

Comment on “Influence of shaft length on golf driving performance”

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Introduction

In a recent study published in *Sports Biomechanics* (Volume 7, pages 322–332), Kenny et al. (2008) reported increases in carry distances with no concomitant decrease in accuracy as shaft length of golf drivers increased between 1.156 m (45.5 inches) and 1.270 m (50 inches). Although these findings are of interest to golfers, club fitters, and the custodians of the game, there are several issues that need to be verified before the results of this study can be fully accepted and their universality established.

Individual differences and the pitfalls of group-based research designs

Kenny et al. (2008) referred to several participants who made substantial increases in average carry distance (21.8 m and 9 m) compared with the relatively modest increase in average carry distance for the group (4.3 m) when using the extra long driver rather than their own driver. Given the magnitude of these gains, it is likely that the remaining participants would have made much smaller increases, possibly even decreases, in carry distances of strokes hit with longer drivers. This finding would certainly support suggestions from theoretical and anecdotal reports that the performance benefits of longer shafted drivers are largely individual-specific and related to golfing ability, physical characteristics, and personal preferences (e.g. Wishon, 2006). Clearly, additional descriptive statistics, including statistical power analyses, are required to give a more complete picture and enable the reader to draw their own conclusions.

Club characteristics and artefacts of increasing shaft lengths

Although Kenny et al. (2008) made a concerted effort to match the physical properties and playing characteristics of each of the experimental drivers, it is still possible that variations among the drivers could, at least in part, account for some of the reported performance gains. For example, although the coefficient of restitution for driver heads is limited to 0.83, not all drivers are manufactured to this maximum limit. Some driver heads are “hotter” than

others and it is quite possible to see increases in ball speed of 1–2 mph for a given clubhead speed. Likewise, shafts installed with correct spine alignment can purportedly produce similar increases in ball speed and also improve accuracy through more consistent ball striking. According to the method described in the paper, these factors do not appear to have been considered during driver assembly, but could have easily contributed to the performance increments seen when using the long and extra long drivers.

Another factor that could have influenced the results of Kenny et al. (2008) is swingweight. The work of Harper et al. (2005) was cited as rationale for allowing swingweight to increase incrementally with increases in shaft length, as they apparently concluded that swingweight had little effect on player performance. On the contrary, Harper et al. (2005) reported statistically significant *decreases* in clubhead speed when swingweight increased by five points or more – the minimum difference in swingweight of the experimental drivers used by Kenny et al. (2008). Furthermore, Harper et al. (2005) only examined swingweight changes in the C7–E0 range, whereas the experimental drivers used by Kenny et al. (2008) were in the much heavier swingweight range of D9–F4. Admittedly, Harper et al. (2005) did not report any significant changes in ball speed with increasing swingweight but this finding is not entirely applicable to the study of Kenny et al. (2008) as the swingweight of their experimental drivers increased as a function of shaft length increases, not mass added to the driver head. Considering that “stock” OEM drivers are typically built to a D4 swingweight and the markedly greater perceived and physical effort it takes to wield drivers with swingweights on the E and F scales, the performance increases observed by Kenny et al. (2008) are both surprising and remarkable.

Regarding the physical properties and the playing characteristics of the drivers that were measured and attempted to be matched, there does not appear to be constant flex among the experimental drivers, with the “long” driver being a whole flex rating more than the “regular” and “extra long” drivers. A constant flex line-up, according to the original work of Dr. Joe Braly in the 1970s, would be 300 cycles per minute (CPM), 316 CPM, and 332 CPM for the “regular”, “long”, and “extra long” experimental drivers, respectively. However, despite this discrepancy, it is unlikely that this difference in flex would make a major difference to the results.

As an adjunct, shaft frequencies are typically measured in cycles per minute not cycle per second (Hz) as stated in Kenny et al. (2008). Furthermore, shaft frequencies of 300+ CPM are incredibly, almost unmanageably, stiff even for the highest clubhead speed players. To illustrate this point, three times world long drive champion, Sean Fister, used 251-CPM shafts to win the 2001 and 2005 RE/MAX World Long Drive Championships (Fister & Rudy, 2008). Extrapolating from “standardized” shaft frequency tables (e.g. Summitt, 2000), the shafts used in the experimental drivers would be in the region of 4X or 5X assuming, of course, that Kenny et al. (2008) used conventional frequency testing and analysis methods.

Role of constraints on driving technique and performance

Kenny et al. (2008) attempted to use the theory of task constraints to explain why there might be decreased accuracy when using longer drivers. However, changes in task constraints do not necessarily mean greater variability in outcome data. Rather, task constraints, together with organismic and environmental constraints, coalesce to shape movement patterns and can, therefore, better account for variability in the underlying processes, rather than the product, of a motor skill (Newell, 1986). Indeed, according to dynamical systems theory and the well-known principle of sensorimotor equivalence, the

same outcome can be generated by an infinite number of different movement patterns. A potentially more profitable research strategy in the future, therefore, might be to manipulate different physical characteristics (e.g. swingweight, moment of inertia, etc.) of golf clubs and examine the corresponding changes in patterns of coordination and control in the golf swing. This is largely uncharted territory for golf biomechanists, as most research in this area has adopted a reductionist product-oriented approach (e.g. Stanbridge et al., 2004; Wallace et al., 2004; Harper et al., 2005). However, a more idiographic process-oriented constraints-led approach, emphasizing changes in movement patterns of specific golfers with systematic manipulation of key constraints, could potentially provide more insightful information about the interaction of golfer and golf club, which could be useful, for example, in custom-fitting.

Summary

Kenny et al. (2008) reported that low-handicap golfers were able to produce longer carry distances with longer drivers with no concomitant decrease in accuracy. However, it was not clear whether these increments in performance were an artefact of shaft length or some other unaccounted for characteristic of the experimental drivers used. Furthermore, it was difficult to determine whether these performance gains were experienced by all or only a few of the golfers studied. Additional research is required to substantiate these findings and also to establish how shaft length is related to performance and technique in less accomplished golfers. Regardless of skill level, the realization of the potential performance benefits associated with longer drivers is, to some degree, likely to be individual-specific. Accordingly, suitable research designs emphasizing the individual – with appropriate sample and trial sizes to achieve the requisite level of statistical significance, effect size, and power – are required.

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