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Correlation between the Leg Length, Leg Muscle Explosive Power, Speed, and Body Mass Index (BMI) towards the Outcomes of Kids Athletics

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Abstract

This research aims to determine the correlation between leg length, leg muscle explosive power, speed, and body mass index towards kids athletics outcomes of male fourth grade students in elementary schools of Cluster 2, Gantung District, East Belitung Regency. This research was a quantitative study with correlational research. Instruments for measuring leg length with anthropometry, leg muscle explosive power with standing broad jump, speed with 20-meter sprint, body mass index was measured by the formula for dividing body weight (kg) by the square of height (m2) and kids Athletics outcomes using 4 tests: turbo throw, frog jump, kanga escape, and formula one. The research findings reveal that: (1) there is a significant correlation between the Leg length with the outcomes of kids athletics, the calculated ρ value is at 0.313 > ρ table 0.216 and the p-value is at 0.004 < 0.05; (2) there is a significant correlation between the explosive power of the leg muscles with the results of kids athletics, the calculated ρ value is at 0.826> ρ table at 0.216, the p-value is at 0.000 < 0.05; (3) there is a significant correlation between the speed with the results of kids athletics, the calculated ρ value is at 0.782 > ρ table 0.216, the p-value is at 0.000 < 0.05; (4) there is a significant correlation between the body mass index with the results of kids athletics, the calculated ρ value is at 0.525 > ρ table 0.216, the p-value is at 0.000 < 0.05; and (5) there is a significant correlation between leg length, leg muscle explosive power, speed and body mass index with the outcomes of kids athletic with a calculated F value of 79.563 > F table (df 4; 78) 2.49 and a significance value of p-value 0.000 < 0.05.

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INTRODUCTION

Physical education, sports, and health (PJOK) is essentially an educational process that utilizes physical activity to produce holistic changes in individual quality, both in physical, mental, and emotional forms (Muhajir, 2017). PJOK learning in elementary schools specifically athletic material has undergone modifications and adjustments according to age levels known as kids athletics. Kids athletics is a special athletic sport for children whose implementation can be individual and group in the form of games or competitions to train children to compete in a fun situation. Kids athletics for elementary school levels learned by students are kanga escape, formula one, turbo throwing and frog jumping.

Kids athletics activities include the first kanga escape, which is a back and forth run consisting of a combination of hurdles (goal running) and sprints (short distance running). The second activity formula one is an activity consisting of a combination of rolling, sprinting (short distance running), hurdles (hurdling), and slalom course (winding running), the third is turbo throwing is an activity of throwing an object called a turbo which looks like a rocket made of paralon with thick rubber ends and tails having a length of 40 cm and weighing less than 0.5 kg using one hand. The fourth activity of frog jumping is jumping with the support of both feet, upright body position, and hands not touching the floor starting from the initial attitude, jumping three times in a row and the final attitude.

In the implementation of kids athletics numbers, the physical condition components that must be fulfilled by students are the components of muscle strength, muscle endurance, muscle explosive power, speed of movement, heart-lung endurance and flexibility (Widiyanto et al., 2021). Gevat et al., (2012) explains "speed and maximum running acceleration are the most important and fundamental factors of various sports such as athletics". In simple terms, speed is the rate at which the speed of an object changes, this of course affects the movement in kids athletics. Kids athletics are also supported and supported by the length of limbs that each individual has.

Limb length is a lower limb that has a very important function when doing sports, especially as a support for upper limbs, determining movement when walking, jumping, jumping, running or kicking. Limb length as part of body posture has a very close relationship in relation to being a lever when jumping (Hermawan & Tarsono, 2017). Long limbs are beneficial for athletes to move forward, so that not much energy is expended, as lower limbs, long limbs as a support for upper limb movements, to determine the success of walking, running, jumping, jumping and kicking movements (Fahkruzzaman et al., 2015). A component that has a close relationship to the success of kids athletics learning outcomes besides leg length is leg muscle power.

Leg muscle power is measured through the Standing Broad Jump which is a basic motor skill for various sports that require high-speed contractions such as sprinting, hurdling, and jumping in athletics, football, skiing, jumping, and several combat sports (Mackala et al., 2013). Kids athletics activities in which there are elements of sprint running, goal jumping, frog jumping, rooling and throwing movements with footsteps are greatly influenced by leg muscle power and the condition of the body mass index of students.

