



## The Effect of Functional Training Programs to Improve Distance Hitting for Baseball Players in University

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### Abstract

**Background and Aim:** In the field of baseball, the attacking ability of baseball players is mainly reflected in their hitting techniques, including hitting distance and swinging speed. At present, the level of domestic university baseball teams is still very low. From the data of hitting percentage, long hit percentage, and home run, it can be seen that the main problem is reflected in the insufficient ability to hit from a long distance. Therefore, it is difficult to have more multiple and home runs in the game, resulting in the team being unable to score. These shortcomings will hurt the overall athletic ability of the team. This study aims to address this issue by focusing on developing and implementing training programs specifically designed for the effect of functional training programs to improve distance hitting for baseball, to significantly improve the long-range hitting ability and swing speed of baseball players.

**Materials and Methods:** This study is an experimental study. The research subjects are 20 baseball majors (18-22 years old) from Guangzhou Sports College in Guangdong Province, including 6 professional baseball coaches, 1 baseball instructor from a professional sports college, and 3 professors in the field of sports training, totaling 10 experts. This study used focus groups to develop and improve training plans through expert interviews and experimental analysis, with an IOC value of 0.914. This study mainly used analysis of variance to analyze the results before, 4 weeks after testing, and after testing.

**Result:** After specialized functional training, the use of the T-seat hitting distance test and swing speed test effectively improved the long-distance hitting ability and swing speed of baseball players, and improved their long-distance hitting ability and swing speed, which helped to improve their athletic level and achieve better game results.

**Conclusion:** After 8 weeks of baseball versatility training, 20 martial arts athletes underwent further tests on their long-range hitting ability and swing speed. This study analyzed the differences and their effects on long-range hitting ability and swing speed before and after training. The comparison before and after training fully proves that functional training in baseball can effectively improve the long-range hitting ability and swing speed of baseball players.

**Keywords:** Baseball; Hitting; Functional Training; Long-Range Hitting; Swing Speed

### Introduction

Baseball is one of the top 3 sports in terms of social value and economic value in the world. Baseball was first invented by the UK and continued after it was introduced in the United States. Compared with China, the development of baseball in China lags behind the United States, Japan, South Korea, and other countries. Currently, the Chinese Baseball League was founded in 2002 and has 10 teams. Take the 2017 competition data as an example, a total of 44 college baseball teams participated in the national finals from July to August. But look around the world from our country's college baseball players, according to our college baseball team this level is still low, from the team's hit rate, long rate,





and home run data can be seen, the main problem reflected in distance hitting distance, the game is difficult to appear baser and home run situation, lead to the team cannot score. The breadth and depth of China's baseball research are not equal to that of the United States, Japan, and South Korea. The development of baseball and social attention to baseball and the United States and Canada are much lower. Compared with the domestic research in the field of baseball, the speed, strength, sensitivity, and flexibility of baseball functional physical quality training is. From the digital equipment of baseball training to the functional research of each project, foreign research has reached a certain height. The rationality and research depth of functional training are confirmed in other projects.

For baseball players, distance hitting is a key aspect of baseball hitting technology, including significant strength and trajectory ability to hit the ball, and make it hit the ball to fly a consistent distance, this skill is the basis of the runners into the base. The swing base was divided into six phases (stance, stride, coiling, swing initiation, swing acceleration, and follow-through) by five key events (lead foot off, lead foot down, weight shift commitment, maximum front foot vertical ground reaction force, and bat-ball contact) (Ren (2015), mainly using the body's upper back muscles, wrist and grip strength, core muscles, legs, and buttocks flexibility, To improve distance hitting, hit second base, third base, and home runs in the competition, to promote the team's compensatory success, the long-distance strike is critical How, functional training can systematically optimize the movement mode, core strength, power chain, grip strength, and other links through training There are more, this study improves the distance hitting study of college baseball players by studying functional training.

