

## The Differences Result In Serve Skill of Junior Tennis Players Assessed Based On Gender and Age Las Diferencias Resultan En La Habilidad De Servicio De Los Tenistas Jóvenes Evaluadas Según El Género Y La Edad

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**Abstract.** This research aims to determine the differences in serve performance of junior tennis players based on age and gender. The sample comprised 60 males and females aged 10, 12, and 14 years. The data collection instrument used was Hewitt's tennis achievement test. The research results show that the age factor variable for junior tennis athletes has a Sig. Value of  $0.00 < 0.05$  means there is a significant difference in junior tennis serve results. In the gender factor variable, the Sig. Value is  $0.007 < 0.05$ , which means there is a significant difference in the results of tennis serves furthermore, the Sig. Value of the age and gender is  $0.977 > 0.05$ , which means there is no influence or interaction between age and gender in determining the results of tennis serve shot scores. In conclusion, the serve has an important role in tennis. This serve can be improved and trained throughout a player's career, from beginner to professional. The differences are visible between males and females from an early age. Based on the general result, males can serve 8-10% better than females because of physical strength, movement skills, and anthropometry. Male players have a faster serve speed and generate more serve points than females. It is caused by anthropometric factors: height and weight correlate with service speed in age and gender groups. Height is associated with a higher serve impact point to increase success in serving.

**Keywords:** Serve, Tennis, Junior, Gender, Age.

**Resumen.** Esta investigación tiene como objetivo determinar las diferencias en el rendimiento del servicio de los tenistas junior en función de la edad y el sexo. La muestra estuvo compuesta por 60 hombres y mujeres de 10, 12 y 14 años. El instrumento de recolección de datos utilizado fue el test de rendimiento tenístico de Hewitt. Los resultados de la investigación muestran que la variable factor edad para los atletas de tenis junior tiene una Sig. Un valor de  $0,00 < 0,05$  significa que hay una diferencia significativa en los resultados del servicio del tenis juvenil. En la variable factor género, la Sig. El valor es  $0,007 < 0,05$ , lo que significa que hay una diferencia significativa en los resultados de los servicios de tenis, según la Sig. El valor de la edad y el género es  $0,977 > 0,05$ , lo que significa que no hay influencia ni interacción entre la edad y el género a la hora de determinar los resultados de las puntuaciones de los tiros de servicio de tenis. En conclusión, el servicio tiene un papel importante en el tenis. Este servicio se puede mejorar y entrenar a lo largo de la carrera de un jugador, desde principiante hasta profesional. Las diferencias son visibles entre hombres y mujeres desde una edad temprana. Según los resultados generales, los hombres pueden servir entre un 8% y un 10% mejor que las mujeres debido a la fuerza física, las habilidades de movimiento y la antropometría. Los jugadores masculinos tienen una velocidad de servicio más rápida y generan más puntos de servicio que las mujeres. Es causada por factores antropométricos: la altura y el peso se correlacionan con la velocidad del servicio en grupos de edad y género. La altura se asocia con un punto de impacto de servicio más alto para aumentar el éxito en el servicio.

**Palabras clave:** Servicio, Tenis, Junior, Género, Edad

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### Introduction

Sport is a planned and structured physical activity that impacts physical and mental health. By exercising regularly and according to the body's abilities, a person can feel the benefits of exercise, including improving blood circulation to make the body fit and improve body performance, which allows the body to function smoothly and enhance brain performance in our daily activities to be more productive (Malo & Nurhidayat, 2021). Sport has become a global need for scale and intensity in improving the quality of scientific life and must be a factor in the growth of quality sporting life (Gusdernawati et al., 2021).

According to Law Number 11 of 2022 concerning National Sports, sports are divided into three categories, namely: (1) educational, (2) community, and (3) achievement sports. Educational sport begins in early childhood,

guided by physical education teachers and assisted by trained physical personnel. Recreational sports as part of a method to restore health and fitness. Individuals, training units, institutions, organisations, or associations can play recreational sports. Recreational sports are carried out for recreational purposes, including (a) achieving a healthy body condition, physical fitness, and mental happiness, (b) building social relationships, and (c) promoting and preserving regional and national culture. Performance sports are intended to improve athletes' abilities and potential. Tennis is a popular sport in the world, including Indonesia, that can be played by adults, young people, children and older people (Mawarda & Nurhidayat, 2021). Tennis is a sport that is in great demand by most Indonesians. Currently, tennis is used in society as a view that the value of playing tennis is better and more noble than the level of society in the area. In addition, this sport

can be played by government circles, political elites, entrepreneurs, teachers, coaches, athletes, etc., to unite mission and vision for better change. The different tennis in various regions is a form of the development and progress of Indonesia. Increasing tennis players and coaches in multiple areas does not guarantee good results. Therefore, it needs to be balanced with the right coaching model to make it easier to attract talented athletes. Good training and coaching tennis are the ways to create good tennis players.

