

Analyze the Physical Performance of Elite Athletes: Relationship between Leg Muscle Explosive Power, Flexibility, and Balance in Elite Taekwondo Athletes Pre-Porprov West Java



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ABSTRACT: This study carried out on elite athletes from West Java Province to analyze the physical performance of elite athletes, namely power, flexibility and balance on the accuracy of their dollyo chagi kicks on these three physical performances. In two previous studies, it was known that physical performance had an influence on the psychology and physiology of athletes, both elite and non-elite athletes. Therefore, this research aims to provide reference material for non-elite taekwondo athletes to determine the physical performance profile of elite athletes so they can excel and achieve targets in national and international competitions, especially for athletes with the peak age of performance according to their LTAD age, namely 18-24 years. A sample of 75 people was taken using the total sampling method from 6 cities and districts in West Java. The development method is the method used in this research by finding the mean and standard deviation with of each test variable. From this research, it is known that the standard deviation of power is 30.730; flexibility, namely 7.793; balance 2,335; and dollyo chagi of 19,007 with an average power of 2.10 meters, flexibility of 20.88 cm, and balance of 3.67 seconds.

KEYWORDS: Power, Flexibility, Balance, Taekwondo, Elite Athlete

INTRODUCTION

In a condition of prime fitness, a person needs to do physical exercise which involves physical condition with the correct exercise method (Bompa, Tudor O.; Buzzichelli, 2019). The components of physical condition are: strength, endurance, explosive power, speed, flexibility, agility, coordination, balance, accuracy, and reaction (Widiastuti, 2015). Physical performance that is different from other sports probably comes from the wide age range of performance of Olympic athletes (Longo et al., 2016).

Taekwondo is the most popular Korean martial art and is also the national sport of Korea (Falaahudin et al., 2020). Taekwondo is a martial art that requires speed and strength (Gatsis et al., 2021). Taekwondo is oriented towards kicking and punching movements and upholds discipline, ethics and good behavior (Mailapalli et al., 2015). Taekwondo has many advantages, not only teaching physical aspects, such as fighting skills, but also emphasizing teaching mental discipline aspects (Song & Yang, 2019). Thus, Taekwondo will form a strong mental attitude and good ethics for those who seriously study it. Taekwondo contains deep philosophical aspects so that in studying Taekwondo, the mind, soul, and body as a whole will be grown and developed (Yang et al., 2020).

Taekwondo means a martial art that uses techniques to produce a form of beautiful movement (Apriantono et al., 2020). Three important materials in practicing Taekwondo are the moves in the martial art itself (Taegeuk), the technique of breaking hard objects (Kyukpa), and the last is fighting in Taekwondo martial arts (Kyorugi) (Kim & Nam, 2021). Learning Taekwondo cannot only touch on the technical skills aspect of self-defense, but also includes the physical, mental and spiritual aspects so that there is a balance between them (Lafanda et al., 2015).

At the 2012 London Olympics, the men's lowest weight category, namely under 58kg between Joel Gonzales Bonilla (ESP) and Lee Dae Hoon (KOR), was won by Joel Gonzales Bonilla with a score of 17-8. The 17 points in detail resulted from 7 momtong

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dollyo chagi kicks, 2 elgol dollyo chagi kicks, 1 punch, and 3 points from kyonggo (mistakes made by Lee Dae Hoon. Meanwhile, Lee Dae Hoon got 8 points from 7 momtong kicks dollyo chagi and 1 kyonggo. All the kicks or 2 elgol dollyo chagi kicks that Bonilla executed were kicks that were on target and were effective in producing 6 points, but 22 of the 41 dollyo chagi momtong kicks or only 32% of the kicks were on target. Another case with the heaviest class in the men's category at the 2016 Rio Olympics, namely over 80 kg. The match between Abdoulrazak Issoufou Alfaga (NIG) and Radik Isaev (KAZ) was actually won by the Kazakstan athlete with a final score of 2-6. Alfaga was able to perform 18 momtong kicks dollyo chagi and 18 elgol dollyo chagi kicks but none of them were effective in producing points. Meanwhile, Isaev did 10 momtong dollyo chagi kicks although none of them were on target and 1 of 2 elgol dollyo chagi kicks managed to score points.

