

DISTRIBUTION OF GRIP PRESSURE THROUGHOUT THE PHASES OF PUTTING IN ELITE GOLF COLLEGE PLAYERS

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The purpose of this study is to investigate the distribution of grip pressure, force and the peak pressure of different phases during the putting stroke. Five elite college players with handicaps of 2-8 participated in the study. The Novel Pliance-x System and 150Hz 8-camera Motion Analysis Corporation System were used to collect grip pressure and identify each phase of the putting stroke. At each phase of the putting stroke, average grip pressure, peak pressure and grip force were investigated. Results indicated that lowest grip pressure occurred at address up to the top of backswing (2.41 ± 1.36 Kpa). Grip pressure started to increase during the downswing and reached its peak, 0.02 ± 0.05 s, before impact (4.70 ± 1.97 Kpa). The pressure reduced again after impact (4.36 ± 2.06 Kpa). Results indicate that grip pressure does not remain the same throughout the stroke.

KEY WORDS: putting, grip pressure.

INTRODUCTION: A golf adage suggests "drive for show, putt for dough". Leadbetter(1997) suggests that putting is the key to shooting low scores, and the ability to hole putts can turn a good round into a great round, and save a poor ball-striking day with a reasonable score. It has been reported that putting accounts for approximately 40% of all golf shot played (Gwyn & Patch, 1993)

A club Grip has always been consider as an important fundamental in golf technique (Wiren 1992, p.73). Anderson (2007) indicated that good pressure is the same pressure level you would use when holding a child's hand. One common drill suggests imagining you are holding a bird or an egg when you are swinging the club. Floyd (1998) suggested that the way to hold the putter is "secure", neither light nor tight. Most golf professionals who putt well use very light grip pressure, but a few professionals, e.g. Tom Watson, have used a very firm grip pressure successfully. Tiger Woods (2007) indicated the importance of grip pressure in putting. He asserted that light, consistent grip pressure is one of the keys to negotiating lightning-fast greens and allows better putterhead release. Many amateurs either grip the putter too tightly from the start or increase grip pressure during the stroke. Either way, they have trouble controlling pace, which is just as important as line. There is limited quantitative research on the optimum grip pressure of the putting.

There are many instructions to describe how the club should be gripped and both light or tight grip pressure are able to be utilized successfully, but very few scholars pay attention to quantitative analysis about the pressure of the putting stroke. Therefore, the purpose of this study was to investigate and quantitatively analyze the distribution of the grip pressure, peak pressure and grip force of different phases during the putting stroke by using the Pliance-x System and Motion Analysis System to collect the data..

METHOD: Five elite male collegiate golf players (n=5) participated in the study (Table 1). Each participant performed putting 5 times as accurately as possible at a target distance of 12 feet.

The putts were performed on a large synthetic grass surface with a phony hole (Pelz, 2000). The grip pressure was measured by Pliance-x System Golf sensor- S2035 (1.35cm*1.35cm*64 sensors, Pliance, Novel Inc., St. Paul, MN, USA) with the sensor mat rolled on the putter (Figure 1). The Motion Analysis System with 8 high speed cameras at 150 Hz (Motion Analysis Corporation, Santa Rosa, USA) was used to identify each phases of the putting stroke. At each phase of the putting stroke, average grip pressure, peak pressure and grip force were calculated. Phases I, II and III are respectively from the address position to the top of backswing, the top of backswing to impact and the impact to the finish position(Figure 2).

Averaged grip pressure of each phase was calculated by averaging the mean pressure of grip mat through time for each phase. The maximum pressure out of 64 sensors was averaged through time for each phase to present the peak grip pressure of each phase. The total grip force of each phase was calculated by averaging the sum of the pressure of each sensor multiplied with the area of each sensor (1.35cm*1.35cm) through time for each phase. Statistical analysis were used to test the significant difference at the alpha level .05 within variables of phases I, phases II and phases III. It's examined by one-way ANOVA with dependent samples through SPSS 12.0.

