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Comparative Analysis of Wilson NXT Brand String Tension on Wilson Hyper Hamer 7.5 Racket against Wilson and Nassau Ball Bounce on Court Tennis

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***Abstract*---**Field tennis is a small ball game that requires a field and the players need a racket with its own string specifications. Like the Wilson NXT brand strings on the Wilson Hyper Hamer 7.5 racket, which has its own tension when it will receive the ball. To find out the tension of the strings, it is necessary to do a test. The ball bounce data was collected at positions 0 to 7 positions with a racket tension of 50 lbs and analyzed by performing normality tests, homogeneity tests, and hypothesis testing. The normality test on these strings has a significance of 0.05 and is categorized as normal. Meanwhile, the homogeneity test can be seen that the results of the Dunlop ball and Nassau ball bounce have a value of sig. p 0.31 and the data is homogeneous. For the results of the t-test, it is known that the significance value of p is 0.611 and there is a significant difference. So, there is a correlation of the influence of the Wilson NXT brand string tension on the Wilson Hyper Homer 7.5 racket on the rebound of the Dunlop ball and the Nassau ball in tennis.

***Keywords*---**ball, Dunlop, Nassau, racket string, tension, Wilson nxt.

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Introduction

Court tennis is a small ball game. According to Prasetyo (2011), the sport of tennis uses a rectangular court with a length of 23.77 m and for the width there are two, namely for a single court width of 8.23 m and a double court with a width of 10.97 m. The court is divided into two equal parts separated by a net that runs across the center of the court with a height of 91.4 cm at the center and 1.067m at each net post. This game is played on a hard court (hard court), clay (gravel), or grass court (grass court). The game of tennis can be played by two people who face each other in singles games, both men's singles and women's singles. Can also be played in doubles games, both men's doubles and mixed doubles. The equipment or facilities needed to be able to play this sport are rackets, balls and strings used for playing tennis (Ducher et al., 2005).

One of the equipment used in the tennis game is a tennis racket. According to Juliansyah et al. (2017), a tennis racket is one of the batting equipment used in court tennis games. Rackets are generally used as a means of supporting game performance in accordance with the comfort of novice athletes or professional players. Rackets also have sizes and shapes according to the order of use according to the age level used in the game on tennis.

In addition to tennis equipment such as rackets, there are other equipment used in tennis games, namely tennis balls. According to Setiawan (2006), tennis ball is an important component in the game of tennis. Tennis balls produced by PT Nassau Sport Indonesia are generally yellow or green, the inside is made of rubber and the outside is coated with fine yellow or bright green optical hair.

After the tennis ball component there are court tennis racket strings or nets mounted on tennis rackets. About racket strings and tennis court strings, not many realize that strings play an important role in the overall performance of a player's tennis game (Cañal-Bruland et al., 2018). According to Prasso (2007), the racket strings used are the basic material used for playing tennis. Tennis racket strings generally have different sizes and diameters because they can affect the overall performance of both beginners and professional athletes.

In addition to the tennis racket strings, the adjustment of the tension of the tennis racket strings can affect the overall performance of the tennis game (Bower & Cross, 2003). According to Sunaryadi (2010), by adjusting the tension of the racket rope, tennis players can adjust the amount of power or control obtained from various types of racket strings with a thick or thin diameter. The impact (hit) of the ball with the strings of the racket (Baszczyński et al., 2016; Maeda & Okauchi, 2010). This tension is a tension that is often used by players, but there are some problems in the field, especially for beginner athletes, they are very new in choosing the ideal racket tension for the racket used, to produce a normal ball bounce (Akca et al., 1999).

According to Valdivia et al. (2013), the main advantage of kinovea is ease of use and analysis without the use of physical sensors. In addition, it is free and can be used in measurements on motion. Advantage of kinovea to get the ball's bounce height based on a known scale on a meter taped to the wall. Video recording of

the falling motion of the ball begins with the position of the ball when it touches or collides with the racket strings.

Based on the description above, by adjusting the tension of the tennis racket strings which are thick or thin in diameter. However, with different string brands with the same string tension (Nuriel et al., 2005; Guido & Villone, 1999). As happened to the wilson nxt brand string tension on the wilson hyper hammer 7.5 racket against the reflection of wilson and nassau balls on tennis. Through this, to determine the stress on each type of racket with different treatment on the ball. Knowing the difference between the two can provide a benefit for coaches and players, especially for novice players. For coaches, insight or knowledge can be used as a reference for a trainer, especially in using a good racket string tension on a tennis player. And for a novice athlete, insight and knowledge can be used as reference material to determine the tension of the strings to be used in the game of tennis.

