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IMPROVING FOREHAND AND BACKHAND SKILLS USING GTS EXERCISES IN JUNIOR ATHLETES AGED 12-14 YEARS

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Abstract

This study aims to determine the effect of GTS training given on the increase in groundstroke stroke in tennis athletes with a focus on 12–14 years old. The research conducted was a quantitative method with quasi experiments with pre-test and post-test non-equivalent to control the group design. The respondents of this study were tennis athletes aged 12-14 years totaling 28 people. They were divided into two groups, of which 14 respondents were in the experimental group. Meanwhile, the control subjects amounted to 14 people. The research instrument used was the Groundstroke hewwit tennis achievement test. The data was analyzed with the SPSS 26 application. The results showed that the value of t = 6.03, df = 13 and its significance (2 tailed) or p-value = 0.000 < 0.05. Thus, the statistical descriptive results with 14 experimental subjects showed an average of 46.96, and after being given the post-test treatment, the results showed an average of 55.86. This shows that descriptively a difference was obtained before and after the treatment. Thus, the average descriptive statistical result in 14 control subjects was 42.86, and after being given the average post-test result was 43.71 This shows that descriptively the difference was obtained before and after the treatment. Therefore, it can be confirmed that the GTS exercises provided are effective in improving the groundstroke ability of junior tennis athletes aged 12-14 years.

INTRODUCTION

To achieve an achievement is not easy because achievements will be realized if there is cooperation between the government, the community, and supporting elements in the development of the athletes themselves. National sports coaching can run as well as possible, important components are needed in addition to the identified coaching paths. The components in the national sports coaching system are: (1) objectives, (2) management, (3) manpower factors, (4) athletes, (5) facilities and infrastructure, (6) program structure and content, (7) learning resources, (8) methodology, (9) evaluation and research, and (10) funds (Harsuki, 2012:37). This opinionshows that to achieve sports achievements, it is necessary to have directed cooperation and also pay attention to all related aspects that support the achievement of achievements, such as: training that is carried out systematically and directionally, implementing training programs, paying attention to training principles and training methods used during the training process so that everything is achieved well.

Mastery of good basic techniques is an important part of tennis because without good basic technique skills, it is clear that tennis athletes will not have good achievements. Basic techniques are all underlying activities so that with such capital athletes can compete. Athletes are generally very focused on how they complete tasks, and therefore should not utilize the movement techniques they are used to in a training session or match. (Goyena, Fallis, 2019) explained that in court tennis, mastery of stroke techniques is very important to be able to play well and mastering good techniques can save and streamline the use of movements.

The basic techniques in court tennis include groundstroke (Forehand and Backhand) Servicing and volleys. The techniques mentioned are very important techniques in court tennis. Seen in the video of the 2023 Wimbeldon match some time ago in the final between Novak Djokovic and Carlos Alcaraz, the above techniques dominated throughout the game. For service hits, of course, they continue to be done at the beginning of the game and every time after the point is earned. It is calculated that the two players made a Groundstroke for the first game alone 30 times, namely forehand 13 times, the blow Backhand 17 times, it can be seen here that the blow groundstroke is the most commonly used stroke, the Groundstroke is also one of Alcaraz's weapons in winning matches. From the video that has been seen, at least half of all tennis shots are Groundstroke. This punch is often used as a blow to attack (Attacking) for top players. Groundstroke is a blow after the ball bounces off the court. Hitting must be done as best as possible so that the resulting punch is accurate. Forehand and backhand groundstrokes are important skills for successful players (Campbell et al., 2016). Blow groundstroke is one of the most dominant strokes in court tennis, so the application of accuracy to these strokes is necessary to win the match. In Tennis groundstrokes is essential components to be successful (Johnson & McHugh, 2006).