The results of these two analyzes show that body weight class will influence the intensity of kicks performed by taekwondo athletes. Likewise with the effectiveness of these kicks in generating points in each weight class. The number of kicks performed also experienced a significant difference between the men's and women's lowest weight classes at the 2020 Tokyo Olympics, female athletes performed more kicks than men but their effectiveness was low. This can be caused by the amount of flexibility, explosive power and balance of the kick which are influential. Differences in gender, competition class and age will be factors that cause differences in the effectiveness value of the dollyo chagi kick which is caused by the intensity and accuracy of the kick (Mailapalli et al., 2015)

In previous research conducted research entitled Physical, physiological and psychological profiles of elite Turkish taekwondo athletes in 2020. They conducted research on explosive power, agility, flexibility, reaction speed and balance using the vertical jump method for explosive power, sit and reach for flexibility, and running on a treadmill for a balance test. The findings of this research reveal the physical, physiological and psychological characteristics of taekwondo (Lafanda et al., 2015). Test results can be useful for assessing the performance of taekwondo players. In the research Identification of elite performance characteristics in a small sample of taekwondo athlete (Tirtawirya et al., 2019). Anthropological tests and 6 physical performance tests for elite and non-elite athletes as well as three coordination tests for adolescent athletes. This research confirms that knowledge about the physical performance of elite athletes will develop along with their coordination (Di Domenico et al., 2019).

Research on physical performance conditions and comparisons between elite and non-elite athletes in two previous studies has developed knowledge about physical performance and elite athletes but still has not confirmed the existence of physical performance in elite athletes and the ease of research tools used in each study. This research was conducted on elite athletes from West Java Province regarding the accuracy of their dollyo chagi kicks in this study. Therefore, this research aims to be a reference material for non-elite taekwondo athletes to determine the physical performance profile of elite athletes so they can excel and achieve targets in national and international competitions, especially for athletes at their peak age of performance according to their LTAD age (Chaabene et al., 2018).

METHODS

The research method used in this research is a development method that takes samples from the entire population the entire population of elite athletes or a total sampling of 75 people sourced from 6 cities and districts in West Java, namely Depok City, Bogor City, Bandung City, Bekasi City, West Bandung Regency, and Bogor Regency.

Standing Board Jump is a form of fitness test method that is commonly used to determine the power of a person's leg or foot muscles or the explosive power of a person's leg muscles. The higher or further the jump, the stronger the leg muscle power or explosive power of an athlete. The purpose of this test is to determine and measure explosive power or leg muscle power. The assessment is taken from the furthest number of the 3 jump attempts achieved by the sample.

The flexibility test in the leg muscles is using the V-sit and reach test instrument. This instrument was used because it was considered more efficient for a sample of taekwondo athletes who needed flexibility, especially in the hamstring muscles to create high kicks.

Balance test participants will be tested with the Balance Board Test instrument. This instrument is used because the sport of taekwondo is dominated by dynamic balance movements. The assessment is taken from the number of 3 test attempts achieved by the sample. With the three instruments above, the total number of dollyo chagi kicks, both momtong dollyo chagi and elgol dollyo chagi kicks, will be compared for each 1 minute. The test was analyzed using SPSS 24.0 software, descriptive analysis involves calculating the mean and standard deviation.

