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RELATIONSHIP OF BODY MASS INDEX TO THE POWER OF ARMS AND EXPLOSIVE POWER OF LEGS FOR DISPLACED SCHOOLGIRLS OF 9-10 YEARS OF AGE

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Abstract: The study aimed at being acquainted with two relationships, Firstly to the explosive power of legs by linear regression equations in Sargent test and secondly to the power of the arms by linear regression equations in the test of push-ups. Furthermore, to fit a multiple regression model of the relationship between the independent variables (the power of the arms and the explosive power of legs) and the dependent variable (BMI). The participants were 60 female students from the fourth-grade primary (age mean 9.30 ±0.46-year, height mean 1.32 ± 0.06-meter, weight mean 31.16±8.80-kg, BMI mean 17.55±3.64). The variables measured included the explosive power of legs (Sargent test) and the power of arms. Multiple correlation coefficient by the method of all slopes and the test of the normal distribution of residuals were used to process data statistically.Theoretical or mathematical terms have not been reached for the validity of the regression model, which has been fitted between the dependent variable (BMI) and independent variables (explosive power of legs and the power of arms).The physiological reasons may be what distinguishes performance among children of moderate weight, overweight and obese, not body composition.
Keywords: Body Mass Index, explosive power of legs and the power of arms.

I. Introduction

School sports have an active and significant role in preparing student girls and developing physical and motor components for them. Physical components and body status have great importance and clear effects on the human level of motor,practical and scientific performance,such these effects have an importance especially. For children in determining the type of motor activity and how it is influenced by and effect on physical components. In addition, Physical componentscouldpoint outthe motor components related to an activity may the girl experienced. The Body Mass Index, BIM is an important measure of physical components. It has a direct relationship with obesity in general. BMI is used to classify people according to their level of obesity. In addition to the scientific research, BMI is utilized today to distinguish among healthy body weights in the field of school tests, health clubs and sports. BMI is calculated by using a person's height and weight. The formula is BMI = kg/m2 where kg is a person's weight in kilograms and m2 is their height in meters squared. In fact, BMI has been neglected for many decades throughout history, where there has been no appropriate or easy measurement used in scientific research, numerically reflecting the dimensions or composition of the human body. In 1972, the nutrition scientist and epidemiologist Ancel Keys defined this indicator as an appropriate approximation for determining body fat levels within the community(Keys et al., 1972). Since then, more than (150,000) researches and articles in scientific journals have referred to BMI in their texts(Gutin, 2017).There are many studies dealt with BMI in the field of children and schoolchildren. Certain Studies such as the study of Sudina HC in 2017 dealt with the effects of body components such as height, weight, body composition and motor capabilities. Sudina examined the relationship between the body composition represented by BMI with a three-tests battery including vertical jump, chin up and shuttle running for a sample of 70 student boysaged 13 - 16 years(Sudina, 2017). Catenassi et al examined in 2007 the relationship between BMI and some gross motor skills in 27 four to six-year-old boys and girls. The skills were those of the Test of Gross Motor Development-Second Edition (TGMD-2) and of the Körperkoordinations-test für Kinder (KTK). The TGMD-2 consists of six locomotion tasks (running, jumping, jumping on one leg, horizontal jumping, jumping one obstacle, sliding and galloping) as well as six object control tasks (hitting back, gripping, bouncing, throwing, rolling and kicking). The KTK consists of the performance of four motor tasks: balance during backwards gait, jumps on one leg, lateral jumps and transference on platforms.(Catenassi et al., 2007).The Sharma & Nigam study in 2011 examined the relationship of three levels of BMI, low, medium and high with the Chin ups, Vertical Jump, Shuttle Run, Sit and Reach for male 9 and10 yearsold(Sharma & Nigam,

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2011). Hence, the importance of this studyis the relationship of BMI with some physical and motor qualities in a female sample of the 10-year oldin addition to the positively or negatively effects of these qualities. This study assumed the ability to utilize these effects positively to enhance and develop these physical and motor qualities, as well as a guide to prepare appropriate training programs for each physical or motor quality in relation to the indicator of (BIM).To create and prepare a healthy generation as well as high physical and motor qualities and the ability to perform various activities (sports and non-sports) Ideal.