By incorporating functional training into their daily practice, college baseball players can potentially improve their long-range hitting abilities and overall performance on the field. In many sports, the amateur level at home and abroad and the level of professional elite sports training is functional training, functional training began to rise to sports medicine and sports training combined multidisciplinary cross background, in training plans, athletes, rehabilitation training, and other aspects began to functional training plan into the life of athletes, coaches. At present, functional training is still an emerging training research field at home and abroad, but functional training is mainly manifested in low space requirements, low equipment requirements, and high time freedom. The training methods are flexible and changeable, which can conduct functional training for athletes of different events and the same training stage and can conduct efficient sports training combined with multi-dimensional training methods to achieve training results (Yan, 2011). It makes functional training in various projects more frequent and in-depth, and also more in-depth and feasible. In terms of the functional training principle, it "pays attention to the basic posture of the body and the human movement mode, integrates various qualities of the body to optimize the most basic movement ability of the human body, and systematically optimizes the movement mode, spinal strength, power chain, recovery, and regeneration" (Juan, 2015). At the same time, with the continuous advancement of technology, functional training has been optimized and self-enriched for different training objects and training content.

Therefore, understanding the impact of functional training programs on distance hitting can contribute to enhancing the overall performance of baseball players. If specific training regimens prove effective, coaches and players can incorporate them into their routines to optimize hitting capabilities. Baseball is a highly competitive sport, and any edge gained through effective training can be a significant advantage. Researching functional training programs provides insights into techniques that can give university baseball players a competitive edge, potentially translating to better team performance.





In essence, investigating the impact of functional training on distance hitting for university baseball players contributes not only to individual player development but also to the broader context of sports science, coaching strategies, and the advancement of training methodologies in the field of baseball

## Objectives

### *Main objective*

To study the effect of functional training programs on the development of distance hitting for baseball players in university

### *Subsidiary Objectives*

1. To survey the problem of distance hitting in baseball players at university
2. To construct a functional training program to improve distance hitting
3. To compare the distance hitting before and after the test by the functional training program

## Literature Review

### *1. The Development History and Current Situation of Chinese Baseball*

Baseball was first introduced to China by American missionaries in the early 20<sup>th</sup> century. In some big cities, especially in coastal areas, baseball began to be popular in schools and universities, but it was not until the late 1980s and 1990s that baseball in the Chinese Mainland began to develop to a certain extent. During this period, China began to build baseball fields, cultivate baseball players, and gradually formed some amateur and semiprofessional baseball teams (Christian, et al, 1995). In 2002, China established the Chinese Baseball League (CBL), which was the first professional baseball league in China. Although the league is relatively small, it marks a new stage of development for Chinese baseball. During this period, the Chinese baseball team began to participate in more international competitions, such as the World Baseball Classic and Olympic Baseball Games. At the same time, China has also engaged in a series of exchanges and cooperation with baseball organizations from countries such as the United States and Japan. Although there has been some development, baseball is still a peripheral sport in China. Lack of sufficient attention, inadequate infrastructure, and immature talent cultivation mechanisms are the main challenges. As the current situation enters the 2020s, the development of Chinese baseball seems to have slowed down. Due to various reasons, including economic factors and the impact of the global pandemic, the influence and operational status of CBL are facing challenges. One highlight of Chinese baseball is the cultivation of young players. Some schools and clubs have actively promoted and trained at the youth level. Despite facing challenges, currently, taking the 2017 game data as an example, from July to August, a total of 44 college baseball teams participated in the National College Baseball Finals. But looking at baseball players from our country's universities around the world, according to our university baseball team, the level is still very low. From the team's hitting percentage, long hit rate, and home run data, it can be seen that the main problem is reflected in the distance hit distance. It is difficult to have more long hits and home runs in the game, resulting in the team being unable to score. The breadth and depth of research on Chinese baseball are not equal to those of the United States, Japan, and South Korea. The development of baseball and social attention to it, as well as to the United States and Canada, are much lower. Compared with research in the domestic baseball field, the speed, strength, sensitivity, and flexibility of functional physical training in baseball are crucial. From the data equipment of baseball training, foreign research



has reached a certain level in the functional research of each project. The rationality and research depth of functional training have also been confirmed in other projects. Chinese baseball still maintains cooperation with international baseball organizations, striving to learn and improve in management, training, and competition. Due to the reintroduction of baseball into the Olympic Games, this may bring new development opportunities for Chinese baseball. Although Chinese baseball started relatively late and its development speed is not as fast as some mainstream sports, it is still striving to find its positioning and development path in the Chinese sports field through international cooperation and youth training. The future development situation will largely depend on policy support, social attention, and the construction of infrastructure and talent training systems.