Method

The method used in this type of research is descriptive quantitative research with an experimental approach (Campbell, 2014; Heale & Twycross, 2015; Qu & Dumay, 2011; Burawoy, 2009; Moser & Korstjens, 2018). Quantitative descriptive research was conducted to determine the effect of a treatment on the characteristics of the subject under study. The research variable is an attribute, the value of the nature of the object, individual activities that have many certain variations between one and another that have been determined by researchers to be studied and searched for information and conclusions are drawn (Ridha, 2017). In this study, there are two variables, namely the comparison of the Wilson NXT brand string tension and the Wilson Hyper Hammer 7.5 tennis racket as the independent variable and the Wilson and Nassau ball bounce as the dependent variable (Melnyk et al., 2021).

The data collection technique is a research conducted by research methods. The instrument used is a camera as a video recording device for data collection (Rinartha et al., 2018). The results of data collection in the form of video recordings are then processed with Kinovea 08.15 to get the height of the ball's reflection based on a known scale on the meter attached to the wall. The data obtained will be analyzed through normality test, homogeneity test, and hypothesis testing (D'Amato et al., 2017; Little & Seehaus, 1988).

The normality test aims to ensure that what is obtained is symmetrically or normally distributed, i.e. the distribution of numbers is mostly in the middle, and the further to the right or left, the smaller the distribution of numbers, so that it resembles a bell or curve. The normality test is intended to determine whether the distribution of the variable scores has a normal curve or not. To test the normality of the data, the Kolmogorov Smirnov Z test was used with the help of the 25th edition of the statistical program series (SPSS) for windows. To find out whether the data distribution is normal for each variable by looking at the results of the significance, if the sig count > 0.05, then the data is declared normally distributed (Shiukashvili, 2020).

Homogeneity test serves to show that the elements of the research sample are homogeneous (same, similar or not homogeneous). Homogeneity is used to determine whether several population variants are the same or not. As a test criterion, if the significant value is more than 0.05, it can be said that the variance of two or more groups is the same.

This research is using experimental method. Research data analysis was carried out by comparing pre-test and post-test data after treatment. If the t-count value is smaller than the table value, then Ho (hypothesis 0) is accepted and if the t-count value is greater than the t-table value then Ho is rejected. In this study, the t-test used SPSS 25.

Discussion

This research is related to the tension in rackets with different brands of strings with different balls, namely rackets with Wilson NXT and Wilson Hyper Hammer 7.5 strings, where the balls used are Wilson and Nassau balls. Experimental data was collected from 4 reflecting points, namely, top, middle, bottom, right side, left side. Then compare the interrelationships and dynamic characteristics produced by the three strings as shown in Figure 1.

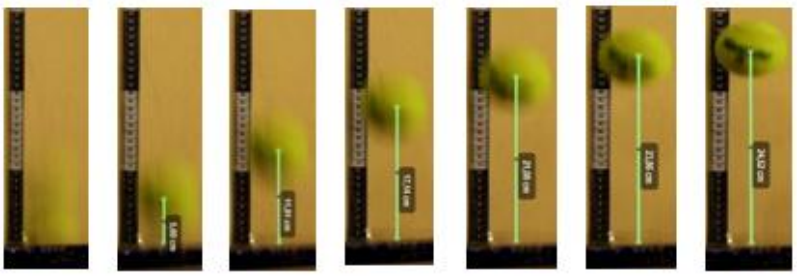

Figure 1. Collection of ball bounce data at positions 0 to 7 positions with a racket tension of 50 lbs

After the experiment is carried out, a data will be obtained. From the data obtained in the experiment, it can be analyzed the value of the displacement or the amplitude of each Newton of the excited force on the racket frame. The data is processed into a graph. In the first experiment, the Wilson XT brand string tension on the Wilson Hyper Homer 7.5 racket was tested against the Dunlop ball bounce. The data obtained is then processed into data that is easy to read and converted into a graph as shown in Figure 2.

