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OVERVIEW IN THE FIELD OF PHYSICAL EDUCATION AND SPORTS: LEG POWER, AGILITY, FLEXIBILITY, AND SPEED TO THE T-KICK ABILITY OF MARTIAL ARTS ATHLETES

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ABSTRACT

This research analyzes the contribution of leg power, agility, flexibility, and speed to the T-kick ability of PPLP Dispora South Sulawesi martial arts athletes. We use quantitative methods with a correlational analysis approach. The results showed that agility made the largest contribution to T-kick ability with 83.3%, followed by leg power at 68.8%. Speed contributed 40.5%, while flexibility contributed the lowest at 24.7%. The combined analysis of the four variables (leg power, agility, flexibility, and speed) on T-kicking ability shows a very significant contribution, namely 96.0%. In conclusion, agility and leg power have a dominant role in improving an athlete's T-kick ability. Even though flexibility has the lowest contribution, the combination of these four factors is very decisive in developing T-kick ability. These findings can be a valuable reference for coaches when designing effective training programs to improve the performance of South Sulawesi Dispora PPLP martial arts athletes.

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1. INTRODUCTION

An athlete named Ria Hasryani Hasyim, representing IPSI South Sulawesi at PON XX-2021 Papua, managed to secure one bronze medal. The competition for the achievements of Pencaksilat athletes in Indonesia is typically fierce due to the presence of the Pencaksilat College, which conducts performance development in stages (Wilson, 2015; Adda, 2022). As a result, the national level of achievement competition is intense, and each province must exert maximum effort to participate in the PON.

The South Sulawesi Dispora technically controls sports achievements and other activities, while the South Sulawesi Provincial Education Department academically oversees the Student Education and Training Center (PPLP), one of the centers for Pencaksilat sports development in South Sulawesi. The accomplishments of the South Sulawesi Dispora's PPLP Pencaksilat athletes over the past two years have failed to elevate the South Sulawesi Dispora's standing at the 2023 POPNAS, held in the

provinces of Babel and South Sumatra. The decline in performance of South Sulawesi PPLP Dispora Pencaksilat athletes has raised various questions from Pencaksilat observers, including us as South Sulawesi Pencaksilat athletes. Thus, as athletes and postgraduate students at UNM, we have observed the achievements of the South Sulawesi PPLP Dispora and want to understand why their performance has declined.

Martial arts, typically performed in public, is a running and rhythmic attack and defense movement that adheres to certain traditional politeness rules (Caron et al., 2017; Nurzaman & Nursasih, 2021). Martial arts refers to a game (skill) in defending oneself with the skill of parrying, attacking, and defending oneself, either with or without weapons (Martínková & Parry, 2016; Artis, 2022; Yearby et al., 2024).

Apart from having excellent physical abilities, a fighter must also have basic technical skills, one of them is the T-kick (Firmanto et al., 2023). When doing a T-kick or other kicks, you need to pay attention to leg power, agility, flexibility, and kick speed so that you can make the movement correctly and hit the target quickly, hard, and precisely. Strength is the muscle's ability to exert or use the maximum possible force to generate tension against resistance (Hafidz et al., 2021). The T kick necessitates explosive movements from the limbs to avoid simple capture by the opponent and to anticipate their attack. A fighter must have adequate leg power to support the techniques used, especially kicking methods (Hoelbling et al., 2020; Kirk et al., 2020; Tulendiyeva et al., 2021).

Maximizing his power will significantly impact his kick execution, as strength plays a crucial role in delivering a powerful kick that weakens the opponent. Flexibility is the ability to move the body or joint organs flexibly or widely so that they are useful for efficient movement and preventing injury (Yılmaz, 2021). Flexibility is critical for successfully executing a T-kick. With adequate flexibility, the legs can move efficiently when doing the kick. This happens because the joints have a wider range of motion, so they can support the kicking ability. To be able to use the T-kick when competing well, agility is required. In martial arts, agility is the ability to change direction (place or position) to avoid an opponent's attack and continue with a counterattack using a T kick (James et al., 2016; Akhmad et al., 2021). Furthermore, explosive power in leg muscles is a quality that enables a muscle or group of muscles to perform physical work. explosively (Aldani, 2021).