RESULTS AND DISCUSSION

The results of multiple linear regression testing on explosive power, flexibility and balance on the dollyo chagi kick in elite

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athletes produced a constant value of 79.669 and a regression coefficient value of. Then the regression equation becomes $Y = 79.669 + 0.209X_1 + 0.623X_2 - 0.075 X_3$. The results of the linearity significance test analysis with the regression equation are:

Table 1. Significance and linearity test results of regression of Y with X1, X2, and X3

Model		Sum of Squares	Df	Mean Square	F	Sig
1	Regression	4799,146	3	1599,715	5,178	0,003
	Residual	21935,520	71	308,951		
	Total	26734,667	74			

Significant Value $0.003 < 0.05$; it is said to have had a significant influence on Dollyo Chagi's kick. The calculated F value in the regression above is 5.178

$Df_1 = 3-1 = 2$; $df_2 = 75-3 = 72$; F_{table} with a Df value of 72 is 2.73.

Table 2. Coefficient Correlation

Responden (n)	(r_{y123})	Rsquare	Fcount	Ftable
75	0,424	0,180	5,178	2,73

Fcount value $> F_{table}$; $5.178 > 2.73$; then it is said to have a significant influence on Dollyo Chagi's kick at $\alpha = 0.05$. Based on these data, the first hypothesis "There is a relationship between explosive power, flexibility and balance on the dollyo chagi kick in elite taekwondo athletes" was accepted, and H_0 was rejected. Likewise, the value of the coefficient of determination (Rsquare) in the contribution of variable So 82% of them will be caused by other factors.

Table 3. Results of the relationship and significance tests of Y with X1, X2, and X3

	B	Significance
(Constant)	79,669	0,000
power	0,209	0,002
flexibility	0,623	0,021
balance	-0,075	0,934

$$y = 79.669 + 0.209X_1 + 0.623X_2 - 0.075 X_3$$

The following is an interpretation of the relationship between variables from the multiple linear regression equation in the table above: Constant = 79.669, that is, if explosive power (kg.m/second), flexibility (cm), and balance are zero (0), then the dollyo chagi kicking ability (seconds) is 79.669

- The X_1 coefficient of 0.209 states that if the explosive power increases by 1 point, the dollyo chagi kicking ability will increase by 0.209, and vice versa, assuming the other independent variables remain constant.
- The X_2 coefficient of 0.623 states that if flexibility increases by 1 point, the dollyo chagi kicking ability will increase by 0.623, and vice versa, assuming the other independent variables remain constant.
- The X_3 coefficient of -0.075 states that if the balance increases by 1 point, Dollyo Chagi's kicking ability will decrease by 0.075, and vice versa, assuming the other independent variables remain constant.

CONCLUSION

The results of the correlation analysis between variables X_1 , X_2 and X_3 and Y have a correlation coefficient of -0.424 with N of 75 people. Therefore, it can be concluded that the close relationship between flexibility and balance and the dollyo chagi kick is moderate, but if the value of flexibility and balance increases, the value of the dollyo chagi kick increases.

Based on the calculation results in the f test, the results show a significant value of $0.003 < 0.05$; it is said to have had a significant influence on Dollyo Chagi's kick. The calculated f value is $5.178 > 2.73$, namely f table; it is said to have had a significant influence on Dollyo Chagi's kick. This is also shown by the regression equation $Y = 79.669 + 0.209X_1 + 0.623X_2 - 0.075 X_3$ in a sample of 75 people.

However, based on the results of the regression test, the R^2 value is 0.181 or 18%. This shows that 18% of dollyo chagi

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kicks can be explained by the independent variables of explosive power, flexibility and balance. Meanwhile, the rest can be explained by other factors outside the research model. However, hypothesis is said to be accepted because there is a relationship between explosive power, flexibility, and balance.

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Based on the conclusions, implications and limitations that have occurred during the research process, there are several suggestions that will be given as input for coaches and sports practitioners, especially in the sport of taekwondo, namely:

1. To improve your dollyo chagi kicking skills, you can do this by increasing explosive power and flexibility training and balance.
2. In improving dollyo chagi kicking ability, both stomach and head targets must be adjusted to the magnitude of the relationship value of each variable to dollyo chagi kicking ability.
3. The creation of training programs must be thorough and in accordance with the needs of each individual.
4. It is hoped that the research results can become a reference and enrich research data related to the development of the kyorugi category in the sport of taekwondo.

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