Body mass index (BMI) is the amount of ideal body weight calculated from a person's weight and height. BMI is very influential in jumping sports activities. Excess body weight and ideal body weight will affect strength and speed when repelling and to produce maximum muscle explosive power (Huda, 2012; Agatha et al., 2022). According to Mubarani et al., (2017) "body mass index and body fat percentage are anthropometric components that can be a supporting factor for achievement,

especially in sports that require agility" such as learning kids athletics at primary school level.

The implementation of kids athletics learning many students who have different weight posture backgrounds that affect the success and quality of the results obtained from the thin, moderate and obese categories. BMI is a description of daily food consumption. Basically every child has different nutritional needs, depending on age, gender, weight, height and level of physical activity. If they have good nutrition, it is expected that children can develop and grow well, both physically and psychologically. In this case, it is related to the BMI of students who are different in terms of body condition, both in the thin, normal and obese categories, which will certainly affect the body's fitness in doing kids athletics.

Based on the results of observations and learning results conducted at SD Negeri gugus 2 Gantung sub-district when doing learning related to kids athletics, many students jump a short distance even though they have a high posture, while there are students with low posture who are able to have a long jump, then there are also those who have a fat body able to have a longer jump compared to students who are medium and thin, this is not in accordance with the results of Efendi, (2022) that limb length has a significant relationship with long jump results. besides that during the implementation of PJOK learning it is known that there are various characteristics of students with various body postures ranging from fat, thin, tall, short like schools in general. In addition, during the implementation of PJOK learning, it is known that there are various characteristics of students with various body postures ranging from fat, thin, tall, short like schools in general. At the time of learning, it is known that students who have an ideal posture are able to carry out motion tasks well when doing kids athletics jumps, but there are also those whose bodies are not ideal able to do better kids athletics activities in comparison with ideal students. The results of (Putri, 2013) show that the level of physical fitness has a significant relationship with the ability of kids athletics. The results of research by Wijaya et al., (2022) show that the physical components of speed and explosive power affect the results of kids athletics, but based on observations in the field there are students who have short limbs, small explosive power, slow speed, ideal BMI good kids athletics results, then there are also students who have long limbs, small explosive power, fast speed, BMI is not ideal kids athletics results are good and there are students who have long limbs, small explosive power, slow speed, BMI is not ideal or excess kids athletics results are good.

From the above background, problem identification is obtained, among others, students in making less than optimal jumps, running is not fast enough, the body mass index that many students have is excessive, the foot repulsion when jumping the power is lacking and not yet known all the variable quantities of each student. Based on the background description, the research is interested in knowing the relationship between leg length, leg muscle explosiveness, speed, and body mass index with the results of kids athletics for 4th grade male students of SD Negeri gugus 2 sub-district Gantung, East Belitung Regency.

METHODS

This type of research is correlational, aims to determine the relationship between leg length (X1), leg muscle explosive power (X2), speed (X3), and body mass index / BMI (X4), with the results of kids athletics (Y) 4th grade male students of SD Negeri cluster 2 Gantung sub-district, East Belitung district.

The data analysis technique in this study uses descriptive percentage data analysis (Sugiyono, 2019, p.112). Data analysis with the help of the SPSS 25 application, then the data is tested for

normality, linearity and then hypothesis testing. For the correlation test using the spearman test while the simultaneous f test uses multiple regression. To find out how much contribution using the coefficient of determination

Participants

In this study the population was 83 students. The sampling technique in this study used total sampling, namely the total number of populations directly sampled as many as 83 male students of class IV SD Negeri gugus 2 Gantung District, East Belitung Regency

Sampling Procedures

Describe the procedures for selecting participants, including (a) the sampling methods if a systematic sampling plan was used; (b) the percentage of the sample approached that participated; and (c) the number of participants selected themselves into the sample. Describe the settings and locations in which data were collected as well as any agreements and payments made to participants. When applying inferential statistics, take seriously the statistical power considerations associated with the test of hypothesis.

