Research On The Application Of Digital Monitoring In The Field Of Junior Golf Technology

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Abstract: In order to effectively improve the hitting level of the first wood swing of young golfers and improve sports performance, this paper conducted experimental research on 20 young golfers through the research methods of literature, experiment and mathematical statistics, and discussed the influence of digital monitoring application on the hitting effect of the first wood of young golfers. In this paper, the experimental group and the control group were set up, the experimental group was added with digital monitoring, and the control group received routine training. Finally, the conclusion was drawn that: After the experiment, the club head speed and the total distance of the first wood swing in the experimental group had significant positive effects, and were obviously better than the control group; Compared with the data before and after the test of the batting effect index of the No.1 wood swing in the experimental group, although the test results of the left and right Angle Index did not show significant difference, the effect was better than that of the control group with certain positive effects; Digital monitoring can effectively improve the level of young golfers' first-wood swing hitting skills, and students with good index test results will have better first-wood swing hitting effects. Therefore, in order to further improve the first-wood hitting effect of young golfers,digital monitoring equipment should be actively introduced in daily training to provide diversified teaching support and guidance for the improvement of young golfers hitting skills.

Keywords: Digital monitoring; Teenagers; Golf; First tree

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1 Introduction

With the continuous improvement of the quality of life of the Chinese people, many people have begun to pay attention to green life, and enhancing physical fitness and enriching the spiritual world have become the life pursuit of many people. Golf as a healthy, green aerobic leisure sport, since the development of our country has harvested more enthusiasts, golf is a high-level leisure sport, now gradually to the middle class of development, the participation group is more and more popular, its development and national policy also has a greater relationship. In March 2017, the "13th Five-Year Plan for the Development of Golf" mentioned that it is necessary to actively promote the widespread popularization of golf and accelerate the development of the golf industry. In November 2020, the "14th Five-Year Plan for Sports Development of the China Golf Association" also mentioned that it is necessary to further strengthen and improve the construction of golf events and service systems, expand the team of professional talents, and create a better social environment for the development of golf driving ranges.It can be seen that at present, China has given more policy support to the development of the golf industry, which has created a better development environment for it. In this context, more and more teenagers are joining the game of golf and becoming the backbone of promoting the development of golf. However, due to the immaturity of the young people's mental development, they do not have a high grasp of golf driver hitting skills. Therefore, the use of digital monitoring equipment to intervene in the hitting action of junior golfers has become a necessary measure to improve the hitting effect of junior golfers.

1.1 Purpose of the study

In golf, how to improve the driver hitting skills of junior students is a necessary measure to improve the golf skills of junior students. With the rapid development of digital technology, the use of digital monitoring equipment to intervene and train the batting action of junior players has become a new method for golf clubs to train junior players. In view of this, this paper explores the impact of digital monitoring on the hitting effect of golf drivers based on the characteristics of golf driver swing technology, hoping to promote the improvement of junior golfers' driver swing skills and provide a theoretical basis for other golf enthusiasts to improve the hitting level of drivers.

1.2 Research implications

1.2.1 Theoretical implications

At present, the literature on the application of digital monitoring in golf drivers is very scarce. Therefore, this paper designs a comparative experiment to observe the data of junior golf drivers by using the Trackman radar monitor, and reflects the impact of the hitting effect of junior golfers drivers through data comparison, and writes the research process into an academic paper, which can increase the literature on the application of digital monitoring in golf drivers.

1.2.2 Practical Significance

The application of digital monitoring in the junior golf driver

can be supported by data to allow teenagers to master the technical movements of the golf driver faster, as well as to deeply understand the principles of the golf driver and reduce technical action errors. At the same time, the digital monitoring equipment can analyze the action frame by frame, so that the teenagers can learn the golf driver more scientifically and rationally, so as to improve the skills of the junior golfers' drivers, reduce the number of strokes in the later stage, and comprehensively improve the hitting effect of the junior golfers.

2 Research objects and methods

2.1 Research Subjects

In this paper, the application of digital monitoring in junior golf driver technology was taken as the research object, and six junior golfers from Chongqing Baifu Riverview Golf Club were taken as the experimental objects.

2.2 Research Methodology

2.2.1 Documentation Law

By logging in to CNKI, consulting a large number of relevant literature on keywords such as "golf", "digital monitoring" and "golf driver", and searching for relevant materials through Internet query, this paper has laid a certain theoretical foundation for the development of this research.