Our analysis revealed several levels of physical conditions that did not meet the standards, potentially impacting the kicking ability of South Sulawesi PPLP Dispora athletes, leading to a decline in their performance. Martial artists frequently employ kicks as an attack technique in martial arts competitions, as they are simple to execute and yield a substantial score of three points. However, their execution necessitates a combination of physical attributes such as strength, agility, speed, flexibility, and coordination. The intensity of the kick should be high to achieve the maximum effect, the kick intensity should be high.

2. METHOD

This is a type of quantitative research that aims to measure one variable, determine the relationship between two or more variables, influence one variable with another, and differentiate two variables. The subjects of this research were PPLP Dispora South Sulawesi martial arts athletes.

Data analysis is crucial and relates to research design, methods, and results. After collecting the data, the analysis process commences. Data processing involves the use of statistical formulas. We processed the research data using SPSS 22, conducting normality test, linearity test, and hypothesis tests. The following is one of the T-kick models that will be a subtheme in this research, presented in Figure 1.

Figure 1. T kick

3. RESULTS AND DISCUSSION

Results

Descriptive Analysis

1. Limb Power Data Value N. 12. Range value 0, Minimum value 2. Maximum value 3. Sum value 28, Mean value 2.37, and Standard deviation value 0.144.
2. Agility data N value 12. Range value 4. Minimum value 12. Maximum value 16. Sum value 157, mean value 13.09, and standard deviation value 1.213.
3. Flexibility data N value 12. Range value 12. Minimum value 15. Maximum value 27. Sum value 268, mean value 22.33, and standard deviation value 3,676.
4. Kick speed data (N value) 12. Range value: 16; minimum value: 24. Maximum value: 40. The total value is 359, the average is 29.92, and the standard deviation is 4,795.
5. T-kick ability data N value. 12. Range value: 34; minimum value: 158. Maximum value: 192. The total is 2214, the average is 184.50, and the standard deviation is 12.004.

Summary of the descriptive analysis results: The study investigated the effect of leg power, agility, flexibility, and kick speed on the T-Kick ability of PPLP Dispora Martial arts athletes in South Sulawesi. Please refer to Table 1 for further details:

Table 1. Results of descriptive analysis

Variable	N	Range	Minimum	Maximum	Sum	Mean	Std. Deviation
Limb Power	12	0	2	3	28	2.37	0.144
Agility	12	4	12	16	157	13.09	1.213
Flexibility	12	12	15	27	268	22.33	3.676
Kick Speed	12	16	24	40	359	29.92	4.795
T Kick Ability	12	34	158	192	2214	184.50	12.004

Normality Test

1. For Limb Power data from 12 samples, the KS-Z value was 0.882 (P = 0.417 < α 0.05), so it can be concluded that the Limb Power data follows a normal distribution.
2. For the agility data from 12 samples, the KS-Z value was 0.969 (P = 0.304 < α 0.05), so it can be concluded that the agility data follows a normal distribution.
3. For the flexibility data from 12 samples, the KS-Z value was 1.115 (P = 0.166 < α 0.05), so it can be concluded that the flexibility data follows a normal distribution.
4. For kick speed data from 12 samples, the KS-Z value was 0.842 (P = 0.478 < α 0.05), so it can be concluded that the kick speed data follows a normal distribution.
5. For the T kick ability data from 12 samples, the KS-Z value was 1.115 (P = 0.166 < α 0.05), so it can be concluded that the T kick ability data follows a normal distribution.

Next, we present a summary of the normality test results for data analysis of leg power, agility, flexibility, and kick speed on the t-kick ability of South Sulawesi PPLP Dispora Martial arts Athletes. Table 2 shows the following results from SPSS analysis using Kolmogorov-Smirnov (KS-Z).

Table 2. Data Normality Test Results

Variabel	KS-Z	Asymp.Sig	A	Ket.
Limb Power	0.882	0.417	0.05	Normal
Agility	0.969	0.304	0.05	Normal
Flexibility	1.115	0.166	0.05	Normal
Kick Speed	0.842	0.478	0.05	Normal
T Kick Ability	1.327	0.059	0.05	Normal

Linearity Test

1. The linearity test results of the leg power and T kick ability variables yielded a linearity value of 0.837, indicating that there is a correlation between leg power

and T kick ability, as the linearity value of the data exceeds the 0.05 threshold. the linear one.