Materials and Apparatus

Data collection techniques used in this study using tests and measurements measure limb length measured by anthropometry, leg muscle explosive power with the standing broad jump test, speed with a 20-metre distance running test, body mass index with a meter and weigh the next body weight calculated by entering the IMT formula, and for the results of kids athletics using 4 tests namely frog jumping, turbo throwing, kanga escape running and formula one running.

Research instruments have validity and reliability. validity is a measure that determines the instrument used to collect data in accordance with what is taken (Sepdanius et al., 2019: 7). Reliability is the clarity or stability of the measurement of a test or test tool said to be realible if measurements are made repeatedly, using the same tool, on the same object and the results will be relatively the same (Sepdanius et al., 2019 :11). The instrument used in this study is limb length using a measuring instrument using a meter with a validity value of 0.84 and a reliability value of 0.98 (Wahidi & Nurcahya, 2019,p.62). Measuring leg muscle explosive power standing broad jump test with a validity value of 0.974 and a reliability value of 0.947 (Novianta, 2015). Measuring speed with a 20 metre sprint test with a validity value of 0.91 and a reliability value of 0.91 (Liskustyawati et al., 2019) and body mass index validity value of 0.98 and reliability of 0.98 (Kusnandar et al., 2020). The results of kids athtletics there are test instruments that are used, namely 1) the kanga escape test has a validity figure of 0.98 and a reliability of 0.95, 2) the frog jump test has a validity of 0.87 and a reliability of 0.96, 3) the turbo throw test has a validity of 0.98 and a reliability of 0.94, 4) the formula one test has a validity of 0.97, and a reliability of 0.88 (Hindriani et al., 2018,p.26).

Procedures

Measurement of limb length using an anthropometer, the length of the limb is measured from the groin to the sole of the foot. The implementation procedure is that the testi stands in an anatomical position on

a flat floor without wearing footwear. then the length of the leg is measured from the lowest spine or from the trochanter to the floor (Hermawan & Tarsono, 2017).

Measurement of Limb Muscle Explosiveness using the standing broad jump Test. The first test implementation learners stand behind the boundary line, the position of the feet is parallel, the knees are bent, the position of the hands is beside the feet, the second learners swing their hands forward and behind the body and jump as far as possible forward and then land with both feet together, the third tester marks the landing of the body part closest to the starting line. Learners' results are measured from the landing of the limb nearest the start line. The score obtained by the learner is the furthest jumping distance obtained from three jumps in metres.

Speed Measurement using a sprint run test with a track distance of 20 metres. The implementation of the first test is that students stand on the star line, the second signal in the form of a whistle is given by the tester simultaneously the stopwatch is turned on, the participant starts running quickly, then the participant reaches the finish line and the stopwatch time is stopped. The test was carried out with 3 attempts by taking the fastest time (Sepdanius et al., 2019,p.70). Calculation of Body Mass Index (IMT) Data collection techniques using the test procedure measuring the participant's weight and height, then inputting the IMT measurement formula.

The results of kids athletics ability are obtained by calculating the accumulation of all test results to four kids athletics numbers in the form of kanga escape, formula one, frog jumping, and turbo throwing using t-score

Design or Data Analysis

The data analysis technique in this study uses descriptive percentage data analysis (Sugiyono, 2019,p.112). Data analysis with the help of the SPSS 25 application, then the data is tested for normality, linearity and then hypothesis testing. For the correlation test using the spearman test while the simultaneous f test uses multiple regression. To find out how much contribution using the coefficient of determination

RESULT

The data used is data from measurements to male students of class IV SD Negeri Gugus 2 sub-district Gantung East Belitung district totalling 83 students. Descriptive statistics of the results of data analysis of leg length, leg muscle explosive power, speed and BMI of fourth grade students of SD gugus 2 sub-district Gantung East Belitung Regency can be seen in table 1

Table 1. Descriptive statistics of independent variables

Statistics	Limb Length	Limb Muscle Explosiveness	Speed	Body Mass Index
N	83	83	83	83
Mean	74,10	1,4383	4,6963	16,9616
Median	74,00	1,4500	4,6600	14,9600
Mode	74	1.30	4,27	13,40
Std. Deviation	4.020	0,21063	0,46538	4,76951
Minimum	64	1,0	3,82	11,19
Maximum	82	2,0	5,91	38,41

Descriptive statistics of Kids Athletics results of fourth grade students of SD gugus 2 sub-district Gantung East Belitung Regency can be seen in table 2.

