# A COMPARISON OF ACCURACY AND STROKE CHARACTERISTICS BETWEEN TWO PUTTING GRIP TECHNIQUES

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Nowadays PGA golfers are experimenting with various golf putting grips. The purpose of this study was to investigate the traits of using two putting grips; reverse overlapping grip and finger bone grip at three different putting distances. 20 subjects with no previous golf experience participated in this study. The kinematic data of the subject and the putter's shaft and head was recorded by 8 Qualisys cameras at 100Hz. There was no significant difference between the success rate of getting the ball in the hole at all distances. The finger bone grip produced statistically smaller radial error values than the reverse overlapping grip at the distances for 7 and 11 metres. The finger bone grip provided straighter putter head trajectories and less change in the movement of the COG, which implies more stability of the player and that the ball will travel in the desired path. In conclusion, the finger bone putting technique gave radial errors less than the reverse overlapping grip technique which seems to be due to the added stability and straighter putter head trajectories.

**KEY WORDS:** golf putting, grip types, finger bone putting grip, reverse overlap grip.

**INTRODUCTION:** It is well known that putting plays a large role in the game of golf. According to American PGA statistics from 197 players with an average round of 70.92±0.70 strokes, each player averages 29.3±0.53 putting strokes, which is 41.8% of all strokes in one round (PGA tour homepage). According to Cochran and Stobbs (1968) stated that the most important factors to affect the direction and magnitude of putting is the putter head movement. In previous research, many researchers have focused on the putter's head movement rather than motion or skill of the person controlling the putter. Various studies have demonstrated and discussed the importance of the grip during golf driving and especially putting (Pelz, D. & Frank, J. A., 2000, Paradisis, G. & Rees, J. 2000). With the importance of grip during putting many PGA golfers are continuously researching, developing and testing various golf putting grip techniques, i.e. cross handed, claw, long shaft putter, and crocket grip. The most common of all these techniques is the reverse overlapping grip (Pelz, 1994).

**Figure 1: Finger Bone Grip**

Lately in Korea a new grip technique has been developed by Il-Ju Na, who called it as 'the finger bone putting grip' shown in Fig. 1. This grip is similar to claw grip but it uses right hand fingers to connect with putter. For right hander players the right hand is to be place at the lower part and likewise for left hander players the opposite.

The artificial lawn made by 100% poly propylene with densely packed 9mm pile length was installed in gymnasium. The lawn's length was 15mX2.8m and by the Stipmeter the rolling

length was 19.42. The putter is 33.86 inches in length and weights 500 grams. 20 male university students without any golf experience were recruited for this study. After the explanation of the experimental procedure and signature of the consent form the experiment began. Any left handed subjects were excluded from this study. The experiment started with 5 minutes dedicated to the teaching of putting grip methods, reverse overlapping grip(ROG) and finger bone grip(FBG). Then the subject practiced 15 times for each grip at each distance. The subjects were then partnered up and the putting at 3 different lengths 3m, 7m and 11m for a total time of 60 strokes was randomly assigned. 30 strokes were to be performed with the reverse overlapping grip and the other 30 with the finger bone grip. 10 strokes were performed at each distance with both grips. The full body and the kinematic motion of the putter head and shaft was recorded at 100Hz by 8 Qualisys© OQUS 500 cameras (Sweden). Data was recorded with Qualisys Track Manager (QTM) and then the data was exported as a c3d file and analyzed by Visual 3D (version 4). The events were defined as follows; set up(SU) event was the position at the address, beginning of back swing (BB) was the point at the start of the back swing, transition(TR) was the point at the end of the back swing and the beginning of the forward swing, impact(IM) with the ball and finish(FN) at the end of the front swing.

Radial error is defined a distance between the hole and the ball which putted without regard for direction. The change of centre of gravity shown in Figure 3 was calculated in the axis in the direction of the putting. After averaging the coordinates of the 3 points, 15 cm before the IM, at IM and 15 cm after IM, the radius of curvature was calculated and shown below in Table 3. The angle between the right shoulder, left shoulder and left wrist is used as an index of how independent the movement of the arms from the trunk.

## RESULTS:

### 1. Putting success rate

**Table 1 Frequency success according to distance**

| | 3m | 7m | 11m |
|---|---|---|---|
| **Reverse Overlapping Grip(ROG)** | 29.50% | 8.50% | 1% |
| **Finger Bone Grip(FBG)** | 29.50% | 12.50% | 2.50% |

### 2. Radial Error

**Table 2 Radial Error according to distance**

| | | 3m | 7m | 11m |
|---|---|---|---|---|
| **ROG** | Mean | 72.12 | 105.07 | 138.3 |
| | St. deviation | 42.09 | 47.24 | 31.84 |
| **FBG** | Mean | 74.54 | 83.03** | 118.64** |
| | St. deviation | 30.75 | 28.74 | 20.31 |
| p-value | | 0.390 | 0.019* | 0.009** |

(all values are in cm, *p<0.05, **<0.01)