2.2.2 Observation

Through field observation of the experimental subjects, we learned about the specific use of the Trackman radar monitor, and provided guidance to junior golfers when using the Trackman radar monitor in the field, which became the norm for the use of the Trackman radar monitor.

2.2.3 Experimental method

2.2.3.1 Test subjects

In this paper, six junior golfers from Chongqing Baifu Riverview Golf Club were selected as the test subjects, all of whom were between the ages of 13 and 16 years old, and there was no significant difference between the six junior golfers selected in terms of driver hitting technique and effectiveness. After a 3-month digital monitoring intervention with 6 teenagers, the effect of digital monitoring on the driver hitting of junior golf was verified by the driver hitting level of 6 junior golfers before and after the experiment. If teenagers can ensure a high training frequency and reasonable intensity, such as training multiple times a week, each training time is sufficient, then their skills will improve relatively quickly, and they may achieve better training results within three months, so the coach can set a detailed teaching plan according to it. Among them, among the 6 selected young players, they were numbered A, B, C, D, E, F, and the overall technical level was not much different, which met the experimental conditions. Among them, the age and skill level of 6 players are shown below.

Table 2.1 Skill handicaps for different players

	Gender	Age	Skill Level (handicap)
Player A	woman	16	13
Player B	woman	13	11
Player C	man	16	15
Player D	man	15	14
Player E	man	14	13
Player F	man	16	14

2.2.3.2 Experimental design

In order to explore the application effect of digital monitoring in junior golf driver technology, a before-and-after comparison experiment was designed, and K-VEST-3D was used to analyze the dynamics of junior golf driver before and after the experiment. The driver shots of six junior golfers before and after the experiment were compared. Among them, the monitor will score the player's performance based on the ball. Within a range of 160-210 yards from the target, no more than 20 yards from the target, the maximum score is 100 points, and the closer you are to the target, the higher the score. After 10 strokes, the system calculates the average score based on the player's performance in the individual event, which is the player's score over that distance. The digital monitoring technology used in this article is the Trackman radar monitor, which is a golf radar monitoring device developed by the Danish company TRACKMAN. K-VEST-3D, it is a professional-grade golf hitting body action data analysis system from the United States. The system uses 4 sensors to generate a 3D report of the golf swing, which can provide 3D images of the body and real-time data of the movement throughout the swing to help coaches and players understand the complexity of the swing and quickly analyze the problems of the golfers. Once the report is generated, the system also automatically recommends biodynamic training for athletes to improve swing deficiencies. Among them, during the 3-month training, its cycle training plan is as follows:

Table 2.2 The schedule of this experimental training cycle

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
8 : 30-9 : 00	Theory courses	Theory courses	Warm-up exercises				
9 : 00-10 : 00	Driver lead rod explanation	Driver half-waved explanation	Physical training	Driver full swing practice	Correct incorrect movements	Real grass stand tee exercises	rest
10 : 00-12 : 00	Driver lead rod training	Driver half-swing training	Aimed at physical stability training	Driver batting practice	Steady action	Off-field practice	

Among them, in the three-month experiment, the training plan of the 6 players was the same as the previous month, the theory explanation and the decomposition of the driver were practiced, and the real grass frame TEE practice was carried out after learning. In the second and third months, the movement correction and stabilization are carried out, and the swing plane

trainer is used to adjust the appropriate height and angle. Feel the correct swing trajectory, and then do a mirror exercise so that the teenager can see his swing and correct it. The difference is that the Trackman radar monitor is used for junior golfers in the second two months, and only the player's swing plus coach guidance is used for the second two months. The Trackman radar monitor uses dual radar technology, a high-frequency radar is used to complete the monitoring of the club, including the club path, face angle, rotation angle and attack angle. Another high-frequency radar is used to complete the monitoring of the ball, from take-off to flight and landing. The Trackman radar monitor provides the industry's most accurate real-time data and graphs of ball launch, flight and landing, monitoring the entire ball's trajectory with 99.7% accuracy. It can measure up to 23 sets of batting data, covering clubhead data (such as clubhead speed, clubface orientation, etc.), ball flight data (such as initial shot speed, maximum ballistic altitude, etc.), providing players and coaches with comprehensive and accurate information.