Table 2. Descriptive statistics of dependent variables

Descriptive statistics of the results

Statistics	Throw Turbo	Jumping Frog	*Kanga Escape*	*Formula One*
N	83	83	83	83
Mean	12,9118	4,5128	20,2217	27,1583
Median	12,2200	4,5300	19,8300	26,5300
Mode	12.00	4,10	18.88	29.44
Std. Deviation	3,43493	0,59569	2,51754	4,01572
Minimum	6,30	3,00	15.96	20,59
Maximum	23,45	6,06	30,73	44.12

of *kids athletics of* fourth grade elementary school students in cluster 2 of Gantung sub-district, East Belitung Regency, obtained by calculating the average t-score value of the results of the turbo throwing, frog jumping, *kanga escape* and *formula one* tests, are presented descriptively in table 3.

Table 3. Descriptive statistics of *kids* t-score results

Statistics	*Kids Athletics T-Score* Results
N	*83*
Mean	*50,0000*
Median	*49,5000*
Mode	*41,76*
Std. Deviation	*8,26808*
Minimum	*21,99*
Maximum	*69,13*

Table 4. Normality Test Results

Variables	*p-value*	sig	Description
Limb Length (*Anthropometry*)	0,040	0,05	**Not Normal**
Limb Muscle Explosive Power (Standing Broad Jump)	0,200	0,05	**Normal**
Speed (20 Metre Run)	0,200	0,05	**Normal**
Body Mass Index	0,000	0,05	**Not Normal**
Kids Athletics Results	0,200	0,05	**Normal**

The results of the statistical analysis of the normality test using the Kolmogorov-Smirnov test, the significance value (p) of the limb length variable p-value 0.040 shows <0.05, so the data is declared abnormal, for the variable limb muscle explosive power and speed the significance value p-value

0.200 shows> 0.05, so the data is declared normal and for the body mass index variable p-value 0.000 shows <0.05, so the data is declared abnormal and the results of kids athletics p-value 0.200 shows> 0.05, so the data is declared normal.

Table 5. Linearity Test Results

Variables	*p-value*	Sig	Description
	Kids Athletics Results		
Length	0,576	0,05	**Linear**
Limb Muscle Explosive Power	0,955	0,05	**Linear**
Speed	0,498	0,05	**Linear**
Body mass index	0,024	0,05	**Not Linear**

In the limb length variable with the results of kids athletics the significance value (Sig.) 0.576> 0.05, so the relationship is linear, then the limb muscle explosive power variable with the results of kids athletics the significance value (Sig.) 0.955> 0.05, so the relationship is linear, in the speed variable with the results of kids athletics the significance value (Sig.) 0.498> 0.05, so the relationship is linear, and in the variable body mass index with the results of kids athletics the significance value (Sig.) 0.024 <0.05, so the relationship is not linear. So, it can be concluded that the relationship between the independent variable and the dependent variable is stated to be non-linear, namely the variable body mass index with the results of kids athletics.

The results of the spearman correlation test of the analysis of the limb length variable (X1) on the results of kids athletics (Y) obtained the value of ρ count 0.313> ρ table 0.216, p-value 0.004 <0.05, then H0 is rejected, meaning that H1 which reads "There is a significant relationship between the variable length of limbs with the results of kids athletics" is accepted. The coefficient of 0.313 has a weak level of relationship strength and the correlation coefficient number is positive, so the

direction of the variable relationship is positive, which means that the longer the limb length, the better the results of kids athletics.

The variable explosive power of leg muscles (X2) on the results of kids athletics (Y) obtained a value of ρ count 0.826> ρ table 0.216, p-value 0.000 <0.05, then H0 is rejected, meaning that H1 which reads "There is a significant relationship between the variable explosive power of leg muscles with the results of kids athletics" is accepted. The correlation coefficient is 0.826 which has a very strong level of relationship strength and the correlation coefficient number is positive which means that the greater the leg muscle explosive power, the better the results of kids athletics.