Problem of the study

The research problem lies in the following question:Does BMI have effects on the power of the arms and the explosive power of the legs?

Aims of the study

The study aimed at being acquainted with tworelationships, Firstly to the explosive power of legs by linear regression equations in Sargent test andsecondlyto the power of the arms by linear regression equations in the test of push-ups. Furthermore, to fit a multiple regression model of the relationship between the independent variables (the power of the arms and the explosive power of legs) and the dependent variable (BMI).

Hypothesis of the study

Research hypothesized that there were no significant differences between the BMI and the power of the arms and the explosive power of legs in a sample of females aged ten years. In addition,all the regression coefficients of the linear regression equations in the tests of the power of the arms and the explosive power of legs do not differ from zero, i.e., it is not significant.

II. Related literature

The most related study was “The relationship between body mass index (BMI) and general motor skills in children aged 4-6 years.” (Catenassi et al., 2007)

The study aimed to identify the relationship between body mass index (BMI) and general motor skills through the tests TGMD-2 and KTK. The sample included 27 children consisting of 16 males and 11 females with mean age and standard deviation (0.67 ± 5.64). Correlation coefficients were performed between the TGMD-2 motor development test, which includes running, jumping, jumping with one leg, long jumping, jumping over obstacle, as well as the motor skills test for this KTK category, including picking up, throwing, passing the ball, sticking and kicking the ball with BMI. The results showed no overlapping effect on gender variables, as well as no overlapping effect on variables at the same sex level. There was no significant effect between BMI and general motor skills that required higher physical abilities. The study concluded that achievement of this age group was not associated with general motor skills.

III. Methods and Research Methodology

The participants were female students from thefourth-grade primary in the Haval schools 1 and 2 for displaced girls of the Iraqi Ministry of Education in Duhok city.Displaced female students at the age of 9-10.The size of the research community was 507. The sample size was 60 and the percentage of the sample represented to the community was 11.83%.The study procedure lasted from 15/10/2019 to 7/11/2019. The Yard of Haval school 1was the field of tests

The descriptive methodologywas utilized since it is convenient to the nature of the problem and to achieve the objectives of the study.

Table 1 shows the arithmetic mean and the standard deviations of the variables on which the sample was homogenized

	age			Hight (m)	Weight (kg)	BMI
	day	month	year			
M	17.53	5.65	9.30	1.32	31.16	17.55
±SD	8.22	3.48	0.46	0.06	8.80	3.64

Devices, tools and means used in research

For the purpose of conducting field research procedures, the researchers used the devices of electronic stopwatch measuring to the nearest 1/100 second, tape measure in centimeters, wall of suitable height, a 2.5-meter wall-mounted indicator is included, water bowl, chair, whistle, school yard, and registration sheet.

Means of data collection

Measurement of the body standing height and weight.

The length and weight of the participantswere measured by a scale and a stadiometer.The standing height was measured in meter as the maximum distance from the floor to the highest point of the head, when the subject is facing directly ahead, bare feet, feet together, and arms by the sides. Heels, buttocks and upper back should also be in contact with the ruler when the measurement is made. Formeasuring body weight in kilograms, the participant stands in bare feet on the scale with minimal movement with hands by their side.

Measuring BMI

Body Mass Index (BMI) is calculated by calculating the ratio of square height to body weight according to the following equation:

BMI = body weight (kg) ÷ square length (m).

Physical tests

Sargent Jump Test.