Basically, there are two types of groundstroke strokes, namely: forehand and backhand groundstroke. Groundstroke is said to be more accurate when the ball hit reaches the opponent's baseline, the ball will be more difficult for the opponent to receive. Indeed, to win a tennis match, it is not only determined by the mastery of the groundstroke technique, but also supported by the mastery of other hitting techniques such as: service, volley, and smash, but the mastery of the groundstroke A good one can give a big point in winning the match. In the implementation of the groundstroke technique, we can use topspin. Topspin is a type of spin that is done on the ball when it is hit. This causes the ball to spin forward, creating an upward force that makes the ball dive down, causing it to fall sharply and suddenly. This type of spin is used to produce a ball with a high bounce that is difficult for the opponent to return.

Groundstroke is a forehand or backhand shot that is hit after the ball bounces once on the court. It is one of the core fundamental strokes in tennis and is usually played from the back of the court during baseline rallies. However, groundstroke can be played from anywhere on the court as long as the tennis ball bounces. So approach shots taken from the middle of the court (around the service line) or even closer to the net are still considered groundstroke. Groundstroke It is a crucial technique that is carried out by swinging the racket to produce a controlled hitting force with a target that has high accuracy, against the ball bouncing off the ground. Groundstroke can be done through forehand or backhand force on the side of the body. (Suprunenko, 2021).

Groundstroke consists of two words Ground and Stroke. Ground What is meant here is land and Stroke is a blow. According to (Brown, 2013) groundstroke is "A stroke made after the ball bounces off the playing field". Based on the above opinion, it can be concluded that: groundstroke is a blow that is made right on target after the ball hits the ground. To achieve a high-speed groundstroke with adequate accuracy is one of the fundamental requirements for the development of modern tennis athletes (Landlinger et al., 2010).

In the execution of the Groundstroke punch, there is a term Topspin. Topspin It means forward rotation, where the racket swings forward and rubs against the tennis ball from bottom to top then causes the tennis ball to rotate from back to bottom to front to top.

(T. Huang & Gao, 2023). Blow Topspin, which involves the forward rotation of the ball after a collision, is desired by players of all levels because it provides a greater margin for vertical errors (i.e. the ball moves higher over the net) while also increasing the likelihood of the ball bouncing off the opponent's court.(Vaverka et al., 2018). Topspin shots, the racket is moved first downwards, then upwards until the ball hits. (Blache et al., 2017) Although topspin is the most effective method of controlling the ball on the court, recreational players will usually learn to hit the ball flat first before they learn topspin. Topspin is generated on the ball by the racket following a low-to-high swing path (wrist abduction) through the impact zone (Rigozzi et al., 2023).

Groundstroke Backhand is a type of stroke in the game of tennis that is hit after the ball bounces first on the court and is hit from the left side for those holding the racket with the right hand, and from the right side for the person holding the racket with the left hand. (Genevois et al., 2014) The backhand is one of the two basic strokes in tennis and can be played with one or two hands, with a topspin or a backspin. Although the derivatives are diverse, the scientific literature describing the production of the groundstroke backhand has not been reviewed as extensively as it is the serve and forehand.

(Pat, 2018) A backhand in tennis is the other of the two types of groundstroke. It can be a one-handed and/or two-handed stroke. Like the forehand, the basic swing pattern starts on one side of your body, moves forward and across, and ends on the other side of your body. But unlike the forehand, the backhand is hit with the back of your dominant hand facing the direction of the stroke. Backhand In tennis is one of the two basic types of styles. This can be a one-handed and/or two-handed punch. Like forehand, a basic swing pattern starts on one side of your body, moves forward and crosses, and ends on the other side of your body. However, unlike the forehand punch, the backhand punch is done with the back of the dominant hand facing the direction of the punch. In all forms of competitive play, including professional tennis, backhand strokes are played less frequently than forehand strokes (Johnson & McHugh, 2006).

This imbalance also goes beyond the rally test of young novice players, where ((Le Noury et al., 2021) Reports such players prefer to hit the forehand rather than the backhand. Continued According to (Irawadi, 2009) "At first, doing a blow Backhand relative more difficult compared to forehand, this is because the ball must be hit by the back or left hand". In this case, the cause is inaccuracy in handling the racket (grip). This adds to the difficulty factor in doing Backhand. If we can choose the right handle, then the blow Backhand It can be done without experiencing any significant difficulties. In the process of a two-handed backhand slap: The angle of the shoulders and hips should be controlled 43.936° behind the hip joint line at the end of the throwback swing moment, and at 18.370° before the hip joint line at the time of the blow. And the coordination ability of latissimus dorsi and obliquus externus abdominis must be improved.

