Professionalism, Golf Coaching and a Master of Science Degree:

A Commentary

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INTRODUCTION

I would like to comment on an interesting quote from Sean Foley, which was noted by Simon Jenkins.

> [What would you say is at the heart of your coaching beliefs?] I would say that it is recognising that impact is a true science. The rest of the golf swing is opinion. [1, p. 34]. (p. 700)

While it is probably true that it is easier to comprehend the cause-and-effect dynamics of impact, I would argue that the dynamics of the rest of the golf swing (e.g., the downswing) should not be regarded as a matter of opinion. The same set of dynamical laws that allow the prediction of ball flight following the ~0.00045 s of impact time with the club head, can be used to explain how the club head is able to arrive at impact with a specific set of kinematics based on the forces the golfer applies to the club over the ~0.25 s of downswing time. Perhaps Foley was simply trying to highlight the challenges with developing a deterministic-like model for the downswing. However, if one of the most renowned golf instructors in the world believes that our scientific understanding of impact is far beyond that of the downswing, then a Master of Science degree in golf teaching/coaching has an important role to play in the development of professionalism in the discipline.

ABILITY TO DEVELOP AND COMMUNICATE A MECHANICAL UNDERSTANDING OF THE DOWNSWING

Presumably, every golf instructor that has communicated an idea to a student, in an attempt to improve ball flight, has developed a concept of how the downswing 'works'. Arguably, every golfer instructor, to a certain degree, believes they understand the cause-and-effect nature of the swing. They want the student to change the cause to get the desired effect. The classic advice, "keep your head down", following a topped ball, is one example. All golf instructors have some mental representation of the performance parameters (e.g., the kinematic sequence), and the relationships between those parameters, which they feel are important to produce a desirable ball flight. Essentially, every instructor has the rough beginnings of a deterministic-like model of the downswing floating around in his or her head.

I communicate with golf instructors on the biomechanics of the swing on a regular basis, and based on these interactions, I believe that the profession would benefit greatly if golf instructors possessed the skill set necessary to develop their own deterministic models of the golf swing. Briefly, a deterministic model is a vertical flow diagram with a performance outcome measure at the top (e.g., golf ball carry distance) followed by levels of other connected variables. The diagram is constructed such that higher factors are determined by lower factors. Figure 1 displays a deterministic model for the distance of golf ball carry, with an emphasis on highlighting the role of shaft flexibility [2]. The diagram in Figure 1 is a traditional deterministic model [3], in that it stops short of explaining specifically what the athlete should do in order to improve performance. This is a relevant criticism of previous deterministic models discussed by Glazier and Robins [4]. Considering the model in Figure 1,