### 2. Distance hitting Training

For baseball players, distance hitting is a key aspect of baseball hitting technology, including significant strength and trajectory ability to hit the ball, and make it hit the ball to fly a consistent distance, this skill is the basis of the runners into the base. The swing base was divided into six phases (stance, stride, coiling, swing initiation, swing acceleration, and follow-through) by five key events (lead foot off, lead foot down, weight shift commitment, maximum front foot vertical ground reaction force, and bat-ball contact) (Ren (2015), mainly using the body's upper back muscles, wrist and grip strength, core muscles, legs, and buttocks flexibility, To improve distance hitting, hit second base, third base, and home runs in the competition, to promote the team's compensatory success, the long-distance strike is critical How, functional training can systematically optimize the movement mode, core strength, power chain, grip strength, and other links through training There are more, this study improves the distance hitting study of college baseball players by studying functional training.

### 3. Functional Training

Functional training (functional training) originated (Okada, et al, 2011) in the field of physical therapy and exercise rehabilitation in the late 20th century, and now it has been widely used in the fields of public fitness, exercise rehabilitation training, strength, and physical training. In China during the 2012 London Olympic Games introduced functional training, with the American athlete's functional institute (Athletes' Performance Institute, AP) academic exchange work, significantly improved the Olympic level athletes' physical training and competitive level, raised the domestic suspension and core training of a new round of physical training climax functional training. At present, there are some problems of lagging academic research in China, blind training practice, ambiguity in conceptual principles, and fuzzy theoretical cognition. This paper on the social and scientific development of the background as the starting point, through the functional training field of different training institutions and scholars, hold training concepts and methods, which objectively express the concept of functional training, explore the physiological mechanism, reveal its inherent nature, compare the difference with the traditional training mode, to the present functional training theory and practice framework. It is expected that while making up for the deficiency of the academic field of functional training, the paper should guide the practice of sports training scientifically and reasonably, accelerate the construction of the theoretical framework and discourse system of localized physical training, and quickly improve the overall level and performance of competitive sports in China.

Since the 21<sup>st</sup> century, the concept and method system of functional training has been widely promoted and applied in the fields of sports rehabilitation, strength, and physical training around the world. In the 20th century, the field of physical therapy experienced four periods of skeletal muscle, central nervous system, joints, and movement (Juan, 2015). In the late 1990s, with the transformation



of skeletal muscle or nervous system in movement disorders, the movement became a new direction of research. Orthopedic expert Gray (2011) took the lead in designing a screening system to predict exercise risk based on movement patterns. In 2001, Gray Cook first proposed the concept of "functional motion screening" in the book *High-Level Competitive Physical Fitness Training*. Since the beginning of the new century, the functional training concept and method system have been rapidly spread and applied in sports associations and commercial organizations led by the United States. In China, the General Administration of Sport of China organized experts to translate several academic works such as "Action-Functional Action Training System" (Gregory & Travis, 2016) and "Comprehensive Development of Competitive Ability Art and Science of Physical Function Training" (Zatsiorsky, et al, 2020); In 2010, the Beijing Institute of Physical Education established the first functional physical fitness training laboratory (Ren (2015), In September 2011, the Training Bureau of the General Administration of Sport of China established the "National Physical Function Training Team for the London Olympic Games" and signed the relevant cooperation agreement with the American AP organization (She, 2012); Subsequently, Shanghai, Beijing, Wuhan and other places have held different forms and levels of functional training academic conferences, Promoted its communication and application among the coaches of various project levels and the research institutions of scientific research institutes;

Beijing Sport University and Capital Institute of Physical Education have successively undergraduate majors and doctors awarding points in physical sports function training, which have strengthened the construction of disciplines and talent echelon. "The advent of a training methodology will certainly have a huge impact on the performance of human sports and in the competitive sports field, and this trend is functional training" (Li, et al, 2013). The innovation and rise of functional training concepts have a profound academic background. First, The trend of modern competitive sports events is increasingly professional, The competition system and the intensity of the year have increased dramatically, It puts forward demanding requirements on the limit of athletic level, continuous maintenance of athletes and one of the factors to prevent sports injury, The traditional sports training theory represented by structural strength training, large cycle training and excessive recovery theory is constantly being challenged and questioned, The Times call for the optimization and improvement of the old sports training theory and innovative training concept and method system (Komatireddy, et al, 1997); next, The functional motor training theory with the activation, recruitment and control of the neuromuscular system as the main line continuously makes up for the deficiency of the classical training theory in the fields of sports rehabilitation and competitive training; last, In the context of the strong promotion and promotion of American physical training institutions, represented by the NSCA National Physical Fitness Association, MBSC Mike Boyle Strength and Physical Training Center, and AP, Finally triggered the revolution of the concept of competitive sports training.