This can provide benefits for the optimal formation of shoulder and hip angles, and facilitate the release of torso energy rotation, and then generate rapid swing speed.(Lin & Li, 2011). (Muhamad et al., 2011) With a one-handed backhand, it is also difficult to perform extreme topspin shots and short cross-court shots. (Human & Committee, 2021) A backhand shot with one hand leads to greater speed after an impact because a greater force is applied by a flatter racket stroke with less topspin. In contrast, a double hand has less range, is slower in applying slice punches and less variety of

punches (Muhamad et al., 2011). Whether a player is hitting a two-handed backhand shot or not, a slice shot is an important shot that every tennis player must have (Johnson & McHugh, 2006) In comparison, a double-handed backhand handles high and fast balls more easily and can perform extreme topspin and cross-court shots effectively.

One of the things related to the Engineering training that has been proven above is movement related to motor skills. The classification of motor skills is reviewed based on the precision of movement, which can be divided into two, namely: gross motor skills and fine motor skills (Lovric et al., 2019). Gross Motor Skills. Gross motor skills are motor skills that involve large muscles as the main movers. Gross motor skills are related to the large and wide use of muscles in the body (Matheis & Estabillo, 2018). For example, running, jumping, hitting and so on. Gross motor skills are related to the magnitude and breadth of use of muscles in the body.

These skills usually involve the entire muscles of the body, so almost all sports skills can be considered a group of gross motor skills. Based on the reality in the field, among sports activities that have gross motor skills, there are activities that are subtle, such as self-adjustment time (timing) for movement accuracy. The fine movement is a continuous series that also supports gross movement skills, but the special characteristics of gross movement skills related to large muscles still dominate this activity.

While fine motor skills. Fine motor skills are movement skills that involve fine muscles as the main driver. For example, the skill of pulling the trigger of a rifle, the skill of releasing arrows in archery and so on (Matheis & Estabillo, 2018). Fine movement skills are more indicative of the quality of soft movement. In this movement, body activity is more limited to the accuracy of responses from various stimuli. One of the keys to the success of fine motor skills is determined by neuromusculer coordination, especially for movements related to precision and often linked to hand-eye coordination. This fine motor skill sometimes occurs purely in the form of fine motor skills such as playing the guitar, typing and so on. But it is not uncommon for it to also appear on the sidelines of gross motor skills, such as what happens in beautiful jumps, rhythmic gymnastics, and so on. To be able to have good motor skills, it is very necessary to have training.

Training is a systematic sports activity over a long period of time, gradually and individually, aiming to form human beings who function physiologically and psychologically to meet the demands of the task (Bompa & Buzzichelli, 2019). Training is a process by which an athlete is prepared to achieve the highest level of performance possible (Smith, 2003). The ability of a Trainer to direct performance optimization is achieved through the development of a systematic training plan that utilizes knowledge gathered from a variety of disciplines, The training process targets the development of specific Training objectives that correlate with the execution of various tasks (Kamen & Roy, 2000). Some coaches suggest that the optimal age to start training is between 5-9 years old (Ang, 2014).

Exercise is a systematic training process that is carried out repeatedly whose purpose is to prepare for a sports match, to achieve the highest level of readiness for an athlete, because of the specificity of competitive activities and to ensure the achievement of the planned sports results. (Normatovich & Teacher, 2022). Exercise can be defined as a systematic exercise activity over a long period of time, progressively enhanced,

and individual that leads to the characteristics of human physiological and psychological functioning for a predetermined goal. Exercises must be done regularly, systematically, repeatedly and there is always a gradual increase in weight. The purpose of the exercise is to improve the skills and work capacity of athletes to optimize the athletic performance. The training is carried out over a long period of time and involves many physiological processes, psychological variables, and sociological ones. (Bompa & Buzzichelli, 2019).