The speed variable (X3) on the results of kids athletics (Y) obtained a value of ρ count 0.782> ρ table 0.216, p-value 0.000 <0.05, then H0 is rejected, meaning H1 which reads "There is a significant relationship between the variable speed with the results of kids athletics" is accepted. The correlation coefficient is 0.782 which means it has a strong level of relationship strength and the correlation coefficient number is negative which means the smaller the speed time, the better the kids results.

The variable body mass index (X4) on the results of kids athletics (Y) obtained a value of ρ count 0.525> ρ table 0.216, p-value 0.000 <0.05, then H0 is rejected, meaning H1 which reads "There is a significant relationship between the body mass index variable and the results of kids athletics" is accepted. The correlation coefficient is 0.525 which means it has a moderate level of relationship strength and the correlation coefficient number is negative which means the smaller the body mass index, the better the results of kids athletics.

F test (Simultaneous) using Analysis using ANOVA test. Analysis rules if p-value <0.05, then the alternative hypothesis is accepted and vice versa.

Table 6. Anova test Results

ANOVA[b]					
Model	*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig,*
Regression	4502,183	4	1125,546	79,563	0,000[b]
Residual	1103,434	78	14,147		
Total	5605,617	82			

Based on the results of the analysis in the table above, the calculated F value is 79.563> F table (df 4; 78) 2.49 and p-value 0.000 <0.05, then H0 is rejected, and Ha reads "there is a significant relationship between leg length, leg muscle explosive power, speed, and body mass index (BMI) with the results of kids athletics for 4th grade male students of SD Negeri gugus 2 sub-district Gantung, East Belitung Regency" accepted.

The results of the analysis of the Coefficient of Determination (R2) limb length, muscle explosive power limbs, speed, and body mass index (BMI) together relate to the results of kids athletics for 4th grade male students of SD
Negeri cluster 2 Gantung sub-district, East Belitung Regency. The complete analysis results are presented in the following table.

Table 7. Sumari Model Table

Model Summary			
R	*R Square*	*Adjusted R Square*	*Std, Error of the Estimate*
0,896[a]	0,803	0,793	3,76120

The coefficient of determination (R2) in the table above, it is known that the coefficient of determination R Square is 0.803, this means that the magnitude of the contribution of the variable length of limbs, leg muscle explosiveness, speed, and body mass index (BMI) together is related to the results of kids athletics of 4th grade male students of SD Negeri gugus 2 sub-district Gantung, East Belitung Regency by 80.30%, while the remaining 19.70% is influenced by other factors outside this study such as agility, arm muscle strength, interest, mental, and endurance.

DISCUSSION

1. The Relationship of Limb Length to Kids Results

A significant relationship between limb length and the results of kids athletics of male students in grade 4 SD Negeri gugus 2 Gantung sub-district, East Belitung Regency, is proven by the significance value of p-value 0.004 <0.05 and the results of ρ count 0.313> ρ table 0.216 where the correlation coefficient is 0.313 which is included in the category of weak relationship with a positive value, meaning that if the limbs get longer, the results of kids athletics of male students in grade 4 SD Negeri gugus 2 Gantung sub-district are getting better.

The results of the study are supported by previous research on limb length as part of body posture has a very close relationship in relation to being a lever when jumping and jumping (Hermawan & Tarsono, 2017). Furthermore, as a lower limb, limb length functions as a support for upper limb movement, as well as a determinant of movement both in walking, running, jumping and kicking (Fahkruzzaman et al. 2015). According to Sajoto, 1995; Pratomo & Gumantan, (2020) that "one of the important components in sports achievement is body size, body structure or biometric quality in achieving sports achievements in the developed branch.

Limbs are often referred to as lower limbs (extremities) consisting of lower legs (tibia and fibula), upper legs (femur), and feet. While the foot itself consists of the foot (metatarsus), ankle (ankle/tarsus), and five toes (Imam Hidayat, 1999; Wardiman & Hermanzoni, 2019). Leg length is a component of the lower body that can be measured in an upright position from the sole of the foot to the groin position. Limb length has a very close relationship with a person's ability to do kids athletics such as levers when jumping, running, walking and darting.