Recently, tennis development can be seen from the spreading many tennis clubs distributed in urban, suburban, or rural areas. Therefore, in developing this tennis club, the coach will conduct a training program before performing and re-evaluating the results to improve the athlete's training in the following training program to achieve maximum results during the tournament. To win this tournament, the players try to make the opponent difficult hit the ball. This technique requires the strength and speed of the racket swing and the ability to control the ball. The strength and speed of the club's oscillations must be adjusted to hit the ball and fall to the target. In conclusion, coordination is needed for a hard, fast, and directed pull.

Tennis is a sport or game where the ball is hit with a racket in the opponent's area and can be played by two people in a singles match or doubles with four (Malo & Nurhidayat, 2021). In addition, a serve is a hit to start the game and get a point. Several turnovers must be made when performing a serve technique, starting from the preparation and swing phases, the point of contact, and the follow-up movement (Utomo & Daru, 2020). Serve is one of the primary tennis techniques and is a sign of the start of the game. The serve is no longer considered the start of the game but a kind of first attack. Good biomotor components, including endurance, power, speed, and coordination, are needed to carry out the presentation technique. Motoric stimulation that is organized by taking advantage of the learning window can bring benefits to life in general, improving other learning (Bássoli de Oliveira et al., 2021).

There are three types of serve in tennis, namely slice, flat, and double serve. The flat serve is a serve that is often used for the first time when starting a game. It happens because the flat serve is very fast and hard, making it difficult for players to predict the shot they will make. Therefore, players are expected to dominate serve because it is a significant chance to earn points. Executing a fast and strong serve requires good physical fitness and mastery of good and right to play the techniques (Mubarok, 2020). A well-made serve pass can be the key to victory because success in getting points is more significant than maintaining a shot. If the serve is weak, the chances of making a point are reduced because the opponent can attack to get a point through that serve (Hayes et al., 2021). In conclusion, a serve is a technique to shoot in starting the game and make points. Initially, serve was

only seen as an initial shot to pass the ball into the opponent's area as a signal for the start of the match. Through a strong and accurate serve, players can launch attacks to push their opponents. Therefore, it can be concluded that serve is an initial asset that needs to be mastered (Nurhidayat & Vera, 2020).

Because of the movements' complexity, particular guidance is needed to facilitate and expedite the athlete's training in mastering the service technique while performing the input technique. A theory supporting the process of forming techniques is motion analysis through biomechanics. Therefore, the players should do some steps: (a) analyse the movement of the service technique, then use the results of the appropriate analysis to contribute to performance, especially movement efficiency, and (b) create things that can hinder the efficiency of the movement of the tennis service technique. For this reason, trainers must be able to analyse service technical movements from a biomechanical perspective to provide correct information and therapy for their trainees from incorrect technical movements. Currently, only some coaches carry out analysis using this technique because of the limited analysis tools, such as the limited application of biomechanics and motion recording devices when talking about junior category athletes in the 10–18-year age group that have not mastered passing techniques and make multiple mistakes on passing.

Research on development factors of service techniques in tennis requires some aspects, including coach, science, and technology, to support achievement. During the serve, this movement is carried out explosively. Sometimes, coaches are not careful enough to observe when executing an athlete's instructions not adjusted with current technology development. The accuracy of the training method greatly influences a trainer's success in improving an athlete's mobility skills. Training methods are methods used by coaches to improve athletes' abilities effectively. Tennis is a sport branch requiring complex skills. Therefore, the training process in learning each tennis movement technique requires repeated observation and practice. For this reason, the conditions of the training process must be considered in terms of the training methods used.

There are many ways to practice, you should be careful in choosing and determining the teaching method. As such, this is also important or needed by management in activities such as physical education at school with various sports materials in it (Setyawan et al., 2024). The application of training methods is based on the skills to be learned with difficult or simple movement elements (Setiawan, 2013). Therefore, every trainee must choose and use the correct and good method according to the needs. In order to increase the competence of trainers, trainers also need to study the results of research related to the development of the professionalism of trainers, such as research (Cortela et al., 2020) which discusses the professional development of tennis trainers: (learning situation and context). Coaches also need to learn the factors that affect the