So based on the opinion of the expert, it can be explained that training is a systematic process of practicing or working repeatedly in improving the quality of movement consciously to achieve maximum achievement. Training carried out by preparing the program well and providing training levels according to the player's ability will have a good impact on improving the skills of athletes, to achieve training, there must be commitment and cooperation from various parties, such as the coaching community, clubs, and governments, to use the network so that training can be carried out effectively (Arisman et al., 2024)

The current research is concerned with Exercises that can improve groundstroke skills in tennis for junior tennis athletes. In this study, the researcher took 12-14 years old. The age of 12-14 years is an age with quite high growth and this is the right time to develop physical abilities. (Havel & Hnizdil 2010) suggests that a positive trend in increased reaction time is possible to be observed at the age of 15, and after that age a period of stabilization of reaction time follows. However, what should be concerned is that excessive childhood/adolescent special training can hinder the long-term development of athletes through excessive injuries, fatigue, suboptimal athlete-sports competitions, and limiting long-term learning capital.

In contrast, the childhood/adolescent multi-sport training performed by world-class adult athletes with reduced primary sports training implies a relatively resource-saving, cost-reducing and risk-buffering pattern that results in greater sustainability and training efficiency in the long run (Barth et al., 2022). (Wylleman & Rosier, 2016) Identify that teenage athletes at the age of 12-14 are already starting excessive training and competition and that they will make the transition from junior to senior level at the age of 18-19, usually coinciding with the start of their undergraduate studies.

The importance of understanding and assess the needs of their junior athletes such as their ability in problem-solving skills, then and the resources available to provide empirical evidence, which can help build a tailored support system/service for the junior athlete. This will later be related to fatigue issues, psychological stress, and injuries associated with increased demands in sports (López-Flores et al., 2021).

A number of studies have explored the physical characteristics of junior athletes in various sports. (Janel S. Bailey, Rachael Irving, 2019) highlighting the importance of maintaining optimal body composition in junior athletic athletes, with changes in muscle characteristics potentially affecting performance more than changes in body composition. (Pluta et al., 2021) Identify the impact of anthropometric measurements on the physical fitness of junior tennis players, with boys achieving higher scores across most variables. (Zanini et al., 2020) revealed the relationship between body fat percentage and agility and explosiveness in junior football players.