### 3. Putter Head Trajectory

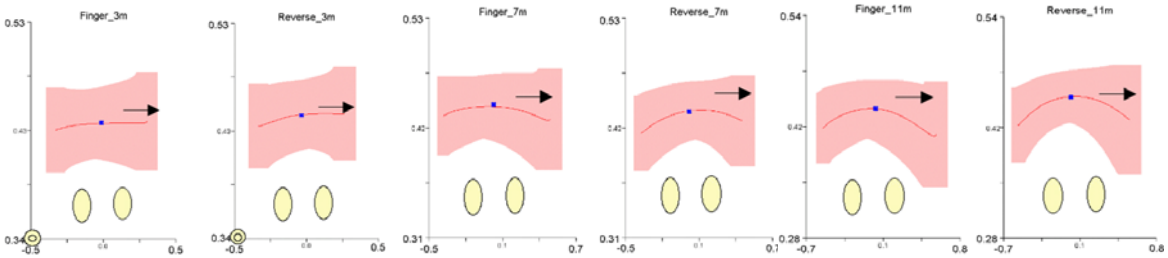



Figure 2: Putter Heads Trajectory for the distance of 3, 7 and 11 m. Finger bone technique on the left side of each(TR-FN, horizontal plane)

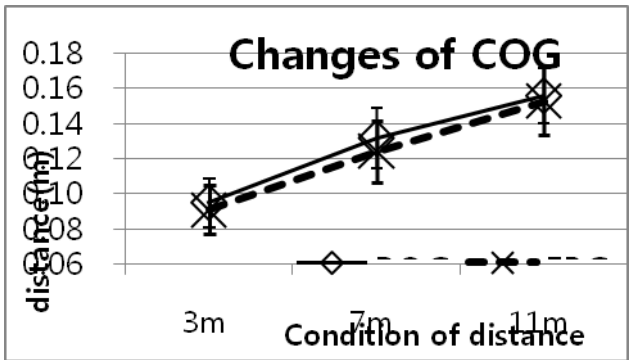
**Table 3 Radius of curvature (horizontal plane)**

| | 3m | 7m | 11m |
|---|---|---|---|
| **ROG** | 369.76cm | 94.55cm | 54.21cm |
| **FBG** | 1434.27cm | 97.60cm | 61.00cm |

※ Radius of curvature was calculated with 3 points. These 3points which are averaged by all trials are collected at IM-15(cm), IM, IM+15(cm).(Y-axis)

### 4. Motion Data Analysis

Changes of COG are measured for stability while subjects are putting.



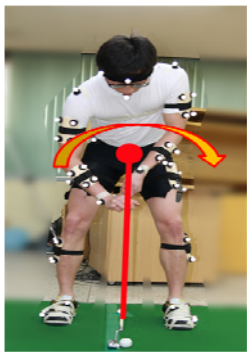



**Figure 3 Changes of COG in putting direction**

**Table 5 Change in angle between the Right Shoulder, left shoulder and left wrist(TR-IM)**

| | | 3m | 7m | 11m |
|---|---|---|---|---|
| **ROG** | Mean | 1.69 | 2.17 | 2.63 |
| | St. deviation | 2.11 | 2.77 | 3.15 |
| **FBG** | Mean | 4.10 | 5.05 | 4.10 |
| | St, deviation | 4.43 | 3.60 | 2.43 |
| p-value | | <0.00** | <0.00** | <0.00** |

(All values are in degrees, *p<0.05, **<0.01)

**DISCUSSION:** There is a not a significant in between the success rate between the distances for the two grip types. As for the radial error there was no difference between the two grip types for the 3 metre putting. However there was a statistical difference between the radial error between the finger bone putting technique and the reverse overlapping technique for both longer distances of 7 m and 11 m. The bone finger putting radial error was smaller for both of these distances. The mean radial error at the 7 m distance was 83.03

cm which was approximately 22.04 cm closer for the finger bone grip. Likewise at the distance of 11m the mean radial error was 118.64 for the finger bone putting as opposed to 138.30 cm for the reverse overlapping grip. At the 11 m distance, the subject using the finger bone grip technique putted the ball 19.66 cm closer to the hole.

It is assumed that the reason that the finger bone grip produces putting closer to the hole is that because the putter head trajectory is straighter and there is less COG movement, the player is more in control of the putter.
By observation of the putter's head trajectory it can clearly be seen that the finger bone grip technique displays a straighter trajectory(shown in table 3). For the change of COG in putting direction, finger bone putting grip is more stable on all condition than reverse overlapping grip but there is no significant difference.(shown by fig. 3) and For the change in angle between the right shoulder, left shoulder and left wrist there was a significant difference for between the two grip techniques. The finger bone technique had a statistically larger change in angle (shown by table 5). The change in angle can be used as a index of how independent the movement of the arms from the trunk.

**CONCLUSION:** This study identified the different biomechanical characteristics of using the two grip methods finger bone grip and the reverse overlapping grip for putting at different distances. The main advantage of using the finger bone grip technique is that for the further distances it tends to get the ball closer to the hole.

This difference of accuracy is assumed to be caused by the finger bone putting grip to be more stable than overlapping grip, as the change of COG on finger bone grip is smaller than reverse overlapping grip's (shown in Fig.3). This suggests that the finger bone grip has more unlocking feature between trunk and upper arms than reverse overlap grip i.e. the trunk and the arms can move more independently.
In future studies, the evaluation of the effect that the small COG movement has on the performance of putting must be investigated, as it is stated by instructors that the locking of the trunk and arms is supposed to be ideal for putting. However in this research, the Finger Bone grip produced less locking with more accurate putting. It is also recommended that for future research, the balls trajectory path and rotation should be examined to explain what happens the ball after impact and to explain why the Finger Bone grip method putts the ball closer to the hole.

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