performance of tennis athletes, semi-isal research (Luna Villouta et al., 2019) that studies the relationship between agility variables and anthropometry in tennis school students, and semi-isal research. Learning part of a skill at one time will make it easier to complete the skill as a whole. Skills with more complex or challenging movements can usually be practised simultaneously. Sari & Susiloningsih (2015) revealed that methods generally use sub-methods to improve technique because (1) athletes can perform the techniques desired by the coach, and (2) it can help to know the techniques and skills that athletes do not master. In addition, the movements must be made simple to help the athletes master both techniques and skills. Therefore, it can be concluded that the stated method can be implemented for beginner players who are still unfamiliar with the skills being learned. In addition, the results of junior athletes' tennis service skills are still not optimal, influenced by training, age, and, gender. Thus, this research aims to determine the results of tennis service skills in junior athletes based on gender (male & female) and age (10 years, 12 years, & 14 years).

## Methods

This research employed a comparative quantitative approach aiming to determine the extent of variation or differences between related variables. The data analysis technique used was parametric Two-Way Anova statistics, which was a two-way or two-category classification analysis based on observing certain factors that caused variation. Data prerequisite tests were carried out using the Kolmogorov-Smirnov normality test, while homogeneity tests were conducted using Levene's Test of homogeneity of variance. This research examined differences in tennis scores based on gender (male & female) and age (10 years, 12 years, and 14 years). The sampling technique was done using cluster random sampling on 60 students consisting of male and female students from junior students/athletes. The calculations were carried out using SPSS Version 25.0. The technique for collecting data on the tennis serve shot skills results was carried out using Instrument Hewitt's tennis achievement test. Hewitt's tennis achievement test evaluated three basic tennis skills: serve, forehand, and backhand. The reliability was tested using the "test-retest" method with the result ranging from 0.75 to 0.94. Validity coefficients for each of the three skills in tennis when compared with a rank order of individual playing ability range from 0.52 to 0.93. Each tennis player is allowed to serve tennis ten times. Tennis players will get the lowest score of 1 and the highest score of 6 according to the results of their serve number area on the court. Further, the result score data obtained is totalled and converted into a numerical value with a scale of 1-100, as in research (Setyawan et al., 2023). The data was grouped into two survey categories (male and female) with three factors: score results for 10-year-old athletes, score results for 12-year-old athletes, and score results for

14-year-old athletes.

Table 1.

The Results of Tennis Shot Skill Value

No	Athlete Names	M/F	Label (Years Old Athlete)	Scores	Conversion Scores
1	M.A	M	10	1.3	36
2	LE	M	10	2,4	67
3	KB	M	10	1.7	47
4	PS	M	10	1.5	42
5	DS	M	10	1.8	50
6	AR	M	10	2,3	64
7	CD	M	10	2	56
8	MD	M	10	2,4	67
9	KH	M	10	1.9	53
10	AB	M	10	1.8	50
11	MR	M	12	1.8	50
12	AR	M	12	2,4	67
13	RM	M	12	2.1	58
14	CT	M	12	1.8	50
15	KL	M	12	1.7	47
16	GR	M	12	2,4	67
17	WS	M	12	2,2	61
18	AF	M	12	2.7	75
19	ND	M	12	2.6	72
20	K.S	M	12	2,4	67
21	MR	M	14	2.6	72
22	BS	M	14	2,4	67
23	RD	M	14	1.8	50
24	K.D	M	14	3,4	94
25	GE	M	14	2.5	69
26	SD	M	14	2.5	69
27	JP	M	14	2.5	69
28	AH	M	14	2,4	67
29	WA	M	14	3.6	100
30	HY	M	14	2.7	75
31	F.A	F	10	1.7	47
32	NS	F	10	1,2	33
33	CR	F	10	2.1	58
34	KW	F	10	2,2	61
35	JN	F	10	1.5	42
36	RW	F	10	1.3	36
37	A A	F	10	1.4	39
38	TD	F	10	1.6	44
39	NL	F	10	2.1	58
40	RC	F	10	1.6	44
41	AN	F	12	1.5	42
42	KR	F	12	2,4	67
43	A-Z	F	12	1.7	47
44	PD	F	12	1.7	47
45	KR	F	12	1.8	50
46	K.D	F	12	2,3	64
47	F.A	F	12	1.9	53
48	YS	F	12	2,4	67
49	ZR	F	12	1.9	53
50	AF	F	12	1.8	50
51	RC	F	14	1.8	50
52	AP	F	14	2,4	67
53	TN	F	14	2.8	78
54	CW	F	14	2.7	75
55	AN	F	14	2,3	64
56	FC	F	14	2,4	67
57	R.A	F	14	2.1	58
58	JA	F	14	1.9	53
59	MD	F	14	2.5	69
60	AW	F	14	2,4	67

## Results

The following data is a detailed description of the data on differences in tennis shot scores in terms of gender (male and female) and age of junior tennis athletes. Based on the results of the descriptive analysis as shown in the table, the number of data (N) for shot results factors is 60 with details:

20 data on shot results for athletes aged 10 years; 20 shot results data for athletes aged 12 years; and 20 data on shot results from athletes aged 14 years. The number of data (N) for the gender factor is 60 with details of 30 male and 30 female students.