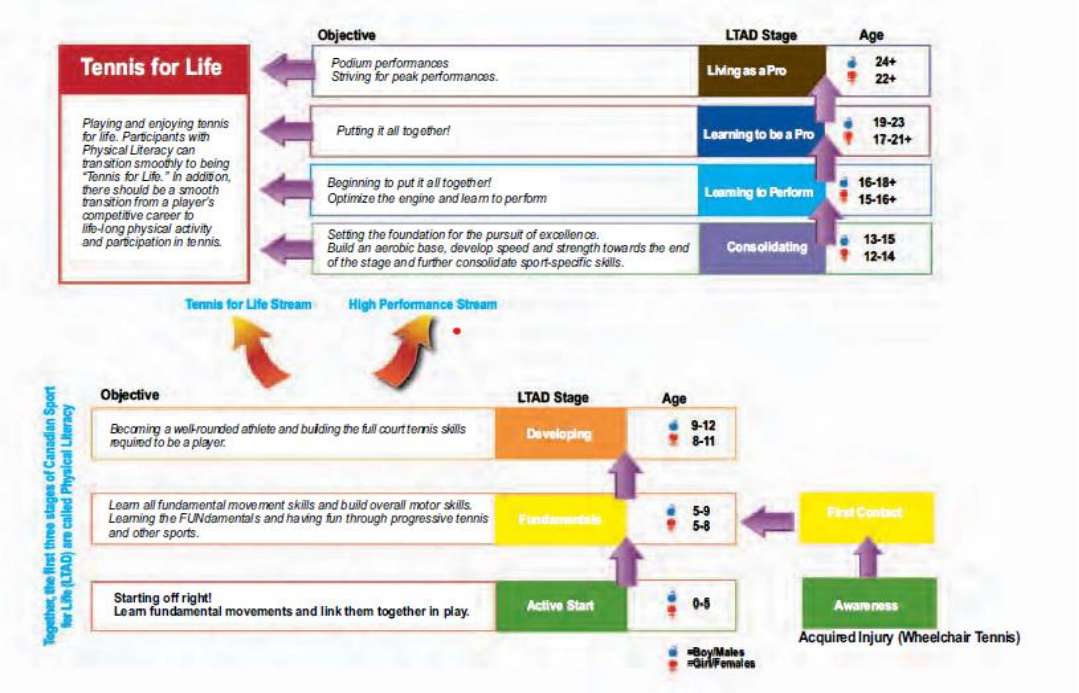

Figure 1: Tennis Canada Long Term Athlete Development Model

(Novick et al., 2008)

It can be seen from the picture above that at the age of 12 – 14 years old, which is categorized as a junior age group in tennis, is at the stage Conditioning and learning to perfume. This indicates that it is very important at that age that the athlete is given good skill training according to his needs. Therefore, what will determine the athlete will continue to the stage learning to be Pro or not. These studies collectively underscore the importance of a balanced physical profile, including body composition, muscle characteristics, and specific physical capacity, in the development of junior athletes. Junior athletes are athletes who are in a transition period from childhood to adolescence. To achieve the target of learning skills at that age, of course, a coach must master growth and development. In court tennis, the junior age is the age group of 10 years to 16 years old (Myburgh et al., 2016). The character characteristics of these junior athletes include a transition period. (Bompa, Carrera, 2015) stated that athletes who are 12 – 14 years old are the beginning of children to participate in the formation period. Next (Hummel et al., 2011) states that athletes aged 12 – 14 years are athletes who are included in the sports formation stage.

Where the sports formation stage is a follow-up stage of the initiation stage, namely the stage of forming skills in certain sports branches according to the talents owned. (W. H. D. Huang & Tettegah, 2010) put forward several characteristics of the growth and development of children aged 12–13 years: 1) Entering the transition period from child to pre-adult, women are usually more "mature" (mature) than men, but men have better endurance and strength; 2) Rapid and irregular body growth, often, causes the balance of the body to be disturbed because the movements tend to be stiff; can practice until tired; 3) Increase the success of the group/team more than individuals, prefer games and matches that use official rules and are more organized, want to be recognized and accepted as a member of the group; 4) There is an interest in activities that can improve their abilities and skills and there is an interest in physical exercise; 5) Enjoys participating in active recreational activities, there needs to be guidance and

supervision in their association with the opposite sex; 6) Self-awareness begins to grow as well as emotions; although it is still less controlled and always seeks the consent of adults; 7) Concern for democratic procedures and groups: the less it can accept the attitude of authority and autocracy of other goods. (Mussen et al., 2015) Age period of 13-14 years: 1) Rapid body growth continues, women are generally taller and heavier than men; 2) The muscles begin to appear to develop, but the coordination of movements is generally still poor; 3) There is sexual tension, the more interest in physical activity grows; love of perfection in appearance, love to experiment and be creative; 4) Prioritizing group activities (alleys) over individual activities; loyalty to a very prominent group; 5) This is a difficult period for the child to adjust to his surroundings (Social Adjusment) men and women have different interests; 6) Less stable in solidarity; have idols such as teachers and older friends; Emotions change, wanting to be free does not want to be dictated.