By using the Trackman radar monitor for the last two 6 golf balls to monitor the hitting of the driver, it helps players to understand their swing action, hitting effect and other indicators through the data provided by the Trackman radar monitor and the power swing sequence, and make a training plan for the player's problems, so as to help the player adjust his swing action and power mode when hitting the ball, and improve the accuracy and stability of the player's driver hitting the ball. At the end of each experiment, the results before the experiment were compared and analyzed, and the technical movements and training content of the players were adjusted to observe whether the players had significantly improved the distance from the driver and whether the body force sequence was becoming more and more smooth.

2.2.3.3 Experimental indicators

In order to further verify that digital monitoring can effectively improve the hitting effect of junior golf drivers, this paper selects three indicators: clubhead speed, experimental score and distance, which mainly evaluate the hitting technology of junior golf drivers. After a period of training, six junior golfers were measured on driver hitting technique.

2.2.4 Mathematical Statistics

The data were recorded and sorted by using the software Excel, and then the data obtained from the index test were analyzed by using the software SPSS 27.0.1 according to different conditions.

3 Research status at home and abroad

3.1 Current status of domestic research

Regarding the application of digital monitoring in the field of sports, Ji Qingge et al. (2023) investigated and analyzed 18 different sports and found that with the development of digital technology, digital monitoring technology, such as virtual reality and smart watches, has been introduced into different sports projects, which have become common digital monitoring devices to improve the efficiency of sports training.Meng Li (2023) pointed out that the use of digital monitoring in sports can present the athlete's sports status in digital form by analyzing the specific functions of digital monitoring equipment, so as to help athletes better adjust their training plans, correct wrong sports movements, and improve the training effect of athletes.Wang Meng and Yang Shaoxiong (2022) investigated the application of wearable devices in sports and found that national team athletes wear high-precision wearable devices during daily training, which can provide great help for employees to improve their own exercise efficiency by monitoring athletes' movement trajectory, heart rate, range of action and other data, and providing digital feedback in the background.Wang Baoqing (2019) used the SVT method to simulate the "eye health" training of players, and used digital technology to interfere with the visual changes of the athletes participating in the training, such as quickly changing the athletes' visual convergence, accommodation, saccade and tracking eye movements, so as to improve the visual perception of the athletes, thereby improving the hitting efficiency.

Regarding the research on the application of Trackman radar monitoring, Trackman radar monitoring is one of the most widely used digital monitoring devices in golf, so it has received extensive attention from scholars. Among them, Yao Bowen (2023) analyzed the application of Trackman radar monitoring in the golf technology evaluation system, and pointed out that the quality and efficiency of golfers' later training can be greatly improved by tracking and monitoring the athlete's hitting trajectory and other indicators by applying Trackman radar monitoring during golf technical training. Xu Shoujin (2022) analyzed the specific application of Trackman radar monitoring and found that in golf events, the application of Trackman radar monitoring equipment can quantify the data of golfers' tee-off, hitting, swing and other action characteristics, providing a reference for later technical improvement.Sun Meirong (2022) pointed out that the application of Trackman radar monitoring to golf technical training can monitor and identify golfers' action characteristics through radar, and then digitize the golfers' technical characteristics after uploading them to the back-end data processing center, which can provide a reference for improving golfers' hitting skills in the later stage. Xu Liguang (2019) pointed out that when Trackman radar monitoring is applied to golfers' training, it can simulate the ballistics of the game ball and remove the influence of weather factors through normal adjustment of the player's data analysis, so as to provide scientific guidance for golfers to improve their hitting skills .

3.2 Current status of foreign research

Shaw James et al. (2023) pointed out that the use of Trackman radar monitoring to improve golfers' hitting effect can accurately collect the player's serve data during each swing, including clubhead speed, hitting efficiency, attack angle, clubhead trajectory direction, clubface orientation, clubface dynamic elevation angle, etc., so as to provide more scientific guidance for improving golfers' technical effectiveness.Suzuki Takeru et al. (2021) used three Sony high-speed cameras to record the swing movements of six players in the World Golf Championship and analyze their driver swing techniques using three-dimensional motion, and made reasonable suggestions.Fisher Kevin M (2019) used a three-position capture system and Dartfish video analysis software to capture the relevant putting performance of the students in a non-laboratory environment, and analyzed and summarized the player's appropriate physical condition during the putting process, in addition to the player's general small putting angle compared to the pending.