#### *4. Baseball hit the ball technique*

In baseball, hitting the ball is the most important offensive technique and one of the most interesting games. In different countries and regions, there are different styles and forms of competition. However, in the training session on the ability to hit the ball, the importance of the ball in the game and training is emphasized. Take Major League Baseball (Major League Baseball: MLB) Baseball League as an example, there is a special responsible coach to guide it. The coach trains the baseball players on technical problems such as hitting point, swing distance, swing speed, swing point, bat material, upper arm extension, arm extension range, turning speed, shoulder speed, and lower limb standing.





Rob (2017) in "Transfer of Training from Virtual to Real Baseball Batting", the VE system is used to collect the movement data of baseball in sports games, to achieve better training effects and economic level of athletes through functional training, and to improve the movement economy of baseball in throwing, hitting and running bases. Add functional training and a new form of. Ren (2015) in the "Baseball Sports Science Training Preliminary Exploration" research on the physical quality training process of baseball players. Through the intervention control experiment, around the baseball physical quality requirements, service technical and tactical ideas, develop a complete physical training plan to improve physical quality, and strengthen the effectiveness of baseball players hit and pitch. Sun, et al (2013) used the process of using the formula to maximize the power of the ball to the ball, which increased the speed of the ball. The energy transfer problem during baseball-hitting collision is analyzed from the kinetic perspective.

### Conceptual Framework

The conceptual framework for this research is as follows:

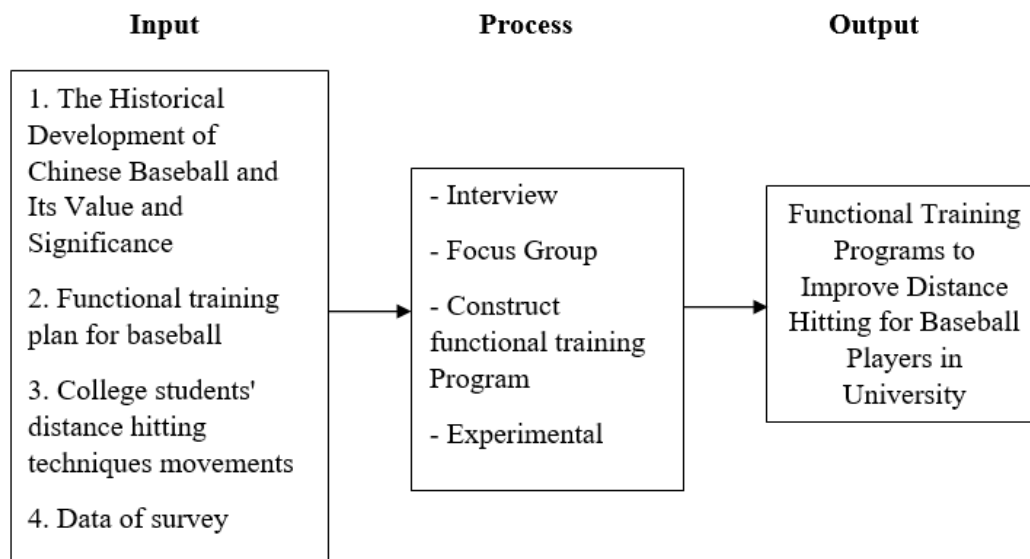


Figure 1: Conceptual framework

### Methodology

#### 1. Research Tools

1. Interview form; 2. Questionnaire (IOC value=0.914); 3. T-seat long-range hitting test; 4. Wand speed test; And 5 Specific Training programs developed by the researcher

#### 2. Population and Sample

1. Population: 60 baseball players from Guangzhou Sport University have received professional baseball training and are aged between 18 and 22.