2. The linearity test between the agility and T kick ability variables yielded a linearity value of 101,601 due to the data's linearity value exceeding 0.05, indicating a linear relationship between agility and T kick ability.
3. The linearity test results for the leg flexibility and T kick ability variables yielded a linearity value of 1.078, indicating a significant relationship between flexibility and T kick ability, as the data's linearity value exceeded 0.05.
4. The speed variable and T-kick ability variable underwent a linearity test, yielding a linearity value of 82,137. This value exceeds the 0.05 threshold, indicating a linear relationship between speed and T-kick ability.

A summary of the data linearity test results. We investigated the effect of leg power, agility, flexibility, and kick speed on Pencak athletes' T-Kick ability. Table 3 below displays the results of the linearity test.

Table 3. Data Linearity Test Results

Variable	Defiation from Linearity (F)	Sig	Conclusion
X1 with Y	0.837	0.575	Linear
X2 with Y	101.601	0.001	Linear
X3 with Y	1.078	0.468	Linear
X4 with Y	82.137	0.000	Linear

Hypothesis Test

The regression analysis of the relationship between leg strength and the T-kicking ability of PPLP Dispora South Sulawesi martial arts athletes found r = 0.688 (P = 0.002 < ± 0.05). This means that H0 is false and H1 is true, indicating that there is a 68.8% relationship between leg strength and the T-kicking ability of PPLP Dispora South Sulawesi athletes. Regression analysis results: Agility plays a significant role in the T-kick ability of South Sulawesi PPLP Dispora martial arts athletes. If the obtained value is r = 0.836 (P = 0.001 < α 0.05), then H0 is rejected and H1 is accepted, indicating that there is a regression. The contribution of agility to the T-kicking ability of South Sulawesi PPLP Dispora martial arts athletes is 83.6%. The regression analysis of the relationship between flexibility and the T-kicking ability of PPLP martial arts athletes in South Sulawesi Dispora found r = 0.247 (P = 0.001 < ± 0.05). This means that H0 is false and H1 is true, indicating that there is a 24.7% relationship between flexibility and the T-kicking ability of PPLP martial arts athletes in South Sulawesi Dispora.

A regression analysis of the relationship between speed and the T-kicking ability of PPLP Dispora South Sulawesi martial arts athletes found r = 0.405 (P = 0.002 < ± 0.05). This implies a relationship between speed and the T-kicking ability of pencak athletes, with H0 being false and H1 being true. The South Sulawesi Dispora PPLP silat is 40. The regression analysis of the effect of leg strength, agility, flexibility, and kick speed on the T-kicking ability of PPLP Dispora South Sulawesi Martial arts athletes found r = 0.960 (P = 0.002 < ± 0.05), which means that H0 is not true and H1 is. This means that

there is a 96.0% regression of the effect of leg strength, agility, flexibility, and kick speed on the T-kicking ability of South Sulawesi PPLP Dispora Martial arts athletes.

Discussion

Leg power refers to the leg muscles' strength and ability to produce maximum power in a short period (James et al., 2016). It involves a combination of muscle strength and speed. Relationship to the T-Kick: Good leg power allows the athlete to produce powerful and explosive kicks. High-leg muscle strength provides a strong push, so the kick becomes more powerful and effective in reaching the target or paralyzing the opponent (Sabillah et al., 2022).

The results of research regarding the contribution of leg power to the T-kick ability of South Sulawesi PPLP Dispora Martial arts athletes showed a very significant figure, namely 68.8%. These findings underscore the crucial role of leg power in producing an effective and powerful T-kick. The contribution of 68.8% indicates that increasing leg power can have a substantial impact on the quality and strength of athletes' T kicks. Good leg power allows athletes to produce the explosive power needed for swift and powerful kicks, increases the range of kicks, and increases the effectiveness of attacks. This figure emphasizes the importance of including leg power development exercises as the main component in the Martial arts athlete training program at PPLP Dispora South Sulawesi. Coaches need to design training sessions that focus on increasing leg strength and speed simultaneously, such as plyometrics, explosive squats, and high jumps. We hope to significantly improve athletes' T-kick performance by focusing on developing leg power, which will ultimately enhance their competitive ability and performance in Martial arts competitions.

Agility is the ability to move quickly and easily, change direction efficiently, and maintain balance (Mappaompo et al., 2024). Relationship to T-Kicks: Agility affects an athlete's ability to quickly position their body and legs before executing a kick. Agile athletes can execute kicks with the right timing and optimal position, and they can feint or avoid an opponent's attack while remaining ready to kick.