Table 1 Participants Characteristics

N	Age(years)	Height(cm)	Mass(Kg)	Experience(years)	Handicap	Putting deviations*(cm)
5	21±1.22	172.6±4.04	76.6±10.01	7.4±2.51	4.6±2.41	28.9±7.98

*The distance between the hole and the final ball position after the putt

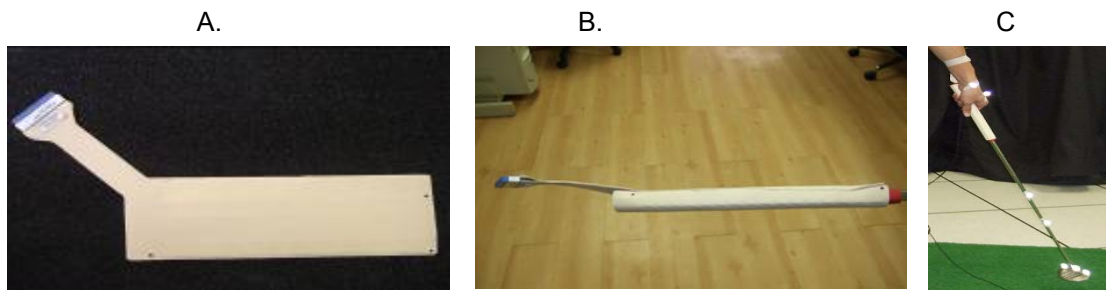


Figure 1: A: Pliance-x System Golf sensor-S2035; B: Sensor roll on the putter; C: front view

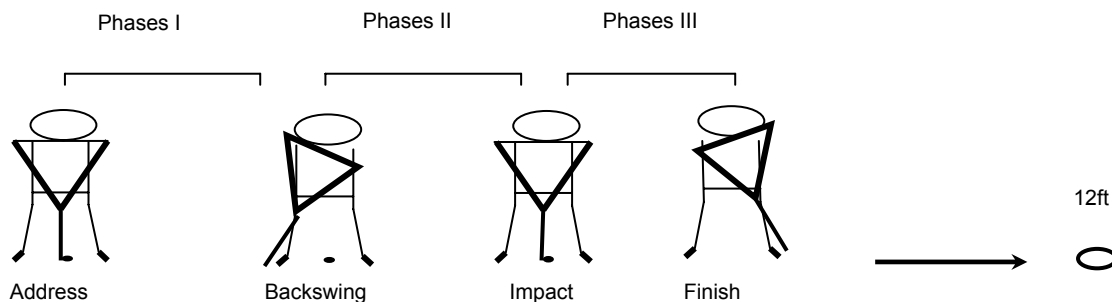


Figure 2: Putting phases

RESULTS: Main results of the value and grip pressure distribution of the putting stroke are represented in the following figures. Figure 3 is a typical grip pressure pattern of participants. It showed a consistent low pressure during the backswing, increase beginning from the top of downswing and a peak pressure happening about the impact. All participants demonstrate the similar pattern.

Table 2 shows a significant difference ($P<.05$) in values between phase I & II and phase I & III. The results show that grip pressure does not remain the same through the phases. Figure 4 shows that grip pressure is extremely low in phase I of the putting stroke. It also shows the increase in grip pressure leading up to, and slightly after impact and the peak pressure occurred 0.02 ± 0.05 before impact. The grip pressure maintains the same level after impact in Phase III.

DISCUSSION: The putting distribution of grip pressure, force and the peak pressure of different phases had similar variation pattern in the study. The results indicated that the contact area of pressure keep constant throughout the putting stroke. Our research showed that the peak amount of pressure occurred 0.02 ± 0.05 s before impact. Two suggested

reasons for this may be due to the increasing centrifugal force during the phase II, so the player needs to have a firmer grip pressure to hold the putter. The other reason may be that the player may stabilize the wrist though the impact in order to control the contact of ball and putterhead. According to Figure 4-6, phase I shows a significant difference between phase II and III which indicates a difference between the putting pressure throughout the stroke. Therefore, optimum grip pressure is characterized by low and constant pressure at backswing, increased pressure before impact and still maintain after impact to stabilize the wrist.