Next (Homer et al., 2012) stated that the age period of 12–13 years children can: 1) Improve skills in activities that use big muscles, running, jumping, throwing and others; 2) Involve yourself in various team games, improve coordination and overcome movement stiffness; 3) Continue skills in sports that use big balls (basketball, volleyball, soccer) and small balls (kasti, roundes); 4) Improve proficiency in sports, hitting the ball with rackets (tennis, badminton, table tennis); 5) Various skills, floor gymnastics as well as with tools (wandrek-aligned bar pingbooks, balance beams, benches and so on); 6) Various athletic numbers to improve coordination, speed, strength (start, sprint up to 50 meters, long jump, high jump, jump jump, relay, throw ball).According to ((Balyi et al., 2020)) children aged 12-14 years enter the training phase to practice (Train to Train). Rapid child growth occurs in this phase. The right and interesting training given to children aged 12-14 years has a big role for the development and quality of the abilities and technical skills that he has. Therefore, in this research plan, the author will take athletes aged 12-14 years. Reported that training 12-year-old tennis players based on real tennis game situations together with motor skills development at the same time can be an instill simple tactics and strategies in improving the trainee's knowledge (cognitive) and abilities skills (Ngatman et al., 2023). This explanation corroborates that the basis of training for 12-year-old tennis players based on real tennis game situations along with the development of motor skills on the court can also instill simple tactics and strategies in improving the trainees' knowledge (cognitive) and ability (skill).

METHOD

Research method is a scientific way of searching and obtaining data related to procedures in conducting research and technical research (Putra et al., 2021) Research methods include both things namely, research procedures and techniques (Putra et al., 2024). This study uses a research method with a pseudo-experimental design where there is a control group that does not fully function to affect the implementation of the experiment. This design aims to describe the results of pre-test and post-test tests in the control group and experimental group. In this stage of the effectiveness test, forty-four (28) athletes were used as respondents, consisting of fourteen (14) subjects in the experimental group and fourteen (14) subjects in the control group. This study used two groups, the first group was given treatment A (GTS Training Model Grant) and the second group was given treatment B (not given GTS Model). Both groups were tested first before being given treatment. Then a post-test

is carried out after being given treatment. In this study, tennis athletes aged 12-14 years old who practice in several clubs in West Sumatra include HITEC Tennis Club, Semen Padang Tennis Club, Payakumbuh Flamboyan Tennis Club. The research was conducted in 12 meetings. The research subjects were 28 people from both groups.

RESULTS AND DISCUSSION

After carrying out a series of processes to develop the design of this exercise model, it is necessary to test whether this exercise model is effective or not in improving the Groundstroke technique. The results of this effectiveness test will provide researchers with a conclusion that the model that has been designed is feasible or not feasible to be implemented on athletes.

In this effectiveness test, the researcher used a research design using a pretest-posttest control group design, meaning that there were two groups involved in this study, namely the experimental group and the control group, where all groups in this effectiveness test used athletes in several tennis clubs. The experimental group consisted of 14 athletes and the control group consisted of 14 athletes. Each group was given different treatment, where the experimental group was given a designed Groundstroke training model, while the control group used a conventional training model, where in the control group the researcher completely handed over the training process to the coach in that group. This effectiveness test will be carried out in February-March 2024.

Before the treatment or treatment was carried out both in the experimental group and in the control group, the researcher first conducted an initial test on all subjects using an instrument test that had been made based on the results of expert tests, validity tests and reliability tests. After that, give treatment as many as fourteen meetings in accordance with the Treatment Plan that has been made and based on the scope of the material provided. After giving the treatment, at the end of the meeting, the researcher conducted a final test on all groups, both the experimental group and the control group with the same instrument test as in the initial test. The following are the results of the pretest and posttest in each group can be seen in the following table:

Table 1: Descriptive Results of Pre and Post Test Data

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Pre-Test Experiment	14	33	58	46.96	8.101
Post-Test Experiment	14	48	62	55.86	4.589
Pre-Test Control	14	34	49	42.86	4.538
Post-Test Control	14	35	51	43.71	4.795
Valid N (listwise)	14				

The data in the table above can be used as a reference for researchers to test the effectiveness of the designed exercise model. As is known, the minimum pre-test score of the experimental group is 33 while the maximum score is 58 with an average score of 46.96 and a standard deviation of 8.101; Then it was known that the minimum post-test score of the experimental group was 48 while the maximum value was 62 with an average of 55.86 and a standard deviation of 4.58; Furthermore, it is known that the minimum pre-test score of the control group is 34, the maximum value is 49 with an average of 42.86 and a standard deviation of 4.53; It is also known that the minimum post-test score of the control group is 35, the maximum score is 51 with an

average of 43.71 and a standard deviation of 4.79. Before determining the effectiveness test of the designed exercise model, there are several analysis requirements that the researcher conducts, namely the data normality test and the data homogeneity test.

