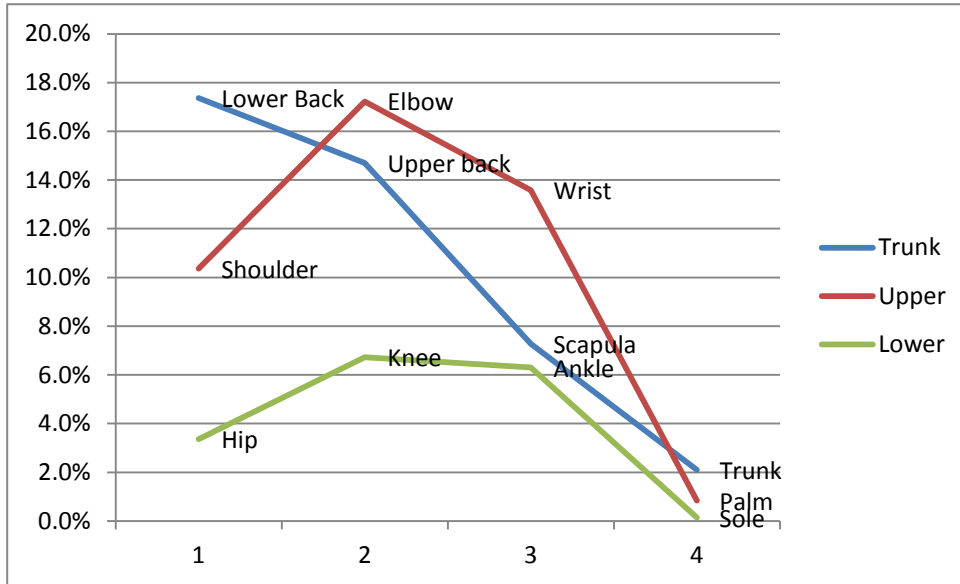
1. B, C 級教練經驗的差異

以百分比呈現



2. Trunk & 上肢 & 下肢的比較

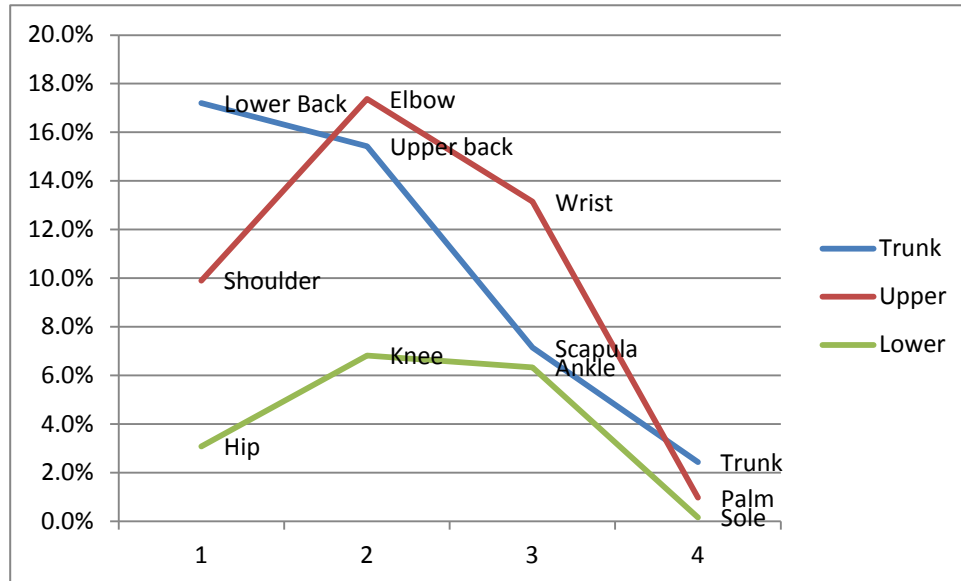
整體



B 級教練



C 級教練 C Class Coach



Golfers most frequently report injuries to the low back, non dominant shoulder, and elbow. Therapeutic interventions should include assessment and treatment of deficiencies in the kinetic chain and professional instruction to modify swing technique.

The kinematic sequence in the golf swing-what starts the downswing? We conclude and suggest that start from sole→ankle→knee→hip→low back→upper back→(neck)→scapular→shoulder→elbow→wrist→palm.

All great ball strikers begin by generating speed from their lower body and transferring this speed through their torso, into their arms, and then into the club. Each segment of the body builds on the previous segment, increasing speed up the chain. Each segment of the chain slow down once the next segment begins to accelerate. The stable segments of sole, knee, lower back, scapular, neck, elbow and palm need to maintain stability during sound golf swing. The mobile segments of ankle, hip, upper back, shoulder and wrist need to overcome their physical limitations.

Conclusion

- ❖ B class coach require at least 5 years of golf experience and the most injured segment is lower back
- ❖ C class coach the most injured segment is the elbow
- ❖ The kinematic sequence in the golf swing should begin from the downward swing.
- ❖ The research concludes and suggests that the sequence starts from sole→ ankle→ knee→ hip → lower back→ upper back→ (neck)→ scapular→ shoulder→ elbow→ wrist→ palm.
 - ∞ The emphases of golf swing sequence will benefit the coaching skills
- ❖ All great ball strikers begin by generating speed from their lower body and transferring this speed through their torso, into their arms, and then into the club.
- ❖ Each segment of the body builds on the previous segment, increasing speed up the chain. Each segment of the chain slow down once the next segment begins to accelerate.
- ❖ The sum of injury rate of the stable vs. mobile segments show no difference in our study.
- ❖ The stable segments of sole, knee, lower back, scapular, neck, elbow, and palm need to maintain their proper angle of stability during a consistent golf swing.
- ❖ The mobile segments of ankle, hip, upper back, shoulder and wrist need to overcome the range of motion and improve physical limitations.
- ❖ A closer study of the scapular as a stable segment is required and look into the scapular relationship with the upper back and shoulder in the future.

Final note: Different levels of golfers and golf injury rate on three divisions of body-trunk, upper extremity, lower extremity needs more study to understand it's mechanism.

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