2. The Relationship of Limb Muscle Explosive Power to Kids Athletics Results

A significant relationship between leg muscle explosive power on the results of kids athletics of 4th grade male students of SD Negeri gugus 2 sub-district Gantung, East Belitung Regency, is proven by a significance value of p-value 0.000 <0.05 and ρ count 0.782> ρ table 0.216 with a correlation coefficient of 0.826 which is included in the category of a very strong relationship with a positive value, meaning that if the leg muscle explosive power is large, the results of kids athletics of 4th grade students of SD Negeri gugus 2 sub-district Gantung.

The results of the study are supported by previous research conducted by Jasmani, (2021), there is a significant relationship between leg muscle power and kids athletics frog jumping ability. Limb muscle explosiveness in running is needed to make maximum repulsion in the start and during running (Henjilito, 2019,p.112). Leg muscle explosiveness is the ability of muscle movement when working strongly and quickly simultaneously, by having good muscle explosiveness, when running can produce fast running speeds (Nur et al., 2022). Power is especially important for sports that require athletes to resist with their feet, such as kids athletics. The absence of explosive power causes the athlete's movements to be slower and less efficient which can increase the likelihood of injury (Agatha et al., 2022).

Muscle power is a factor associated with athletic performance and the benefits of achieving greater muscle strength are related to better forcetime characteristics that contribute to overall athlete performance, greater muscle strength will improve individual performance in a variety of general and sport- specific skills such as jumping, sprinting, and direction-changing tasks, while reducing the risk of injury when performing these skills (Suchomel et al., 2016). Performance in various sporting activities (team sports, athletics, martial arts) is largely related to the success of lower limb ballistic movements that aim to

accelerate body mass as quickly as possible in vertical jumps, horizontal jumps, change of direction, initial acceleration steps and sprints (Padulo et al., 2017).

Basic motor skills for various sports that require high-speed contractions (leg muscle power) such as sprinting, hurdling, jumping in athletics, football, skiing, jumping and some combat sports, furthermore, leg muscle power is influenced by the degree of opposing movement, maximal joint and muscle strength, and posture (Mackala et al., 2013).

3. The Relationship of Speed to Kids Athletics Results

A significant relationship between speed and the results of kids athletics for male students in grade 4 SD Negeri gugus 2 sub-district Gantung East Belitung Regency, proven by a significance value of p-value 0.000 <0.05 and a value of ρ count 0.782> ρ table 0.216 with a correlation coefficient of - 0.782 which is included in the category of a very strong relationship with a negative value, the direction of the variable relationship is negative, meaning that the smaller the speed time, the better the results of kids athletics for male students in grade 4 SD Negeri gugus 2 sub-district Gantung

The results of the study are supported by previous research conducted by Habibi, (2023) which found a relationship between running speed and the results of the formula one kids athletics race. Moving the feet quickly is the most important physical skill (Sahabuddin et al., 2022). According to Gevat et al., (2012) "maximum running speed is the most basic factor in various sports such as rugby, hockey and football, athletics. Acceleration takes place first 0-30 metres or about 3-4 seconds from the start of the sprint. After about 30 metres the acceleration changes to maximal speed and peak speed". Accelerative sprinting requires that the body be propelled primarily by the leg extensor muscles, a requirement reflected in the strong relationship between the relative size of the knee extensor maximum force and accelerative sprinting performance (Sleivert and Taingahue, 2004; Moir et al., 2007).

According to Čillík et al., (2013) "the main factor that significantly influences the level of speed and speed strength ability is contact time during repeated squat-jumps. statistically significant correlations between acceleration and maximum running speed have statistically significant correlations and correlations between contact time and other indicators of speed and speed strength". The 0-300 second all-out high speed/power generation that occurs at intensities beyond minimal speed/power resulting in maximal oxygen uptake final incremental test speed as maximal aerobic speed or power, arises from a complex interaction of metabolic, neuromuscular, and mechanical capabilities (Sandford et al., 2021).