Normality Test

Based on the results of the Shapiro-Wilk normality test after being tested, the results were normally distributed due to the significance value (Sig. > 0.05). As explained in the following Table.

Table 2: Data Normality Test

Tests of Normality							
	Class	Kolmogorov-Smirnova			Shapiro-Wilk		
		Statistics	Df	Sig.	Statistics	Df	Sig.
Groundstroke Results	Pre-Test Experiment	.107	14	.200*	.948	14	.536
	Post-Test Experiment	.110	14	.200*	.949	14	.538
	Pre-Test Control	.184	14	.200*	.949	14	.540
	Post-Test Control	.112	14	.200*	.968	14	.853
*. This is a lower bound of the true significance.							
a. Lilliefors Significance Correction							

Thus, because the data is normally distributed, it is continued using parametric statistics, as follows.

Table 3: Test Paired Samples Test

Paired Samples Test									
		Paired Differences					t	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre-Test Experiment - Post-Test Experiment	-8.893	5.506	1.472	-12.072	-5.714	-6.043	13	.000
Pair 2	Pre-Test Control - Post-Test Control	-.857	.770	.206	-1.302	-.412	-4.163	13	.001

Based on the output of Pair 1, the value of sig.(2-tailed) of 0.000 < 0.05, it can be concluded that there is a difference in the average results of Groundstroke training for the pre-test of the experimental group and the post-test of the experiment. Then in the output of Pair 2, the value of sig is obtained. (2-tailed) by 0.001 < 0.05, it can be concluded that there is a difference in the average results of Groundstroke training for the control group pre-test and post-test. So, there is a significant influence of pre-test and post-test training methods on the results of Groundstroke in court tennis.

a) Homogeneity Test

Table 4: Data Homogeneity Test

Test of Homogeneity of Variances					
		Levene Statistic	df1	DF2	Sig.
Groundstroke Results	Based on Mean	.020	1	26	.889
	Based on Median	.025	1	26	.875
	Based on Median and with adjusted df	.025	1	25.978	.875
	Based on trimmed mean	.024	1	26	.878

The results of the analysis in the table show that the significance value (Sig) on the Based on Mean (0.889) > 0.05 , it can be concluded that the data of the post-test experimental and control classes are homogeneous. Thus, one of the requirements of the independent sample t-test has been met.

Table 5: Independent Samples Test

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Groundstroke Results	Equal variances assumed	.020	.889	6.846	26	.000	12.143	1.774	8.497	15.789
	Equal variances not assumed			6.846	25.950	.000	12.143	1.774	8.497	15.789

Based on the independent sample t-test test above, the significance value (2-tailed) is 0.000 < 0.05, then Ho is rejected and Ha is accepted. This means that there is a significant difference between the results of Groundstroke training in court tennis that applies a conventional training model. For more details, find out the mean of the post-test of the experimental class and the post-test of the control class in the following table.

Table 6: Statistical Group Data

Group Statistics					
	Group	N	Mean	Std. Deviation	Std. Error Mean
Groundstroke Results	Post-Test Experiment	14	55.86	4.589	1.226
	Post-Test Control	14	43.71	4.795	1.281