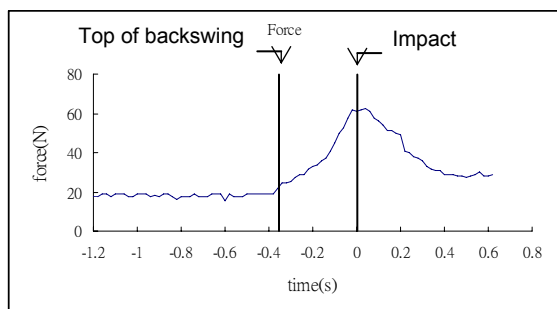


Figure 3: A typical grip force pattern of putting stroke.

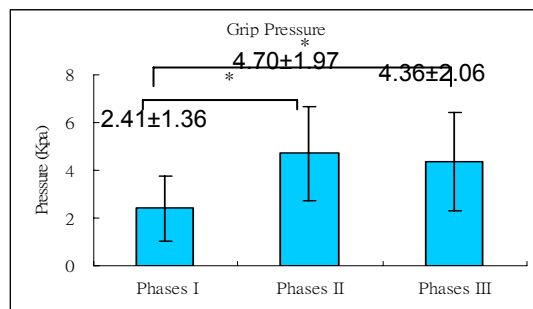


Figure 4: The comparison of mean of average grip pressure during different phases (N=25) *P<.05

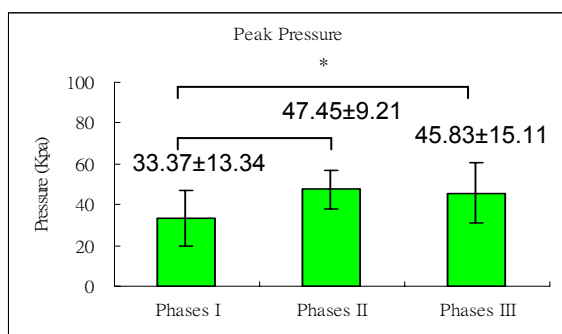


Figure 5: Peak pressure of the sensor during each phase (N=25) *P<.05

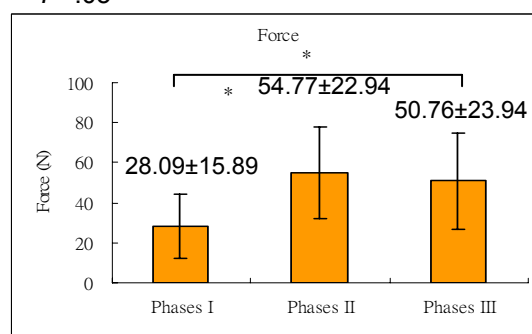


Figure 6: The comparison of mean of total grip force during each phase (N=25) *P<.05

In conclusion, both high and low grip pressure levels were detected from those male college players, but they all performed a same trend through the stroke. As was cited earlier, either light or tight grip pressure is suggested to use in the putting stroke. But through this experiment, we detected the value of the pressure through the putting stroke.

REFERENCES:

- Anderson, C., Crowell, B. A., & Mackin, T. (2007). *Teach Yourself VISUALLY Golf*. (p. 44) Hoboken, New Jersey: Wiley.
- Floyd, R. (1998). *The Elements of Scoring*. (p.129) New York: SIMON& SCHUSTER
- Gwyn, R.G., & Patch, C.E. (1993). Comparing two putting styles for putting accuracy, Perceptual and Motor Skills, 76(2), 387-390.
- Leadbetter, D. (1997). *Positive Practice*. (p.102) New York: HarperCollins.
- Pelz, D. (2000). *Dave Pelz's putting bible*. New York: Doubleday.
- Wood, T. (2007, September). FINDING THE FEEL: Control on fast greens starts with a lighter grip. *Golf Digest*, 58, 44.
- Wren, G. *Golf, building a solid game*. Englewood Cliffs, NJ: Prentice-Hall, 1992.

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