2. Sample: 60 baseball players were included in the sampling criteria and underwent T-seat hitting distance and swing speed tests, respectively. Select 20 baseball players as the final sample. To implement the sampling method, we will test 60 baseball players in descending order of test scores and select the top 20 with the lowest scores. Then, we will invite these baseball players voluntarily and physically healthy individuals to participate in the experiment, with a total of 20 participants.

#### 3. Data Collection



1. Expert Interview Method: Distribute the survey interview to 5 experts to check the quality of the interview form (IOC value>0.914), A quality-tested interview questionnaire was used to interview 7 experts survey the problem of distance hitting in baseball players at university

2. Develop and refine training plans using focus groups to survey 5 experts

3. Experiment: The baseline-specific ability testing method is used to test the data of participants before functional training programs The training plan is based on weeks, a total of 8 weeks The training time is Monday, Wednesday, and Friday, with a total of three days and 120 minutes per session During the 8-week trial, there will be one test during week 4 After 8 weeks of functional training programs

4. Hitting distance and swinging speed tests were conducted on the subjects to collect data, and the first, second, and third test data were compared to draw experimental conclusions.

#### 4. Data Analysis

This study mainly used software packages to analyze the data.

1. One-way ANOVA was used to analyze the result of the pretest, after 4 weeks of training test and posttest.

2. Evaluate the content validity of the questionnaire through the utilization of the program validity analysis method, employing the indices of items of Objective Congruence (IOC).

3. Descriptive statistical techniques, such as computing the mean and standard deviation, are employed to analyze the data gathered from the questions.

4. Content analysis was used to analyze the data from focus group experts.

## Results

### 1. Conduct a questionnaire survey on the long-distance hitting and swinging speed of baseball players.

Table 1: Results of a questionnaire survey conducted on 5 experts

Assessment items	Expert ratings (5 in total)					IOC value	In the end
	1	2	3	4	5		
Swing speed	+1	+1	+1	+1	+1	1.0	
Throw and strike far away	+1	+1	+1	+1	+1	1.0	
T_ Sitting hitting	+1	+1	+1	+1	+1	1.0	
Rotating medicine throwing the ball	+1	+1	+1	+1	+1	1.0	
Weight	+1	+1	+1	0	-1	0.4	
Back Strength	+1	+1	+1	+1	+1	1.0	
Grip	+1	+1	+1	+1	+1	1.0	

(IOC = 0.914)

After interviewing 5 experts to find out about distance hitting problems, the researcher used various problems as the basis for creating a specific training program and 10 experts were consulted by focus group method on how to create a specific training program. The experts' opinions are summarized as follows: They unanimously agreed on the first, second, third, fourth, sixth, and seventh questions.



Only on the fifth question do the fourth and fifth experts have no different opinions, because on the issue of hitting distance, weight cannot represent the distance of hitting. Hitters can compensate for the impact of weight deficiency on hitting distance through hitting technique training, such as explosive power practice and swing practice. Therefore, the obtained IOC value is 0.914

Develop a specialized training program to improve the long-range hitting and swinging speed of baseball players.

The process of constructing the training program

To develop the outline of the training program by interviewing the experts and collecting the opinions of all the experts

Determine training objectives: Firstly, it is necessary to clarify that the training objective is to improve the baseball player's ability to hit and swing from a long-distance

Formulate the training program: According to the training objectives, formulate the training program, which includes the time of each training, training content, training intensity, and training volume Training is conducted 3 times a week, and the duration of each training session is about 120 minutes

Arranging training content: including basic movement training and small combination training It is necessary to choose the appropriate training content according to the attribute's ability and actual situation

Arrange training intensity and amount: During training, it is necessary to control the training intensity and amount appropriately to avoid excessive fatigue. Generally speaking, each action or exercise needs to be divided into 2-3 groups, with each group repeating 10-20 times, with an interval of 1 minute to 2 minutes between each exercise.

Evaluation and adjustment: During the training process, it is necessary to regularly evaluate the training effectiveness and make appropriate adjustments based on the evaluation results. For example, if the swing speed is insufficient, the proportion of fast-hitting training can be appropriately increased; If insufficient hitting power is found, the proportion of strength training can be appropriately increased.