DISCUSSION

The results of the study show based on the results of the effectiveness test on the model designed and applied to junior tennis athletes aged 12-14 years. Based on the results of research that has been conducted on the Groundstroke training model for tennis athletes aged 12-14 years, it was found that the exercise model given to the experimental group had a significant influence on improving Groundstroke ability compared to the control group. This is shown by the difference in the average posttest score in the two groups after being given different treatments. Groundstroke skills are very important for tennis athletes to master because groundstroke is the most widely used stroke when playing tennis. Therefore, the correct Groundstroke training model needs to be taught early on so that junior tennis athletes have a solid foundation for the development of later skills. The training model given in this study refers to the theory of motor learning. (Schmidt & Wrisberg, 2008) states that to learn a movement skill well, it is necessary to have a structured stage of practice or exercise. This also applies to learning the skills of the Groundstroke technique in the sport of tennis. The

training model provided starts from the cognitive stage, namely providing information and examples of Groundstroke movements, then continues with the associative stage in the form of exercises to form Groundstroke movement patterns by paying attention to the position of the body when hitting, the position of the racket and the contact ball impact. This exercise is carried out repeatedly to form an automatic movement pattern at the autonomous stage.

Based on the interpretation of the data of the research results, it can be said that the provision of training models Groundstroke By applying the principle of Motor Learning showing significant progress on capacity improvement Groundstroke junior tennis athletes aged 12-14 years. The exercise model in this study is also in accordance with the theory (Landlinger et al., 2010) That for groundstroke with adequate accuracy is one of the fundamental requirements for the development of modern tennis athletes. The theory is applied to the practice of Groundstroke which was given to the experimental group for 16 meetings. So that the high increase in ability Groundstroke Junior tennis athletes aged 12-14 in the experimental group compared to the control group are thought to be the result of the influence of the training model Groundstroke which has been adjusted to the relevant theory.

Regarding the interpretation of the average score of the research results before and after the treatment, it was found that the average pretest and posttest scores of the experimental group were higher than the average pretest and posttest scores of the control group. In other words, the GTS Training model provided has a good effect in improving the groundstroke ability of junior tennis athletes aged 12-14 years. The difference in the average increase in posttest scores in these two groups is suspected to be due to the treatment factors given. The control group received a form of groundstroke training without a special model, which is dominated by only doing conventional exercises given by the coach. Meanwhile, the experimental group received a dose of structured Groundstroke training by applying the principles of motor learning. So that more special training stimuli were obtained by junior tennis athletes aged 12-14 years in the experimental group. This is suspected to cause a difference in the effect of treatment on improving the groundstroke ability of junior tennis athletes in each group. Based on the confirmation between the Groundstroke training model used in this study and the motor learning theories and Groundstroke components according to experts, it can be concluded that the exercise program given to the experimental group is quite effective in improving Groundstroke abilitytennis athletes aged 12-14 years. With a structured, measurable and planned training model, it is hoped that junior tennis athletes will be able to master the basics of good groundstroke techniques as a foundation for the development of advanced tennis playing skills in the future. Overall, the results of the research on the Groundstroke training model provide a clear picture that the application of motor learning science and skill training principles is beneficial for improving tennis performance. By designing a training program based on the theory and needs of athletes, coaches are expected to produce the best tennis athletes in the future.

CONCLUSION

Based on the results of the study on the influence of GTS training on tennis groundstroke hitting ability, the use of a court tennis game model can improve the forehand hitting skills of tennis athletes aged 12-14 years. Thus, descriptive statistical results were obtained with 14 experimental subjects showing an average of 46.96, and

after being given the post-test treatment, the results showed an average of 55.86. This shows that descriptively a difference was obtained before and after the treatment. Thus, the descriptive statistical results of the 14 control subjects were 42.86 on average, and after being given the treatment, the average post-test results were 43.71. This shows that descriptively a difference was obtained before and after the treatment. Therefore, the GTS training model is applicable and effective to improve the groundstroke ability of junior tennis athletes aged 12-14 years. Our results show that the level of effectiveness is significant, but the study is still limited to a few clubs. Further development is beneficial for the rejuvenation of science. The resulting model should be added so that a wide variety of exercises can be done to the maximum. The research subject should use a wider range. The groundstroke training produced by the Model should be socialized to a wider level so that it is easier for trainers to obtain references for GTS Training model variations. These are the suggestions that the researcher conveyed for the use and further development of the groundstroke tennis training model in athletes aged 12-14 years.

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