4. Relationship between Body Mass Index (BMI) and Kids Athletics Results

A significant relationship between body mass index and the results of kids athletics of 4th grade male students of SD Negeri gugus 2 sub-district Gantung, East Belitung Regency, is proven by the significance value of p-value 0.000 <0.05 and the value of ρ count 0.525> ρ table 0.216 with a correlation coefficient of -0.525 which is included in the category of a very strong relationship with a negative value, the direction of the variable relationship is negative, meaning that the smaller the body mass index, the better the results of kids athletics of 4th grade male students of SD Negeri gugus 2 sub-district Gantung

This is reinforced by the opinion of Huda, 2012; Agatha et al., (2022) "Body mass index is very influential in jumping sports activities. Ideal body weight and overweight or overweight affect the speed and strength to make a repulsion and to bring out maximum muscle explosive power ". According to Mubarani et al., (2017) "Body mass index and body fat percentage are anthropometric components that can be a supporting factor for athlete achievement, especially in sports that require agility". Mubarani et al., (2017)"states that the higher person's body mass index (BMI), the less

agility they have because the time needed to complete the agility test takes longer". The magnitude of body size correlates with height with body potential, especially in terms of strength and muscle work performance (Hanafi et al., 2022)

According to Aikawa et al., (2020) there is a significant positive correlation between body mass and international Association of Athletics Federations (IAAF) scores, and between muscle mass and IAAF scores, revealing that there are several correlations between body composition and athletic performance."

5. The Relationship between Limb Length, Limb Muscle Explosive Power, Speed, and Body Mass Index (BMI) on Kids Athletics Results

Based on the results of the study, it shows that there is a relationship between leg length, leg muscle explosiveness, speed, and body mass index (BMI) with the results of kids athletics for 4th grade male students of SD Negeri gugus 2 sub-district Gantung, East Belitung Regency, with an F value of 79.563> F table (df 4; 78) 2.49 and a p-value of 0.000 <0.05, with a contribution of 80.3%. Based on these results it is clear that leg length, leg muscle explosive power, speed, and body mass index jointly affect the results of kids athletics for 4th grade male students of SD Negeri gugus 2 sub-district Gantung, East Belitung district where there are 4 branches consisting of turbo throwing, frog jumping, kanga escape and formula one.

With a contribution of determination of 80.3%, the remaining 19.70% comes from outside the research that has been done, as for these elements according to the opinion of Bakti et al., (2024) "elements that support the success of athletic sports are endurance, agility, flexibility, balance, reaction time, and coordination". Then it is reinforced by Abhaydev et al., (2020) that Kids athletics is a specialised children's sport whose results are strongly influenced by the motoric variables of explosive strength and agility". Widiyanto et al., (2021) also explained that kids athletics numbers have physical condition components that must be fulfilled by students in the form of muscle strength components, heart lung endurance and flexibility.

The theory is in accordance with the movements in kids athletics such as in the kanga escape and formula one there are smovements that require agility when passing the swalom pole, passing the goal, and changing direction. For flexibility and endurance there is also a formula one when doing the front roll, the advanced movement of throwing the turbo, and the strength of the hands when throwing the turbo kids athletics branch. Another factor that is no less important in influencing the results of kids athletics is the internal factor that exists in the respondent, namely interest and psychic during the test, when not interested in kids athletics, the enthusiasm they have will be less so that it will affect the results of kids athletics.

CONCLUSION

That the variable length of l imbs with the results of kids athletics has a significant relationship with rcount 0.313, variable limb muscle explosive power with the results of kids athletics has a significant relationship with rcount 0.826, variable speed with the results of kids athletic has a significant relationship with rcount - 0.782, then there is a significant relationship between body mass index (IMT) with the results of kids athletics with rcount -0.525 and the results of kids athletics. There is a relationship between leg length, leg muscle explosive power, speed, and body mass index (BMI) with the results of kids athletics for 4th grade male students of SD Negeri cluster 2 sub-district Gantung, East Belitung Regency, with a calculated F value of 79.563> F table (df 4; 78) 2.49 and a p- value of 0.000 <0.05, with a contribution of 80.3%.

Research has relevance, benefits and uses related to theoretical benefits, among others, as a reference for the development of further research, knowing the physical elements that are important in kids athletics so that they can be taken into consideration for the implementation of extracurricular and learning kids athletics and for practical benefits for students, it is hoped that as a basis of knowledge for students and material to improve kids athletics abilities and for PE teachers, as input to solve problems faced in relation to kids athletics.

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