Table 2.  
The Results between-Subjects Factors Test.

Between-Subjects Factors			
		Value Labels	N
Age	1	10 years old	20
	2	12 years old	20
	3	14 years old	20
Gender	1	Male	30
	2	Female	30

Based on the results of the descriptive test as in (Table), the mean score of male students at the age of 10 years is 53.20 with the of 10,645, while the mean score of female students at the age of 10 years is 46.20 with an SD of 9,750. The mean score of male students aged 12 years is 61.40 with an SD of 98.34, while the mean score of female students aged 12 years is 54.00 with an SD of .907. The mean score of male students aged 14 years is 73.20 with an SD of .235, while the mean score of female students aged 14 years is 64.80 with an SD of 17. Therefore, it is known that the results of female athletes at the age of 10 years have the lowest scores, while the results of male students aged 14 years have the highest scores.

Table 3.  
The Results of the Descriptive Statistics Test.

Descriptive Statistics				
Dependent Variable: Tennis Shot Results				
Age	Gender	Mean	Std. Deviation	N
10 years old	Male	53.20	10,465	10
	Female	46.20	9,750	10
	Total	49.70	10,479	20
12 years old	Male	61.40	9,834	10
	Female	54.00	8,907	10
	Total	57.70	9,889	20
14 years old	Male	73.20	14,235	10
	Female	64.80	8,917	10
	Total	69.00	12,337	20
Total	Male	62.60	14,021	30
	Female	55.00	11,788	30
	Total	58.80	13,402	60

### Hypothesis Test Results

#### Prerequisite Test

The first prerequisite test was carried out using the Shapiro-Wilk normality test with the Sig. Value is  $> 0.05$ , then the data is normally distributed. In addition, if Sig. Value is  $< 0.05$ , meaning that the data is not distributed normally. The results of the normality prerequisite test are shown in (Table) in the Kolmogorov-Smirnov test and the Shapiro-Wilk test, the Sig. Value is  $0.372 > 0.05$  which means that the data is normally distributed.

The second prerequisite test was carried out using Levene's Test of homogeneity of variance homogeneity test with the condition of the Sig. value is  $> 0.05$ . It means that the data variation is homogeneous. In addition, if the Levene Statistics value is  $< 0.05$ , it means that the data is not homogeneous. Homogeneity test results as per (Table)

Sig. Value is  $0.911 > 0.05$ , meaning the data is homogeneous.

Table 4.  
The Results of Test Tests of Normality.

Standardised Residual for Results	Tests of Normality					
	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	Df	Sig.	Statistics	Df	Sig.
	,091	60	,200*	,979	60	,372

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table 5.  
The Results of the Homogeneity Test.

Levene's Test of Equality of Error Variances a,b						
		Levene Statistics		df1	df2	Sig.
		Based on Mean	Based on Median			
Tennis Shot Results	Based on Mean	,299	,161	5	54	,911
	Based on Median	,161	,161	5	54	,976
	Based on the Median and with adjusted df	,161	,286	5	36,024	,975
	Based on trimmed mean	,286	,286	5	54	,919

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: tennis shot results

b. Design: Intercept + Age + Gender + Age \* Gender

#### Two-Way Anova Test

The Two-Way Anova test was carried out after meeting the normality and homogeneity test requirements. Meanwhile, if the normality and homogeneity tests are not completed, then nonparametric analysis is employed. Two-Way Anova analysis is a two-way classification analysis based on observing two criteria or factors that cause variation.

Based on the results of the Two-Way Anova test from 60 students' score data, it shows that the age factor variable for junior tennis athletes has Sig. Value of  $0.00 < 0.05$  means a significant difference in junior tennis shot results based on age of 10 years, 12 years, and 14 years.

In the gender factor variable, the Sig value is  $0.007 < 0.05$ , meaning there is a significant difference in tennis shot results based on males and females.

Furthermore, for the age and gender factor variables, the Sig value is  $0.977 > 0.05$ , which means that there is no influence or interaction between the factors of age and gender in determining the results of tennis shot scores.

Table 6.  
The Results Tests of Between-Subjects Effects.