3.3 Literature review

To sum up, through the review of relevant literature and theories, it is found that the current digital monitoring technology has received extensive attention from experts and scholars at home and

abroad, especially in the field of physical education teaching and training. In the field of golf, relevant research has begun at home and abroad. However, due to the late start of golf in China and the high price of related instruments and equipment, there are relatively few literatures on the application of digital monitoring technology to junior golf technical training. In this case, more research and exploration should be carried out on the digital monitoring technology of junior golf, hoping to improve the technology of junior golf and cultivate reserve talents through digital monitoring. Therefore, it is necessary to strengthen the research on the digital monitoring technology of golf teenagers on the basis of the research on physical fitness and psychology, and explore its application prospects in golf technical training.

4 Results and Analysis

4.1 Analysis of the hitting effect of the junior golfer's driver before the experiment

Prior to the experiment, the driver shots of 6 junior golfers were analyzed and the dynamics of the players' drivers were analyzed using K-VEST-3D. The score is determined by the distance of the driver, the angle of deflection between the left and right, and the distance difference between the target (200 yards) The closer to the target, the higher the score. Before the experiment, the full-swing batting effect of 6 people was counted, as shown in the following table:

Table 4.1 Data on the full-swing batting effect of junior golfers before the experiment

Project	Distance	Clubhead speed	Pre-experiment scores
Player A	175.66	69.23	79.2
Player B	170.89	70.63	76.5
Player C	190.1	75.14	88.65
Player D	182.56	76.56	85.12
Player E	178.91	75.61	82.64
Player F	195.3	73.66	90.96

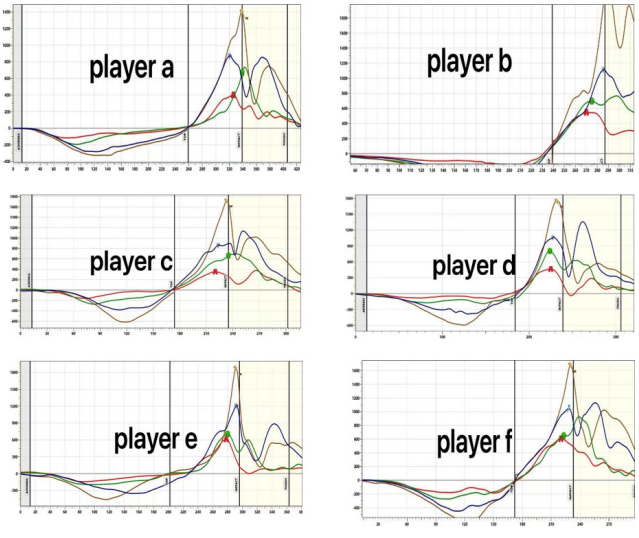

FIG 4. 1 Dynamic analysis of young players before the experiment

An analysis of the table above shows that prior to the experiment, the full swing distance of the six junior golfers ranged from 175.66 to 195.3 and the clubhead speed ranged from 69.23 to 76.56. In terms of overall score, player F has the highest score of 90.96, followed by player C with a score of 88.65, and player B has the lowest score of 76.5.

4.2 Analysis of the hitting effect of the driver of the junior golfer after the experiment

After the experiment, after two months of driver training, coach-specific training, and hard work by the teenagers, the driver hitting effect of the six junior golfers and the dynamic analysis of the players were analyzed. The score is determined by the distance of the driver, and the declination angle between the left and right sides and the distance difference between the target (200 yards) are the closer to the target, the higher the score. After the experiment, the full-swing batting effect of the 6 players was statistically counted, as shown in the following table:

Table 4.2 Data on the full-swing batting effect of junior golfers after the experiment

project	distance	Clubhead speed	Post-trial scores
Player A	181.56	78.9	86.22
Player B	185.79	74.99	87.56
Player C	202.8	81.88	96.22
Player D	194.56	73.79	91.12
Player E	205.89	81.56	96.32
Player F	186.23	80.63	88.23