## 2. Results of constructing a training program

### 2.1. Elements of distance hitting

The key skills of hitting the ball and hitting the ball far are divided into six stages (standing, stepping, coiling, swing start, swing acceleration, and completion) and five key items (front foot off, front foot down, center of gravity transfer, maximum vertical ground reaction force of front foot, and hitting contact). The necessary physical abilities for hitting training include leg strength, core strength, hip joint strength, back strength, shoulder strength, forearm strength, chest muscles, Flexibility in the legs and buttocks, and wrist and grip strength, which are composed of various indispensable technical movements, are important elements for specialized practice in various parts of the body, and can lay the foundation for future hitting distance.

Table2: Classification and Content of Baseball Hitting Techniques and Abilities

Batting action	Stand, step, coil, swing start, swing
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Foot movements	Leaving the front foot, lowering the front foot, shifting the center of gravity, and maximum vertical ground reaction force of the front foot
Swing a stick	Swing trajectory, extend the stroke
SKILLS	Swinging speed, hitting, and flying distance
physical ability	Leg strength, core strength, hip joint strength, back strength, shoulder strength, forearm strength, chest muscles, leg and hip flexibility, wrist and grip strength

From Table 2, the researcher sent the above information to 10 experts for the study and the result was that 10 experts unanimously approved this training content, which can be used as the training content for this experiment.

## 2.2 Developing a training program

The guidance content of the 15 experts is to construct a training plan for hitting long, which mainly focuses on hitting training and functional training as auxiliary training. The focus is on improving hitting techniques, such as swing speed, hitting accuracy, hitting angle, and hitting stability. Improving swing speed can be achieved through vertical throwing, oblique throwing, rapid throwing, and single-handed hitting exercises in striking training. The training intensity should not be less than 3 times a week, and each time should not be less than 90 minutes of training. In the hitting training cycle, functional training can be added to assist with hitting exercises in the middle stage, such as back muscle training, bench press training, leg training, wrist strength training, etc. The training intensity can be controlled at medium intensity, and in the later stage, long-range hitting can be the main training goal.

The training plan is divided into four stages. The first stage is from September 1 to September 14, 2023, which is mainly the basic training stage of upper limb hitting movements and adjusting swing routes. The second stage is from September 15 to September 30, 2023, which is to improve the basic hitting skills and hitting strength, and further improve the long-distance hitting skills of the first stage. The third stage is from October 1st to October 15th, 2023, to strengthen the strength of various parts of the body required for hitting skills, laying an important foundation for long-distance hitting. The fourth stage is from October 15 to October 31, 2023, mainly to improve the basic skills and techniques for mastering long-range strikes in the first three stages.

Table 3: Training Program

Training time	Training purpose	Training content
Phase I September 1- September 15, 2023	Mastering the essentials of basic kung fu movements	Training time: 120 minutes Warm-up: 10 minutes Basic training: 90 minutes Relaxation: 10 minutes Flexibility: 2 sets of 8-10 reps of each exercise, 30 seconds rest between sets. Shoulder exercises Leg exercises Waist exercises



Training time	Training purpose	Training content
		Straight Swing Legs Flexion Legs Steps Sleight of hand Agility: 5 sets of 2 repetitions of each exercise with 30 seconds rest between sets. Jumping Balance Small Combination Training
Phase 2 September 16 - September 30, 2023	Ability to improve flexibility and agility	Training time: 120 minutes Warm-up: 10 minutes Basic training: 90 minutes Relaxation: 10 minutes Flexibility: 3 sets of 10-15 reps for each exercise, 30 seconds rest between sets. Shoulder exercises Leg exercises Waist exercises Straight Swing Legs Flexion Legs Steps Sleight of Hand Agility: 5 sets of 3 repetitions of each exercise with 30 seconds rest between sets. Jumping Balance Small Combination Training
Phase 3 October 1- October 15, 2023	Refinement of various technical movements in basic skills	Training time: 120 minutes Warm-up: 10 minutes Basic training: 90 minutes Relaxation: 10 minutes Flexibility training: 3 sets of each exercise 10-25 reps per set, 1 minute rest between sets Shoulder exercises Leg exercises Waist exercises Straight Swinging Legs Flexing Legs Agility: 2 sets of 3 repetitions of each exercise, 30 seconds rest between sets.
Phase 4 October 16th - October 31st, 2023	Consolidate and improve the quality of completion of Wushu Taolu movements	Training time: 120 minutes Warm-up: 10 minutes Basic training: 90 minutes Relaxation: 10 minutes Flexibility training: 2 sets of each exercise 12-30 reps per set, 1 minute rest between sets Shoulder exercises Leg exercises Waist exercises Straight Swing Legs Flexion and Extension Legs Agility: 2 sets of 2 reps of each exercise, 30 seconds rest between sets Footwork Jumping Balance Small Combinations



