

Evaluation of the Plumb-Bob Method for Reading Greens in Putting

Dr. Sasho MacKenzie

20080678

Department of Human Kinetics

St. Francis Xavier University

August 29, 2019

Literature Review

According to PGA Tour statistics listed on the PGA web site, the putting stroke accounted for approximately 41% of all strokes made during the average tournament round of golf in 2002 (“PGA Putts Per Round”, 2002; “PGA Scoring Average”, 2002). Hence, a golfer’s putting performance plays a large role in the overall score. Putting performance is linked to handicap, but the exact form of the relationship is unclear. Carnahan (2002) demonstrated that handicap was a statistically significant explanatory variable of putting performance. However, handicap only accounted for approximately one quarter of the variation in putting performance.

A golfer’s putting performance is dependent upon three skills. First, the golfer must determine the club head speed required to displace the ball from its resting position to the hole. To determine this speed, the golfer needs to consider the rolling friction between the ball and grass, the vertical displacement of the hole relative to the ball, and the distance the ball must travel to reach the hole. Second, the golfer should execute a putting stroke where, at impact, the putter-head has only horizontal velocity in the direction of the target line, and the plane of the putter-face is perpendicular to that line. Brooks (2002) describes three types of putting strokes commonly recommended by golf instructors, which could produce the desired impact conditions. These strokes are in reference to the target line and are: the straight back to straight through; inside to inside; and inside to straight through. Brooks (2002) examined these strokes using mathematical models, but did not arrive at a conclusion regarding which stroke would be best. Finally, the golfer must predict the direction and magnitude of break in the putt to determine a

target line (Pelz, 1994). Assuming ideal club head speed, the predicted break depends on the magnitude of slope the golfer reads on the green between the ball and hole.

There is no accepted method for determining the slope of a green. Golfers often make assumptions based on visual cues from the surrounding landscape or use their kinaesthetic sense of balance to arrive at a conclusion. A popular system that has been used for decades is the plumb-bob method. According to Pelz (2000), one out of every seven golfers uses the plumb-bob method for reading the slope. This includes many professional golfers, such as Ben Crenshaw who had the least putts per round on the PGA Tour in 1982 and 1994, and the best putting average in 1987. Some of the literature endorses the method (Stockton and Barkow, 1996; Foston, 1992), suggesting that if used correctly, it can be a valid method of determining the slope of the green. Yet others (Farnsworth, 1997; Pelz, 2000; Werner and Greig, 2000) reject the procedure, citing inherent inconsistencies that lead to large possibilities for error.

Foston (1992) described the plumb-bob method as follows. The golfer stands behind the ball straddling an imaginary line that bisects the hole, golf ball and stance of the golfer. The golfer then suspends the putter at arm's length in front of the face allowing gravity to pull the shaft into a true vertical alignment. The golfer should be positioned far enough behind the ball so that both the ball and hole can be sighted within the length of the putter shaft. While sighting only out of the dominant eye, the golfer aligns the bottom of the shaft with the centre of the golf ball. Although not stated by Foston (1992), an implicit assumption in the plumb-bob method is that the golfer stands perpendicular to the slope of the green beneath the feet (Pelz, 2000). According to the theory, if there is any slope in the green, then the top of the shaft will be observed to be

on the high side of the hole. For easier reference in this paper, the distance between the hole and the upper shaft will be referred to as plumb-bob separation (Fig. 1).

A scientific evaluation of the plumb-bob method has not been documented in the peer-reviewed literature. The technique is often used without a sound understanding of how it works, or how certain variables affect its performance. Pelz (2000) has stated that a necessary condition for the plumb-bob method to correctly indicate slope was a consistently graded green from where the golfer was standing behind the ball, through to the hole. However, this condition of a constant grade between the golfer and the hole is certainly not met for most putts on real greens. The objectives of this study were twofold. The first objective was to evaluate the validity of the plumb-bob method under conditions of changing slope using plumb-bob separation as the dependent measure. Also, the plumb-bob method is susceptible to human error. The golfer must stand perpendicular to the slope while executing the technique. Therefore, a second objective was to measure the deviation from perpendicular of an individual while attempting to plumb-bob on a sloped surface. It is hypothesized that the plumb-bob method will not be a valid method for determining the slope of a green under conditions of changing slope and that golfers will be able to stand perpendicular to a slope with a standard error of $\pm 2^\circ$.

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