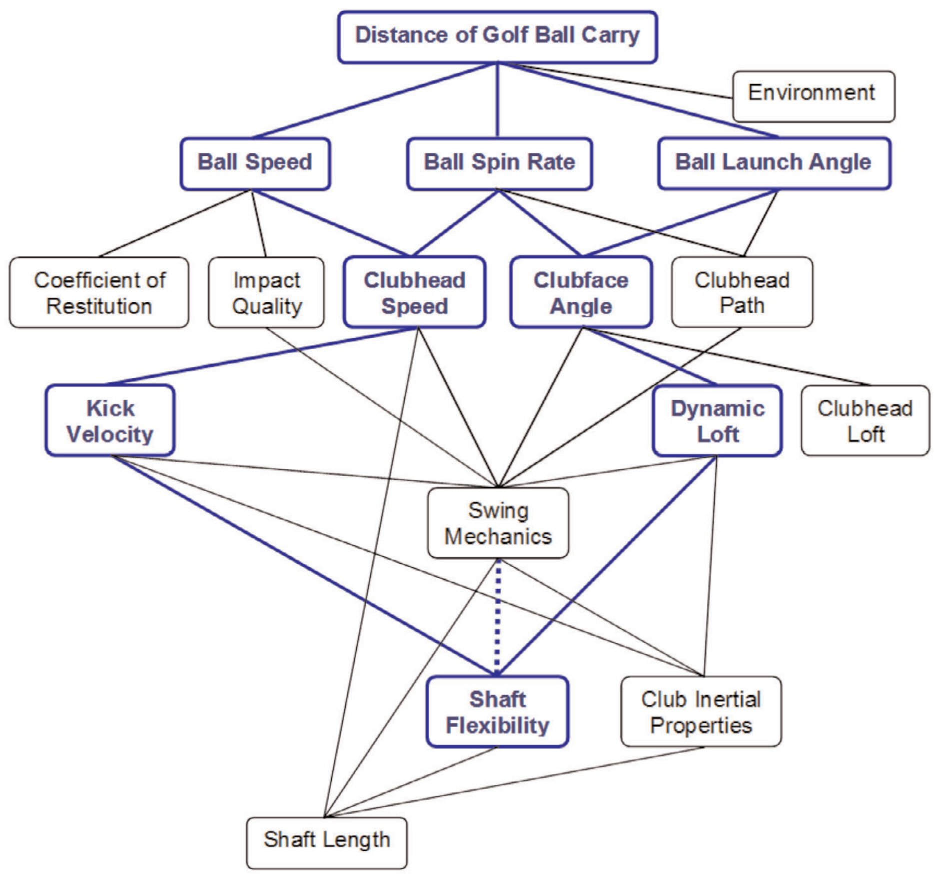

Figure 1. Flow Diagram Illustrating How Shaft Flexibility Influences the Distance a Golf Ball will Travel in the Air Following Impact with a Driver
Lower factors affect the higher factors of which they are connected. Environment refers to factors such as air temperature and wind. Impact quality refers to the location of impact on the clubface. Shaft flexibility may affect the feel of the club during the swing which could alter the golfer's swing mechanics.

Glazier and Robins would contend that it does not specify how golfers should move their body segments in order to maximize clubhead speed, and that researchers should look towards other methods to understand technique. However, I would argue that the limitations of deterministic models, in general, should not be defined by previous examples of their application. While it may be true that deterministic models have historically left out technical descriptions, there is no reason why future deterministic models cannot include performance parameters such as the kinematic sequence. The relationship that any performance parameter (e.g., weight shift, delayed release, or swing plane) has on the outcome of a swing (e.g., clubhead speed, path, or face angle) can be understood by determining how that variable affected the force being applied to the club by the golfer. I believe that golf instructors should develop their own model, which works down from the 'Swing Mechanics' block in Figure 1. Lower blocks would detail how the golfer's movements and efforts influence the forces on the club and hence the motion and orientation of the club head at impact.

Perhaps to Foley's point, it could be argued that universally agreed upon biomechanical principles have not been established to explain the downswing. At present, some biomechanical principles are more universally agreed upon than others. For example, I think the majority of golf biomechanics researchers would agree that the club and lead arm should *not* be co-planer throughout the downswing [5-9]. Conversely, there would likely be less agreement on the optimal club head attack angle for maximizing overall driving performance (distance + accuracy).

CONCLUSION

A Master of Science degree in Golf Teaching/Coaching would provide a golf teaching professional with the ability to present their swing ideas in a logical way based on more fundamental physical concepts and demonstrate how their hypotheses and assumptions fit into a deterministic-like model. Collectively, over time, golf instruction will evolve as certain concepts move from the hypothesis end of the spectrum to the fact end of the spectrum.

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EDITOR'S NOTE

Dr. Sasho MacKenzie attended Dalhousie University where he earned a B.Sc. in Kinesiology. He then completed a Ph.D. in Biomechanics at the University of Saskatchewan which focused on 3D forward dynamics simulation of the golf swing. He is currently an associate professor in the Department of Human Kinetics at St. Francis Xavier University and his research interests lie in the optimization of human movement with a strong emphasis on sport performance. His research encompasses both optimal sport movement patterns as well as the most advantageous training techniques.