Training time	Training purpose	Training content
Phase I September 1st - September 14th, 2023	Mastering the basic elements of hitting the ball	Swing training: Single-handed swing (front and back hands) (20-30 times per group, 2 groups in total, with a 5-minute interval between each group) Hitting training: T-seat hitting, objective throwing hitting, single-handed hitting training (15-20 times per group, 3 groups in total, with a 3-minute interval between each group)
Phase 2 September 15th - September 30th, 2023	Strengthen the ability to improve hitting techniques and hit rates	Hitting training: throwing (objective throwing), T-seat (30 times per group, 3 groups in total, with 5-10 minutes intervals between each group) Leg training: Forward step stretching training, leg lifting, sliding, and step stepping (20 times per group, 3 groups in total, 3-5 minutes apart) Wrest training: grip strength training, barbell bar training (30 to 50 times per group, 3 groups in total, with 3 minutes interval between each group)
Phase 3 October 1 - October 15, 2023	Special strength and swing speed required to improve hitting ability	Body strength training: hip joint strength training, back strength training, forearm strength training, core strength training, bench press training, rotating medicine throwing ball, leg and hip flexibility (15-30 times per group, 3 groups in total, with an interval of 3-5 minutes)
Phase 4 October 15th - October 31st, 2023	Consolidate and improve the quality of baseball hitting ability	T-seat long-range hitting training, grouping throwing and hitting long-range training (30 times per group, 3 groups in total, with 8–10- minute intervals between each group)

The training is divided into four stages. The first stage, from September 1st to September 15th, 2023, is the basic training stage for mastering hitting. The second stage is from September 16 to September 30, 2023, which is a stage to improve baseball hitting skills and hitting accuracy, further increasing the difficulty of basic training for baseball hitting in the first stage. The third stage is from October 1st to October 15th, 2023, to improve the strength and swing speed required for baseball hitting ability. The fourth stage is from October 16 to October 31, 2023, mainly to consolidate and improve the quality of baseball hitting ability and improve the basic skills and technical movements mastered in the first three stages.

### 3. Comparison results of long-distance hitting and swinging speed of baseball players before and after specialized training.



The research results indicate that functional baseball training can effectively improve the swing speed and hitting distance of 18-22-year-old baseball players. There was no significant difference in the test results of swing speed and hitting distance between 18-22-year-old athletes before training. Functional training has a positive impact on the swing speed and hitting distance of 18-22-year-old athletes.

Long-distance hitting test: Before, during, and after training, use a tape measure and T-seat to test the subject's ability to hit the ball from a distance, collect data, and analyze it for data comparison.

Swinging speed test: In the swinging speed test, there is a need for a speed-measuring device. The subjects need to face the speed-measuring device and maintain a distance of 5 meters. They need to use the full swing test three times to record their best results. Before and after training, the best results of the testers are recorded, and the data is compared and analyzed.

Table 4: Single factor analysis of variance for T-seat hitting

Clusters	T-seat hitting	F Inspect		Multiple comparisons
		F	P	
Pre-test	52.85±11.59	263.70	0.000	pre-test > measurement > post-test
Mid-test	58.95±11.45			
Post-test	67.00±11.71			

From the results in Table 1, it can be concluded that after the experimental intervention, there is a significant difference in the pre-test, mid-test, and post-test of T-seat hitting, with  $F=263.70$  and  $P<0.000$

Table 5: Single factor analysis of variance for swing speed measurement

Clusters	Swing bat speed kph	F Inspect		Multiple comparisons
		F	P	
Pre-test	78.65±11.78	193.17	0.000	pre-test > measurement > post-test
Mid-test	86.95±11.76			
Post-test	93.95±13.53			