Tests of Between-Subjects Effects					
Dependent Variable: Tennis Shot Results					
Sources	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	4632.800a	5	926,560	8,388	,000
Intercept	207446.400	1	207446.400	1878.035	,000
Age	3761.200	2	1880,600	17,025	,000
Sex	866,400	1	866,400	7,844	,007
Age * Gender	5,200	2	2,600	.024	,977
Error	5964,800	54	110,459		
Total	218044,000	60			
Corrected Total	10597.600	59			

a. R Squared = .437 (Adjusted R Squared = .385)

## Discussion

Based on the above results, it is known that the results of female athletes aged 10 years have the lowest scores, while the results of male students aged 14 years have the highest scores. In addition, there are significant differences in junior tennis shot results based on gender and age (10 years, 12 years, and 14 years).

A serve is an essential shot in tennis (Whiteside et al., 2013). A serve mastered with good technique gives significant advantages to tennis players (Girard et al., 2005). Serve is a complex technique and it requires good technical and physical skills. The complexity of the movement comes from the combination of limb and joint movements required to transmit forces from the bottom up through the kinetic chain and out into the ball (Kovacs & Ellenbecker, 2011). Serve is considered an essential shot in tennis. Therefore, athletes need to train physically and speedily to determine the outcome of the serve to prevent overuse injuries in the future (Fernandez-Fernandez et al., 2019). The serve is improved and trained throughout the player's career, from beginner to professional level (Whiteside et al., 2013). The ability to produce increased service speed is multifactorial. The combination of skill, height, hip movement, and upper and lower extremity power can determine the speed of the serve movement, and the power of the upper and lower extremities can determine the speed of the serve (Palmer et al., 2018).

Verlinden et al., (2004) speculate that the success rate of aces in tennis serves based on gender differences is associated with differences in physical strength, stature, and service speed in male and female players (Hizan et al., 2011). Other research explains a significant difference in service efficiency between males and females. Based on general results, males can serve 8-10% better scores than females. It happens because males have better serve speed and accuracy (Carboch & Kočib, 2016). A study explains that first serve points, serve speed, the average speed of players during the game for a match, and the value of male is higher than women (Reid et al., 2016). It is because male players have better technique and physical capacity (Pugh et al., 2003). Various training methods can be used to improve an athlete's serving performance. Among them is self-talk, which has been linked to improved performance depending on sport, gender, and level (Cordellat Marzal & Valenciano, 2022)

A study explains that male professional players produce more ace serve than U-16, U-12, and female professional players. Female professional players produce more ace serve than U-12 female players (Hizan et al., 2011). The lack of ace in younger players is related to the development of technical, physical, and tactical skills. Young players focus less on long periods throughout a match/tournament, which can impact decision-making and increase anxiety levels, impairing serving performance (Hizan et al., 2011). Other research explains that males are stronger than females in both groups (U-13 and

U-15). In addition, U-15 male players have a higher serve speed than U-13 male players and female players of U-13 and U-15 (Fernandez-Fernandez et al., 2019). The related research explains that males show a faster serve speed, and produce more service points than female players (Reid et al., 2016). The difference results between males and females from an early age, relying on better physical qualities in males. In contrast, the main contributor for females is body mass, especially in U-14 and U-18 players (Filipic et al., 2004). In addition, other research concludes that students' motor experiences give rise to more positive emotions than negative emotions, with greater intensity in girls than in boys (Founaud-Cabeza et al., 2023).

Apart from factors related to fitness, anthropometric factors, namely, height and weight, correlate with service speed in age and gender groups. Height is associated with a higher serve impact point (Roetert et al., 2009). Thus increasing success in servicing (Vaverka & Cernosek, 2013). From a biomechanical perspective, body mass is also related to torque production, thus having a positive contribution to service speed (Fett et al., 2018; Wong et al., 2014).

## Conclusion

Servis an essential shot in tennis. A serve mastered with good technique gives significant advantages to tennis players. However, the serve technique is complex and requires good technical and physical skills. The complexity of the movement comes from the combination of limb and joint movements required to transmit forces from the bottom up through the kinetic chain and out into the ball. The serve can be improved and trained throughout a player's career, from beginner to professional level. The differences are visible between males and females from an early age. Based on general results, male is able to serve 8-10% better than female caused by physical strength, movement skills, and anthropometry. Males have a faster serve speed and generate more service points than female players caused by anthropometric factors, namely, height, and weight correlate with serve speed in terms of age and gender groups. Height is associated with a higher serve impact point to increase success in serving.

## Conflicts of Interest

The authors declare that there are no conflicts of interest.

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