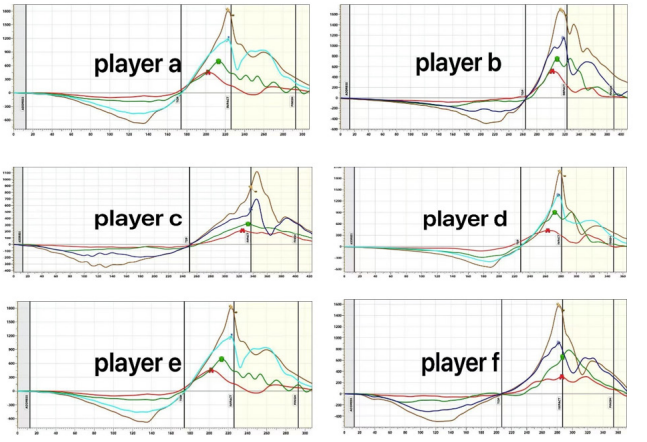

Figure 4.2 Dynamic analysis of young players after the experiment

Through the analysis of the above table, it can be seen that after a two-month digital monitoring intervention, the full swing distance of the six junior golfers was greatly improved, from 175.66 to 195.3 to 181.56 to 205.89. In terms of clubhead speed, it has also increased from 69.23-76.56 before the experiment to 73.79-81.88, which is a significant improvement compared with before the experiment, thanks to the joint efforts of players and coaches, only the players use trackman, and the intervention of coaches. In addition, in the score after the test, the highest score was increased from 90.96 to 96.32, and the lowest score was also increased from 76.5 to 86.22. It can be seen that after the use of digital monitoring intervention, the hitting effect of the teenagers' driver has been

significantly improved, and the hitting distance, clubhead speed, score, body force sequence and other aspects have been significantly improved.

5 Conclusions and Recommendations

5.1 Conclusion

After the experimental training of the experimental group, the clubhead speed and hitting distance of the driver swing in the experimental group were significantly improved, which was significantly better than that of the control group, indicating that the application of digital monitoring can effectively help junior golfers improve their driver swing skills.

Compared with the data before and after the test of the driver swing effect index in the experimental group, although the test results of the left and right declination index did not reflect a significant difference, the effect was better than that of the control group, which had a certain positive impact, indicating that in order to make the left and right declination of the hit more accurate, it was necessary to further use digital monitoring to adjust the hitting angle of the driver.

The application of digital monitoring can effectively improve the technical level of junior golfers' drivers, and the better the students' index test scores, the better their driver swing effect.

5.2 Recommendations

5.2.1 Introduce advanced digital monitoring equipment

In order to further improve the driver skills of junior golfers, golf clubs should actively introduce high-precision and multi-functional digital monitoring equipment, such as Trackman radar monitors, FlightScope, etc., which can provide comprehensive and accurate swing and shot data, including clubhead speed, shot angle, ball trajectory, etc. At the same time, it is necessary to pay attention to the upgrading of equipment, upgrade equipment in time to obtain more accurate and detailed data, and provide more adequate equipment support for junior golfers to improve their hitting skills.

5.2.2 Improve the way players are trained

In the traditional training of junior golfers, the demonstration teaching method and the error correction teaching method are mainly adopted, although these teaching methods have certain teaching effects, but the correction and demonstration of the hitting action of the junior golfers are very dependent on the coach's personal hitting ability and teaching experience. At the same time, for junior golfers, the different comprehension skills of individuals also make the effect of the driver greatly reduced. Therefore, by improving the training methods of junior golfers, introducing digital monitoring equipment, and enriching the training methods of junior golfers through digital monitoring technology, the training effect of junior golfers' hitting skills can be effectively improved.

5.2.3 Strengthen training on the use of digital equipment

In order to further play the role of digital monitoring equipment in promoting the hitting effect of junior golfers, on the one hand, we provide systematic digital monitoring technology training for coaches, so that they can be familiar with the functions and operation methods of various monitoring equipment, and master the skills of data analysis and interpretation. Through training, coaches are better able to use the monitoring data to develop personalized training plans for young players and provide targeted guidance. On the other hand, it is also necessary to educate young players on digital monitoring knowledge, so that they can understand the purpose, method and significance of monitoring, and improve their attention to monitoring data. At the same time, players are taught how to adjust their technical movements according to the monitoring data, so as to further improve the comprehensive hitting skills of junior golfers.

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