CLUB HEAD VARIABILITY IN CHIPPING GOLF SKILLS: THE EFFECTIVENESS OF RESULTS TO THE HOLE

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Abstract

This study is aimed at revealing the effectiveness of club head variability as a result of strengthening the competence of chipping skills in golf. A total of six professional golfers, 13 amateurs golfers handicaps 3-7, and six golfers handicaps 12-16 made a try in this study. Everyone tries chipping test into holes for three categories of distance from the green golf outer circle, which is 1-1.5 meters; 2-2.5 meters; and 3-3.5 meters by using three club head types, namely: club heads commonly done by everyone trying for the case of distance, situation, and green contours flat, irons-9, and irons-8. Everyone tries to do a chipping test in golf that is constructed, namely: Five times three club head types three times the distance. The results of this test are processed and analyzed further by using independent t-test. The results show that the variability of the results suggests that golfers need the mastery of various club head (sand wedge and / or the like, irons-9, and irons-8) usage that require adjustment to the field contours and grass conditions, where sand wedge for all levels of golfing according to their respective handicaps, where for the case in this study is the type of club head that is not appropriate to use.

Keywords: Chipping skills, Club head, Golf technique.

1. Introduction

Sport performance is full of skills; ones with the best skill mastery are those who have the most probability to be the best players. There is a variability in performing skills in golf; either in the first swing (from tee box to pair way; from pair way to green, from around green to the hole; from bunker to green), or in the green itself. There are five categories of the most important component in golf namely putting, chipping, pitching, using middle-distance irons, and driving [1]. Meanwhile, skills in golf are divided into four comprising (i) driving (hitting from the tee), (ii) iron play, (iii) short iron play (chipping, wedge and bunker shots), and (iv) putting [2].

All those different skills in golf actually need different club heads in accordance with their purposes. For instance, the first swing from the tee box to the pair way needs a certain type of club head with a certain type of technology featured in it, whereas for chipping, the club heads used are various based on the position of the balls and the contour of the course so that the balls can be as close as possible to the hole. Chipping has the same purpose as pitching since both skills aim to bring out the ball to the air and land in the green as close as possible to the hole. Both skills are done by hitting the ball using the middle face of the clubs and both are considered difficult yet possible skills to master through intensive and appropriate training [3]. Many golfers performing chipping with a variety of club heads do not have their balls bouncing in the air. Some of the balls are rolling on the course, depending on the contour of the course itself. Thus, the movement of the ball in chipping is sometimes rolling, a little rolling, and even not rolling at all. The movement of the ball in chipping is influenced by the heads used. Meanwhile, decision making in the use of club heads is affected by the position of the ball, contour of the course, and the golfers' habit.

Chipping is performed when the ball is around green and not on the green yet. As mentioned before, the use of different club heads depends on the ball position and the course condition since they really affect the way golfers play and choose their club heads. When the course is relatively flat and with few obstacles in the grass, a putter is usually selected. However, when the grass is thick, the course is not relatively flat, sand wedge, and the like is commonly used. If the contour of the course is flat yet the grass is thick, golfers usually prefer pitch and sand wedge, iron-7, iron-8, or even iron-9. The use of different club heads as different situations show is closely related to the golfers' skills in reaching their goals. In the meantime, reaching goals is often associated with the law of exercise, even if golfers with high handicaps usually swing with one way; using the club heads from around the green to the hole in the green such as pitch or sand wedge.

A study researching the variability of club head usage towards the position of the ball and the location of the ball as the results of the clubs chosen by golfers with different skills was carried out. A total number of 285 male and female golfers are respondents of the study, as they have to swing several times using one of the four driver proprietaries. The results of the study show that golfers with lower handicaps have a lot lower variability from swing to swing in terms of speed, efficiency, location, angle, club lane, and view point in comparison with golfers with higher handicaps [4].

In the meantime, instruments measuring a variety of different skills in golf including chipping have been developed widely. Involving both elite and amateur golfers performing 27 swings in nine aims and two rounds, a study develops a test-iron skill instrument, which has been validated to use. The study finds out that elite golfers outperform amateur ones significantly with each score of 56.395.6 and 58.594.6 points compared to 46.096.3 and 46.196.7 points. Elite golfers also prove that 95% of their performance show good repetition in terms of reliability test. From the research, it can be concluded that test-iron skill test is suitable for respondents in this study considering the clinimetric aspect of the test [5].

Test-iron sill test, whose focuses is merely on chipping in a flat-contoured course and thicker grass, is the foundational consideration in designing an instrument in this study. This condition enables golfers to swing the ball using a

variety of club heads such as pitch and sand wedge, iron-7, iron-8, or even iron-9. The key in doing chipping is making the ball as close as possible to the hole. With a variability of skills and club heads used, it can be illustrated that each golfer will do chipping for five times in different distances (1-1.5 meters, 2-2.5 meters, and 3-3.5 meters from the outer green for each club head).

