

# Effects of special composite stretching on the swing of amateur golf players

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**Abstract.** [Purpose] The study investigated stretching for safer a golf swing compared to present stretching methods for proper swings in order to examine the effects of stretching exercises on golf swings. [Subjects] The subjects were 20 amateur golf club members who were divided into two groups: an experimental group which performed stretching, and a control group which did not. The subjects had no bone deformity, muscle weakness, muscle soreness, or neurological problems. [Methods] A swing analyzer and a ROM measuring instrument were used as the measuring tools. The swing analyzer was a GS400-golf hit ball analyzer (Korea) and the ROM measuring instrument was a goniometer (Korea). [Results] The experimental group showed a statistically significant improvement in driving distance. After the special stretching training for golf, a statistically significant difference in hit-ball direction deviation after swings were found between the groups. The experimental group showed statistically significant decreases in hit ball direction deviation. After the special stretching training for golf, statistically significant differences in hit-ball speed were found between the groups. The experimental group showed significant increases in hit-ball speed. [Conclusion] To examine the effects of a special stretching program for golf on golf swing-related factors, 20 male amateur golf club members performed a 12-week stretching training program. After the golf stretching training, statistically significant differences were found between the groups in hit-ball driving distance, direction deviation, deflection distance, and speed.

**Key words:** Special composite stretching exercises, Golf swing, Posture

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## INTRODUCTION

Among the physical strength factors that support golfers' athletic performance, muscular strength, muscular power, muscular endurance, flexibility, balance, cardiopulmonary endurance, and adroitness are considered important. These physical strength factors are known to be essential factors for improving athletic performance and preventing sport injuries. Muscular strength increases through physical strength training, and it has been reported to increase driver shot driving distance and improve golf accuracy<sup>1, 2)</sup>. Stretching actively or passively stretches muscles, joints, and tendons to enhance flexibility and reduce the possibility of injuries, thereby contributing to the efficiency of muscular exertion and the acquisition of high degrees of skills. A general principle of stretching is increasing muscle lengths to extend the muscle beyond its natural state. To improve flexibility, muscles should be extended more than their normal lengths by at least 10%<sup>3)</sup>. Since injuries are the most important

problem for players of golf, paying more attention to injuries and learning correct golf stretching are considered very important for many people who enjoy golf to minimize their risk of injuries while maximizing their skills.

In the present study, therefore, stretching exercises were performed by the subjects in order to examine their effects on golf swing-related factors that can be easily influenced by continuous and long-term repetitive movements, unstable postures, and excessive force. The study goal was to examine the effectiveness of stretching exercises for improved swing. The study investigated stretching for a safer golf swing compared to present stretching methods for a proper swing in order to examine the effects of stretching exercises on golf swings.

## SUBJECTS AND METHODS

The subjects were 20 amateur golf club members who were divided into two groups: an experimental group of 10 subjects performed stretching, and a control group of 10 subjects who did not. The subjects had no bone deformity, muscle weakness, muscle soreness, or neurological problems. The experimental and control groups had average ages of 46.20±6.39 and 44.90±6.12 years, heights of 174.50±3.81 cm and 174.40±4.57 cm, weights of 79.50±9.02 kg and 76.10±7.23 kg, and BMI of 26.13±3.16 kg/m<sup>2</sup> and 25.03±2.32 kg/m<sup>2</sup>, respectively. All

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**Table 1.** Means and deviations of driver driving distances by group and by measuring time point (Unit: m)

Group	Time point			
	Before experiment	4 weeks later	8 weeks later	12 weeks later
Experimental group	216.0±13.6	224.9±17.9	221.3±13.5	229.0±14.9
Control group	214.3±18.6	218.3±15.3	220.6±16.1	218.7±17.4

**Table 2.** Means and deviations of hit ball direction deviations by group and by measuring time point (Unit: degree°)

Group	Time point			
	Before experiment	4 weeks later	8 weeks later	12 weeks later
Experimental group	3.0±1.4	2.7±1.8	2.2±1.3	2.3±1.4
Control group	3.6±1.9	3.6±1.3	3.4±1.5	3.5±1.3

**Table 3.** Means and deviations of hit ball speeds by group and by measuring time point (Unit: m/s)

Group	Time point			
	Before experiment	4 weeks later	8 weeks later	12 weeks later
Experimental group	67.3±5.4	70.8±6.0	68.6±5.6	72.0±4.7
Control group	66.3±4.8	69.9±8.3	68.6±4.8	67.9±4.8

the subjects understood the purpose of this study and provided their written informed consent prior to their participation in the study in accordance with the ethical principles of the Declaration of Helsinki.