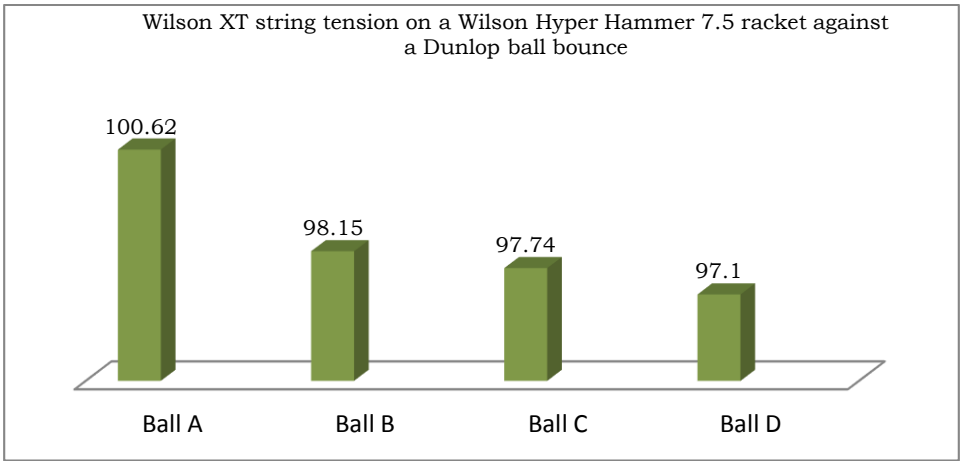

Figure 2. The results of the Wilson XT string tension on the Wilson Hyper Homer 7.5 racket against the Dunlop ball bounce

The second experiment was carried out on a Nassau ball with the same thing, namely the bounce of the ball in positions 0 to 7 with a racket tension of 50 lbs with Wilson XT brand strings on a Wilson Hyper Homer 7.5 racket. In the data results, the displacement or amplitude of each Newton of the force excited on the racket frame will be obtained. This data provides information regarding the tension in the strings as shown in the graph in Figure 3.

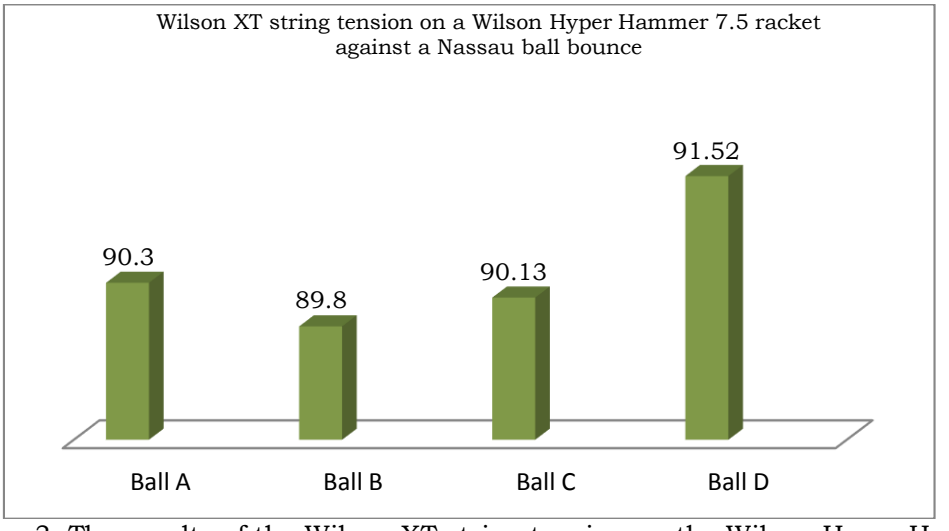

Figure 3. The results of the Wilson XT string tension on the Wilson Hyper Homer 7.5 racket against the reflection of the Nassau ball

Data analysis is used to answer the proposed hypothesis. Before data analysis is carried out, it is necessary to test the analysis prerequisites, namely the normality test and homogeneity test. The normality test is intended to determine whether the variables in the study have a normal distribution or not. The calculation of this normality test uses the Kolmogorov Smirnov Z formula, with computer-assisted processing using the SPSS 25 program. From the results of data

processing, it is found that the Wilson XT string tension on the Wilson Hyper Homer 7.5 racket against the Dunlop ball and Nassau ball bounce has a significance 0, 05 and categorized as normal can be seen in Figure 4.