Having 68 golfers with the status of golfers and non-golfers performing 40, 50, and 60meter swing and are exposed to two-session training each week for three weeks (the training includes physical and cognitive training), a study shows that non-golfers perform better post acquisition phase and maintain their performance in the retention test. A more significant improvement is even shown in terms of cognitive behavioral routines of the non-golfers when their pre-test results in compared with their post-test ones in the intervention and retentions test [6]. Through in individual interview digging out on the respondents' perception towards the function of their training routines analyzed in terms of phenomenological interpretation, the study reveals that 9 superordinate themes arise. They include attention allocation, psychological skill, swing selection, routine thought, routine composition, compulsive behaviors, routine application/ evolution, top players, and moderation factors. This means that routine development depends on individuals, the figures (trainers), and situational assessment of each player [7].

Considering the aforementioned facts and research results, this article is trying to reveal the description of analytical results of the use of club heads by professional golfers, amateur golfers (handicaps 3-7), and golfers (handicaps 12-16) focusing on chipping. This analytical analysis is important to predict the result outcome gained by changing characteristic parameters [8, 9]. The variability of the club heads and a series of processes in the research is analyzed in depth so that the expectation that information on the effectiveness of club heads towards the results of chipping to the hole is met. In addition, factors related to the variability of skills of chipping to the hole are also analyzed. Therefore, this study aims to describe the variability of the club heads used to perform in chipping without considering the skills of the players and to describe the variability of the club head used based on the skills of each handicap.

2. Method

2.1. Participants

25 male golfers (six professional players, 13 amateur players (handicaps 3-7), and six players (12-16) recruited in a program namely POLTAK Lembang, Indonesia, are involved as respondents of the study. All the participants age from 20-52 with the handicap index ranging from 0 to 16. In general, the participants use sand wedge (52, 56, atau 60°), iron-9, and iron-8 belong to each of the players.

2.2. Instrument and test procedure

The instrument used to collect the data in this study is a constructed chipping test. In terms of its validity and reliability, the test is considered adequate. Using Spearman's correlational test, the study proves that the validity and reliability values of the instrument are 0.519 and 0.476 in order.

The procedure is described as follows. First of all, each respondent perform chipping in turn in such different distances as 1-1.5 cm, 2-2.5 cm and 3-3.5 cm from the farthest green for five times using different club heads in the following order: sand wedge and/ or the like for the 1-1.5 cm, 9-iron for 2-2.5 cm, and 8-iron for 3-3.5 cm. Each participant should finish their test so that the others can proceed with the exact same order. The highest score is those who can hit the center of the hole circled with 10 cycles (each circle is 30-cm far with each other). Thus, 60-cm circle is score 9; 90-cm circle is score 8; 120-cm circle is scored 7; 150-cm circle is scored 6; 180-cm circle is score 5; 210-cm circle is score 4; 240-cm circle is scored 3; 270-cm circle is scored 2; and 300-cm circle is scored 1. The hole position in the green in as far as 15 meters and the contour of the green is slating to the right with speed level index of 8. The ball used is Teitleist Pro-V. The illustration of the hole in the green is describe in Fig. 1.

Fig. 1. Illustration of the hole in the green.

2.3. Data collection

All data in this study are collected in a golf course namely Padang Golf POLTAK Lembang, Bandung, Indonesia. The data are collected through a chipping test whose procedure is described in advance. To make the test as it should be, each participant has their own helper to tell them when to perform. There is also another helper standing by the hole to really see the position of the ball in the green. The helper will tell the score to another helper recording all the scores. The other helper is assigned to bring the ball back to the chipping spot. The process is constantly repeated until the last respondent of the study finish performing.

2.4. Data analysis

Prior to data analysis, the study performs distribution normality test and variance homogeneity test using SPSS. The results show that the test of distribution normality of chipping using sand wedge and the like, 9-iron, and 9-iron in order are 0.069; 0.152; and 0.124. It is called normal when the score is more than 0.05. On the other hand, it is considered abnormal when it is less than 0.05. Meanwhile, the variance homogeneity test shows that the score of the $p = 0.609$ and it is considered homogeneous since it is more than 0.05. Thus, the statistical computation can proceed to parametric statistics since the data are normally distributed and the

variance and homogeneous. The data analysis itself focuses on variability test of chipping based on a variety of club heads used and skills of each player using independent t-test.