A swing analyzer and a ROM measuring instrument were used as measuring tools. The swing analyzer was a GS400-golf hit-ball analyzer (Korea) and the ROM measuring instrument was a goniometer (Korea). The measured items were driving distance, hit-ball direction, biased distance of hit-balls, and ball speed after swings. They were measured three times and their average values were used in the analysis. Special composite stretching programs were designed to be suitable for golf events. They followed in the same pattern but were tailored to individual differences. Static stretching and PNF stretching were performed but dynamic stretching was not. Excessive stretching to a painful extent was avoided and stretching was performed slowly so that pain could be subjectively endured. The stretching duration range was 15–30 seconds. Each muscle group was repeatedly stretched 3–5 times. To enhance flexibility, the stretching program was implemented for at least 12 weeks. Every time stretching was performed, the agonistic muscles and the antagonistic muscles were stretched in turn.

The study data were processed using the SAS Win 18.0 statistics package. The means and standard deviations of the swing-related variables were calculated for each item. Two-way repeated ANOVAs (2×4) was conducted to examine measurement differences between groups and between time points. When there were interactions, the groups and time points were separately classified and the dependent t-test was conducted to examine differences between groups. One-way ANOVA was conducted to examine differences between time points. The significance level in all analyses

was  $p=0.05$ .

## RESULTS

With regard to changes in driving distance by group after the 12-week composite stretching program, driving distances of golf driver swings were measured and the results show there were significant differences in driver driving distances between the two groups at both 4 weeks and 12 weeks after the beginning of the program (Table 1). The experimental group showed significant differences between pre-intervention and 4 weeks, and between 4 weeks and 12 weeks ( $p<0.05$ ). The results of two-way repeated ANOVA show there were significantly different interactions between time points ( $F=8.39$ ,  $p<0.01$ ), and between groups and time points ( $F=3.02$ ,  $p<0.05$ ).

Changes in deviation of hit ball directions between measuring time points by group were examined and the results show there were positive changes. Although the control group showed few changes, the experimental group showed decreases at 8 weeks and 12 weeks (Table 2). Although no major effects were shown, the comparison between the groups conducted after separately classifying the results by measuring time point showed statistically significant differences at 12 weeks ( $p<0.05$ ).

Hit-ball speed at golf driver swings were measured and the results show there was an increase of approximately 5 m/s from 67.30±5.40 m/s before the intervention to 72.00±4.73 m/s at 12 weeks in the experimental group, but there was little change from 66.30±4.78 m/s before the intervention to 67.90±4.81 m/s at 12 weeks (Table 3) in the control group. Two-way repeated ANOVA the results show there were no interaction effects but there were significant

differences ( $p < 0.05$ ) between the groups ( $F = 5.95$ ,  $p < 0.05$ ).

## DISCUSSION

Two important factors in a golf swing are driving distance and accuracy<sup>4</sup>. These two factors are very closely related to the accuracy of impact. Therefore, to improve driving distance and accuracy, an accurate impact is essential. Most golfers try to make an accurate impact during the golf swing. However, doing so repeatedly is difficult because of the opposite rotary movements of the body segments during the back swing and the down swing, and the mobility of the trunk and the arm joints. Therefore, a golf swing requires effective coordinated movements of various body segments and the maintenance of body balance<sup>5</sup>. For accurate impact during a golf swing, movements throughout all sections of the golf swing should be made in harmony<sup>6</sup>. In particular, extensive rotary movements are required to hit the golf ball with the golf club in the impact section of the down swing, for which many trunk muscles are mobilized. If the trunk muscles are mobilized to contract excessively or if the muscles on one side contract more than those on the other side, the swing will be inaccurate and the accuracy of the impact will be reduced<sup>7</sup>.

A golf swing requires sufficient muscular strength and flexibility. Since the force applied to the waist at the moment of impact is as large as eight times the body weight, harmony between the muscular strength necessary to endure the force and the appropriate flexibility is essential. If muscular strength and flexibility are in harmony with each other, the ball driving distance and accuracy will be improved and injuries due to sudden muscle contraction will be prevented<sup>8</sup>.

In a previous study of three types of 8-week training (muscular strength training, muscular strength and flexibility training, and flexibility training), all three groups trained for approximately 40 minutes per session, three times per week, and they all showed improvements in overall health condition and club speed. However, only the group that performed stretching exercises showed a very large improvement in flexibility with an average increase in ROM of 24%. All the participants recorded lower course scores and longer driving distances and were not injured in the next season<sup>9</sup>.

Consistent use of muscles can be regarded as an essential

element of an efficient golf swing. The upper limb muscles and the trunk muscles are considered very important for the golf swing. Improved accuracy and driving distance of the golf swing can be achieved through coordination of these muscles.

After implementing the stretching, statistically significant changes were observed in golf swing-related factors such as hit ball driving distance, hit ball direction deviation, hit ball deflection distance, and hit ball speed. Therefore, we consider the stretching exercises were beneficial for the swing patterns of the amateur golfers.

Enforce the combination of warm up and stretching for 7 days, there was significant difference for hamstring flexibility<sup>10</sup>. The targeted 40 people (male student) of healthy body are tested to active individual muscle stretching on right leg. Flexibility is significantly increased and it is improved the muscle strength output<sup>11</sup>.

The present study, increase the ROM and the ball speed when performed a special composite to amateur golf players.

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