The results of research regarding the contribution of agility to the T-kick ability of South Sulawesi PPLP Dispora Martial arts athletes showed a very significant figure, namely 83.3%. These findings reveal that agility has a dominant and crucial role in determining the effectiveness of T-kicks. This enormous contribution indicates that increasing agility can have a substantial impact on the quality and success of athletes' T-kicks. High agility allows the athlete to make quick changes of direction, assume the correct position before kicking, and adapt to the opponent's movements efficiently. This figure of 83.3% highlights that the training program at PPLP Dispora South Sulawesi must give top priority to developing athletes' agility. Coaches need to design comprehensive and intensive training sessions to improve agility, such as ladder drills, cone drills, and game simulations that emphasize quick changes in direction. We hope that athletes can significantly optimize their T-kicking abilities with a strong focus on agility, thereby enhancing their competitiveness and performance in Martial arts competitions.

Flexibility is the ability of muscles and joints to move with a wide range of motion without injury (Rahman & Islam, 2020; Yılmaz, 2021). Relationship to the T-Kick: Good flexibility allows the athlete to perform the kick with proper technique and maximum range of motion. Flexibility in the leg and hip muscles increases the height and range of the kick, reducing the risk of muscle injury (Yılmaz, 2021). The results of research regarding the contribution of flexibility to the T-kick ability of South Sulawesi PPLP Dispora Martial arts athletes showed a quite significant figure, namely 24.7%. These findings underscore the importance of flexibility in effective T-kick execution. The 24.7% contribution indicates that increasing flexibility can have a significant positive impact on the quality of athletes' T kicks. Good flexibility allows athletes to achieve a greater range of motion, improves the biomechanical efficiency of the kick, and potentially reduces the risk of injury (Rahman & Islam, 2020). Even though its contribution is smaller than the speed factor, this figure still shows that flexibility training must be an integral component in the training program for Martial arts athletes at PPLP Dispora, South Sulawesi. Coaches need to design training sessions specifically targeted at improving flexibility, especially in areas of the body directly involved in the execution of the T kick, such as the hips, knees, and ankles. We hope that focusing on this aspect of flexibility will improve athletes' overall T-kick performance, thereby enhancing their competitive performance.

Speed is the ability to perform movements in a short time. This includes both reaction speed and movement execution speed (Del Vecchio et al., 2011; Sant'Ana et al., 2017; Hoelbling et al., 2020; Adil & Hasanuddin, 2024). Relationship to the T-Kick: Speed is essential to surprising the opponent and increasing the effectiveness of the kick. Fast kicks are difficult for opponents to anticipate and avoid. Speed also allows the athlete to execute a series of kicks in a short period, increasing the pressure on the opponent (Del Vecchio et al., 2011; Sant'Ana et al., 2017). Speed training has a significant impact on increasing T-kick speed in martial arts athletes (Hoelbling et al., 2020). They used a sprint interval training program for 8 weeks.

The contribution of 40.5% illustrates that increasing speed can have a direct impact on improving the quality of T-kicks. This emphasizes the importance of including specific speed training in the training program for Martial arts athletes at PPLP Dispora South Sulawesi. By focusing on speed development, coaches can optimize their athletes' T-kick performance, which in turn can increase their competitive advantage in games. However, keep in mind that other factors influence the remaining 59.5%, indicating the need for a holistic approach to training to achieve optimal results.

Leg power, agility, flexibility, and speed all contribute to the T-kick ability of martial arts athletes (Firmanto et al., 2023; Wibowo et al., 2023). Leg power provides power for the kick; agility helps in positioning and quick execution; flexibility increases range of motion and technique; and speed adds an element of surprise and efficiency to the attack. Therefore, training programs for martial arts athletes should include the development of these four factors to improve overall T-kicking ability.

4. CONCLUSION

Based on the results and discussion, it appears that agility and leg power have a dominant role in improving an athlete's T-kick ability. Even though flexibility has the lowest contribution, the combination of these four factors is very determined in the development of T-kicking ability. It is shown that agility makes the largest contribution to T-kick ability, with 83.3%, followed by leg power at 68.8%. Speed contributed 40.5%, while flexibility contributed the lowest at 24.7%. The combined analysis of the four variables (leg power, agility, flexibility, and speed) on T-kicking ability shows a very significant contribution, namely 96.0%.

These findings can be a valuable reference for coaches when designing effective training programs to improve the performance of PPLP Dispora South Sulawesi martial arts athletes.

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