3. Results and Discussion

After the chipping test results are tabulated and calculated in terms of its mean and standard deviation for all types of club heads and different skills of golf, the results obtained are shown in Table 1. The results in the table are very important for further statistical computation in chipping golf either based on the variability of the club heads or based on the variability of the golfers' skills.

Table 1. Data tabulation results (sigma A, mean, and standard deviation).

No.	Golfer Identity	∑ X/M/Sd	SW	Iron-9	Iron-8	Total Score
1.	Professional	∑ X	326	374	338	1038
		M	48	62.33	56.33	172
		SD	7.86	15.56	13.03	36.67
2.	Amateur (3-7)	∑ X	662	759	710	2131
		M	50.92	58.38	54.62	163,92
		SD	12.83	11.76	12.42	26.94
3.	Handicaps (12-16)	∑ X	290	248	264	802
		M	48.33	41.33	44	133.67
		SD	10.576	12.32	13.78	30.83

Based on Table 1, generally professional golfers outperform the others as they show the highest score in comparison with the other golfers, particularly those with handicap 12-16. The most noticeable difference is in the use of iron-9, iron-8, and total score yet the use of sand wedge and the like does not show significant difference. For amateur golfers, compared to the golfers with handicap 12-16, the difference is in chipping using iron-9, iron-8, and combination yet the use of sand wedge and the like is not really different among each other. Moreover, in terms of the handicap level, the amateurs with handicap 3-7 are in the middle. Even though they are different with the handicap 12-16 players, the difference is not too high, as they are with the professionals. In terms of club heads used, iron-9 seems to sore the most in comparison with the other tools in the professional and amateur groups and sand wedge and the like in the handicap 12-16 group.

Based on the data from Table 2, there are several important notes: *first,* the variability comparison of the club heads with significant difference is between the mastery of chipping using sand wedge and the like in comparison with iron-9, where iron-9 shows better performance yet another group (the amateurs with handicap 3-7 and golfers with handicap 12-16 does not show significant difference. The fact that even though the course is flat but has thick grass standing against the wind affects that the use of sand wedge is not suitable since the ball is usually blocked by the grass. In golf, when the basic swings are already mastered, the next level is understanding the field [10]; and *second*, the other club head variability comparison, either in the professionals, the amateurs, or the golfers with handicap 12-16 does not show significant difference.

Table 2. Data analysis results using independent t-test.

No.	Group		*t-cal*	*t-table*	Significance*
1.	The use of club heads				
	Professional golfers				
	1)	Sand wedge** iron-9	1.97	1.708	Significant
	2)	Sand wedge** with iron-8	1.34	1.708	Not significant
	3)	Iron-9 with iron-8	0.72	1.708	Not significant
	Amateur Golfers (handicap 3-7)				
	1)	Sand wedge** iron-9	1.54	1.708	Not significant
	2)	Sand wedge** with iron-8	0.848	1.708	Not significant
	3)	Iron-9 with iron-8	0.79	1.708	Not significant
	Golfers with handicap 12-14				
	1)	Sand wedge** iron-9	1.056	1.708	Not significant
	2)	Sand wedge** with iron-8	0.6107	1.708	Not significant
	3)	Iron-9 with iron-8	0.35	1.708	Not significant
2.	Professional with amateur golfers (3-7)				
	a.	Sand wedge and the like	0.6906	1.708	Not significant
	b.	Iron-9	0.556	1.708	Not significant
	c.	Iron-8	0.268	1.708	Not significant
	d.	Total (combination)	1.96	1.708	Significant
3.	Profesional with amateur (12-16)				
	a.	Sand wedge and the like	0.057	1.708	Not significant
	b.	Iron-9	2.625	1.708	Significant
	c.	Iron-8	2.045	1.708	Significant
	d.	Total (combination)	1.96	1.708	Significant
4.	Amateur 3-7 with handicaps 12-16				
	a.	Sand wedge and the like	0.46	1.708	Not significant
	b.	Iron-9	2.846	1.708	Significant
	c.	Iron-8	1.61	1.708	Not significant
	d.	Total (combination)	2.072	1.708	Significant

*Remarks: it is considered significant when the t-cal is higher that t-table with the α= 0,05. **sand wedge and the like*

In the comparison of chipping skill mastery, there is no significant difference between professional golfers and amateur ones, except when all the scores are summed; the score of professional golfers is significantly better than that of the amateurs. This is actually common sense that players with better mastery will outperform those who are under their level of expertise and mastery.

The comparison of chipping skill mastery between professional golfers and golfers with handicap 12-16 show significant difference in which the professionals show better performance in every club head used, except for the use of sand wedge and the like. When using sand wedge, the professionals do not show better performance since they find difficulties in swinging against the wind. This means that golfers with great skills sometimes do not perform well when the contour of

the course is not as ideal as they wish. However, when they make the right decision, choosing iron-9 and iron-8 for instance, their skill mastery affects the way they perform quite significantly. Frankly speaking, in this context, people with better skills mastery seem to outperform those with lesser skill mastery. Even so, studies state that there is no guarantee at all that experienced players will always be better than those with less experiences even in full concentration [10].