From the results in Table 3, it can be concluded that after the experimental intervention, there was a significant difference in the pre-test, mid-test, and post-test results of the swing rod velocity test, with  $f=193.17$  and  $P<0.001$

## Conclusion

The research results indicate that functional training in baseball can effectively improve the swing speed and strike distance of 18-22-year-old baseball players. There is no significant difference in the test results of swing speed and strike distance before training for 18-22-year-old athletes. Functional training has a positive impact on the swing speed and strike distance of 18-22-year-old athletes,



Among them, the performance on strike distance is the most significant, reflecting the positive role of rod speed and strike distance development. The results indicate that functional training in baseball has a positive impact on the development of athletes' bat speed and hitting distance.

In baseball training, hitting training is a crucial component, and effectively improving the level of basic skills training can greatly help athletes improve their hitting distance.

The developed baseball functional training program has a positive impact on the development of baseball speed and hitting distance for 18-22-year-old athletes.

Using functional baseball training as a means to improve the hitting skills of 18-22-year-old athletes. It has a significant improvement effect on the physical fitness of athletes, with the most significant improvement in bat speed and hitting distance.

## Discussion

The research results indicate that functional training in baseball can effectively improve the swing speed and strike distance of 18-22-year-old baseball players. This is consistent with the research results of Sun, et al (2013) they used the process of using the formula to maximize the power of the ball to the ball, which has increased the speed of the ball. The energy transfer problem during baseball-hitting collision is analyzed by the kinetic perspective.

The results indicate that functional training in baseball has a positive impact on the development of athletes' bat speed and hitting distance. In baseball training, hitting training is a crucial component, and effectively improving the level of basic skills training can greatly help athletes improve their hitting distance. This is consistent with the research results of Rob (2017) In "Transfer of Training from Virtual to Real Baseball Batting", the VE system is used to collect the movement data of baseball in sports games, to achieve better training effect and economic level of athletes through functional training, and to improve the movement economy of baseball in throwing, hitting and running bases. Add functional training and a new form.

In summary, hitting distance has a crucial impact on the game in baseball. Increasing the hitting distance will help the team gain an advantage in the game. Therefore, baseball players and coaches must attach importance to the training and research of hitting techniques. By increasing the hitting distance and improving the level of competition, we contribute to the development of baseball in China.

## Recommendations

### *Recommendation for this research*

Proposal Baseball has developed very rapidly in China, and in the Asian region, we are among the top four strong teams. However, looking at the world, China's baseball level is still at the middle level, with high room for progress and potential to be explored. The Asian strong teams Japan and South Korea have a very strong group foundation and professional systematic training, including specialized training for hitting ability, Therefore, personal training should be strengthened to enhance athletes' basic skills, including swing speed, accuracy, and strength, to improve their hitting distance.

1. Pay attention to physical reserve: Strengthen physical training, improve athletes' endurance and explosive power, and provide motivation for hitting long-distance balls.

2. Develop targeted tactics: Based on the opponent and the situation on the field, develop reasonable tactics to increase the hitting distance.





3. Introducing technology-assisted training: Utilizing modern technological means, such as biomechanics and sports psychology, to provide personalized training plans for athletes and improve hitting distance.

4. Improve the selection and incentive mechanism: Select potential young athletes and give them certain rewards to stimulate their motivation to improve their hitting distance.

5. Strengthen domestic and international exchanges: learn from advanced training concepts and methods from abroad, improve the level of baseball in China, and increase the hitting distance.

In short, improving the hitting distance is a key link in improving the level of baseball in China. Strengthening basic skills training, developing targeted training plans, and introducing technology-assisted training, are expected to improve the hitting distance of Chinese baseball players in a short period, contributing to the prosperity and development of China's baseball industry.

#### *Recommendation for further research*

1. The sample size of the research is small. Even though he's a baseball player. But the group of athletes should be expanded to a larger size. More comprehensive to make the experimental results more scientific and reliable.

2. This research is experimental. Data collection or numerical analysis uses only basic statistics. It may affect the accuracy of data analysis. Therefore, in the future, it is recommended to increase the sample size. Collect data from many aspects Compare data by sample group.

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