Table 1
Wilson XT String Tension on Wilson Hyper Homer 7.5 Racket against Dunlop Ball and Nassau ball reflection

	Sig (2-tailed)	Sig	Description
Wilson NXT string tension on a Wilson Hyper Hammer 7.5 racket against a Dunlop ball bounce	0,120	0.05	Significance > 0.05 = Normal
Wilson NXT string tension on a Wilson Hyper Hammer 7.5 racket against a Nassau ball bounce	0,120	0,05	Significance > 0.05 = Normal

Referring to table 1, it can be seen that the pretest and posttest data have a p value (Sig.) > 0.05, so the variables are normally distributed. Because all data are normally distributed, the analysis can be continued with the homogeneity test. The homogeneity test is useful for testing the similarity of the sample, namely the uniform or non-uniform variance of the sample taken from the population. The homogeneity rule if p> 0.05, then the test is declared homogeneous, if p < 0.05, then the test is said to be inhomogeneous. The results of the homogeneity test of this study can be seen in Figure 5.

Table 2
Results of the homogeneity test of the Wilson NXT brand strings on the Wilson Hyper Homer 7.5 racket against the Dunlop ball and Nassau ball bounce

	Levene Statistic	Df1	Df2	Sig. (p)	Description
Wilson NXT Brand string tension on a Wilson Hyper Homer 7.5 racket against Dunlop and Nassau ball rebounds	1,227	1	6	,310	Signifikansi > 0.05 = homogen

From the table above, it can be seen that the results of the Dunlop ball bounce and the Nassau ball have a sig value p > 0.05 so that the data is homogeneous. Because all data are homogeneous, data analysis can be continued with parametric statistics. The t-test was used to test the first hypothesis which reads that there is an effect of the Wilson NXT brand string tension on the Wilson Hyper Homer 7.5 racket on the Dunlop ball bounce in tennis.

If the results of the analysis show a significant difference, the Wilson brand string tension on the Wilson Hyper Homer 7.5 racket on the Dunlop ball and Nassau ball bounce has an effect on increasing the ball bounce result. The conclusion of

the study is significant if the t count > t table and the sig value is greater than 0.05 (Sig > 0.05).

From the results of the t-test, it can be seen that the t count is 8.133 and the t table is 2.31 (df 3) with a p significance value of 0.611. Because the t count is 8.133 > t table 2.31 and the significance value is 0.611 > 0.05, this result shows that there is a significant difference. Thus the alternative hypothesis (Ha) which reads "There is an effect of Wilson NXT Brand string tension on the Wilson Hyper Homer 7.5 racket on the rebound of Dunlop ball and Nassau ball on tennis" received. This means that the Wilson NXT brand string tension has a significant effect on the bounce of Dunlop balls and Nassau balls in tennis.

The results of the analysis show that there is a comparison between the Wilson NXT brand string tension on the Wilson Hyper Homer 7.5 racket to the Dunlop ball bounce and the Nassau ball bounce in tennis. This is indicated by the value of t arithmetic (8.133) > t table (2.31), and p value (0.611) < 0.05, these results indicate that the value of t count is greater than t table, thus the alternative hypothesis (Ha) which reads “There is an effect of the Wilson NXT Brand string tension on the Wilson Hyper Homer 7.5 racket on the rebound of the Dunlop ball and the rebound of the Nassau ball on tennis, is accepted. This means that the Wilson NXT brand string tension on the Wilson Hyper Homer 7.5 racket on the Dunlop ball bounce and the Nassau ball bounce in tennis, has a significant effect on the results on the Dunlop ball bounce and the Nassau ball bounce in tennis.

Racket tension according to Rapsanjani (2013), the tension in the racket strings caused by the stretch between the two string points on the racket cross-section that will be used on the racket. The basic principle of the voltage to the power of the racket is inversely proportional. Strings with low tension/pulling values will have a large power, while strings with high tension will have small power but better control. The highest reflection occurs at the largest stress variation (60 lbs) which is 33.76 cm. This can also be seen in the number of positions obtained from shifting photos from data processing using the Kinovea application. Variations in string tension of 50 produce as many as 7 positions.

The Wilson NXT is also one of the recommended strings on this list for being a very comfortable string to use. Composed of 1600 fine and strong fibers that guarantee the best response so that the power produced will also feel greater. The Wilson NXT also offers hit ball spin capability, along with high control. This string is one of the all around strings that is suitable for almost everyone. Although it has durability and service life below average, the comfort of playing when using these strings is unquestionable (Kelvin et al., 2011).

Conclusion

This study describes the relationship of tension on a string to the ball through statistical tests. For this reason, in the future it is necessary to have a representative sample size, using measurement tools related to the strings used in the field and the use of users on field rackets for novice athletes. There is also a need for qualitative studies to provide new approaches in exploring the

relationships between these variables uncovering currently unknown contributing factors.

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