The last comparison is chipping skill mastery between the amateurs and golfers with handicap 12-16. There is actually significant difference in the use of iron-9 and the combination yet in the use of sand wedge and the like and iron-8 does not show any significant difference. This finding is actually in line with that between professional golfers and golfers with handicap 12-16, except in the use of iron-8. This fact reminds of the theory stating that comparison of close range will find slight difference; yet comparing a wider range will come up with more difference. This is a basic theory commonly used in decision making, either in golf or in daily life.

In relation to good chipping in golf, Table 3 describes a series of pictures on how to perform ideal chipping. In the table, there are eight types of panelled pictures showing the right technique of performing good chipping. The pictures are divided into either front view or side view to provide clearer visual explanation for readers. The pictures in the table are adopted from reference [11]. In relation to the variability of skill mastery in golf, a study in literature finds out that there are few studies focusing on the impact of variability of complex motor skill [12]. In fact, each skill in golf is actually very important yet complicated. As this study proves, each golfer, with a variety of mastery skills, perform differently using different club heads. This is in line with literature stating that weight shift timing and magnitude of each golfer vary depending on their purpose, required force of the shot included [13]. Thus, when the golfers aim to hit their ball as close as possible to the hole as in this study, they really need to calculate both factors wisely.

In addition to weight shift timing and magnitude, speed is also another important factor in making decisions in golf [14, 5]. In this case, the speed predominantly lies in the upper body. Therefore, the strategy of the upper body will actually affect the velocity of the swing made by the golfers. However, studies show that there is no significant influence of muscle mass of the golfers towards the speed and velocity made by them. In this study; however, even though such biomechanical and kinesthetic factors are not taken into consideration, it has been proven that different skills and different club heads play an important role in performing their chipping.

In terms of club head variability, golf clubs are more of art than of science. Golf is a great combination of art, instinct, and feel [1]. However, as technology grows rapidly, studies focusing on club heads involving science and technology are arising [16-20]. Some of the studies investigate the swing velocity, which is believed to be the most-frequently studied feature in sport science, particularly in biomechanics. Some others study the weight shift pattern and vibration characteristics of the swing. In the meantime, some of the studies focus on vision-based analysis, in which such technology as 3-D display is employed.

This study, however, focuses the use of club heads in terms of its variability. There are three types of different club heads used in this study. They are sand wedge and the like, iron-8, and iron-9. Figure 2 shows the different club heads in which some of them are used in this study. In the figure, what qualifies to be sand wedge

is pitching wedge. That is the reason why this study always follows "the like" after every mention of sand wedge.

As this study proves, there is no guarantee at all the a certain club head will be good in every condition as there is no guarantee that professional golfers will always outperform those with lower skills. All internal and external factors are equally important in making good decisions when playing golf.

Table 3. Visual description of good chipping skill.

No.	Front View	Side View
1.		
2.		
3.		
4.		

Table 3. (Cont.) Visual description of good chipping skill.

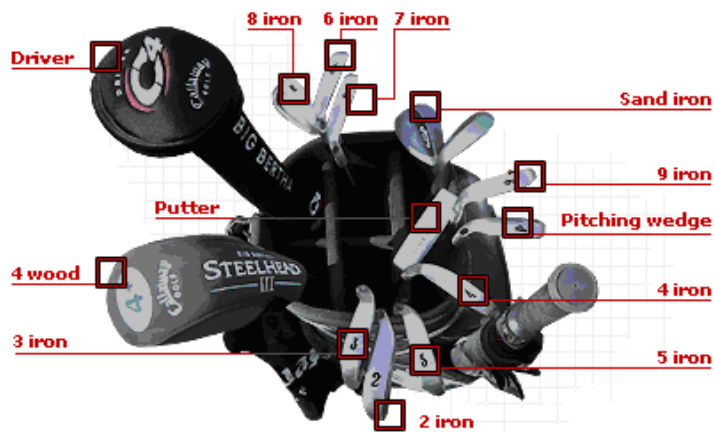|		
5.		
6.		
7.		
8.		

Fig. 2. Types of club heads in golf.

4. Conclusion

Decision making in the use of right club heads in golf gives a chance of success in trying to reach the goals desired. The results of this study focus on how each golfer performs chipping to the hole with a variability of club heads. In addition, the golfers' skill mastery in accordance with their handicaps describes their success of chipping. The more opportunities they have, the bigger their chance to succeed is.

Acknowledgements

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