The participantstands side on to a wall and reaches up with the hand closest to the wall. Keeping the feet flat on the ground, the point of the fingertips is marked as the standing reach height. The participant then stands away from the wall, and leaps vertically as high as possible using both arms and legs to assist in projecting the body upwards. The participant used the jumping countermovement technique in attempt to touch the wall at the highest point of the jump. The difference in distance between the standing reach height and the jump height is the score. The best of three attempts is recorded.

Push-up test

The participant gets in the bent knee position by putting her kneel on the floor, hands on either side of the chest and keep her back straight. She lowersher chest down towards the floor, always to the same level each time, either till her elbows are at right angles or her chest touches the ground.The participant do as many push-ups as possible until exhaustion. The counts of the total number of pushups performed are recorded.

Pilot experiments

Pilot experiments were conducted on the sample to be familiar with the test environment. All measurements, tests and procedures were applied to them in the final pilot experiment to ensure the validity of the instruments and instruments used, and to ensure that the assistant team understood the methods of measurement and work.

Final experiment

The final experiment applied from Nov 5through 7, 2019 in the yard of Haval school 1 for displaced girls. The experiment included measuring the following variables and at rest time: The body weight, the standing body length, the explosive power of legs (Sargent test) and the power of arms

Statistical treatments

Arithmetic mean, Standard deviation, adjusted contribution ratiosderived from the simple linear regression equation, Pearson correlation coefficient, multiple correlation coefficient by the method of all slopes and the test of the normal distribution of residuals were used to process data statistically.

IV. Results

Presentation of the results for contribution of the explosive power of legs (Sargent test) and the power of arms to BMI.

Table 1, the name, physical component included, test time, test unit, average and standard deviation of the tests

Test name	physical component included	test time (s)	test unit	M	±SD
Push-up	power of arms	10	Repetition	12.70	1.83
Sargent Jump	explosive power of legs		cm	22.72	4.44

Table 2, the descending order of the adjusted contribution ratios derived from the simple linear regression equation for each independent variable and individually in the dependent variable (BMI)

independent variable	R2	R2 (adj)	Mallows C-p	s
power of arms	5.4	3.8	1.0	3.5672
explosive power of legs	5.4	2.1	3.0	3.5983

Table 3, Pearson correlation coefficient between the dependent variable (BMI) and independent variables (explosive power of legs (Sargent test) and the power of arms)

BMI	Pearson correlation coefficient	sig	n
power of arms	0.010	0.939	60
explosive power of legs	-0.233	0.073	60

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Table 4.The multiple correlation coefficient (R), R Square, Adjusted R Square and the Standard Error of the Estimate by the method of all variable regression.

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.233	0.054	0.021	3.59831

Table 5. The ANOVA analysis of the estimated multiple regression model (by method all variables regression) shows the relationship between independent variables (explosive power of legs (Sargent test) and the power of arms) and the dependent variable (BMI)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	42.424	2	21.212	1.638	0.203
Residual	738.028	57	12.948		
Total	780.452	59			

Table 6.The values of multiple linear regression coefficients, test statistic value of t and level of significance

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	22.179	4.260		5.207	0.001
power of arms	0.006	.257	0.003	0.024	0.981
explosive power of legs (Sargent test)	-0.214	.118	-0.233	-1.808-	0.076

Table 7. Normality tests of Residual of linear regression model.

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Studentized Residual	0.131	60	0.012	0.919	60	0.001

V. Discussion

Discussion of the results for contribution of the explosive power of legs (Sargent test) and the power of arms to BMI.

It is clear from Table (2) that the best adjusted contribution ratio (adjusted R2) in the (BMI) is up to 3.8, but the preference was for the explosive power of legs (Sargent test) as its coefficient determined is (2.1) and it has the best value in Mallows' test and the smallest value of the standard error of the estimate. Then, power of arms comes.

Table (3) shows that there are no significant correlations between dependent variable (BMI) and independent variables

From table 4 through 7, it can be seen that theoretical or mathematical terms have not been reached for the validity of the regression model, which has been fitted between the dependent variable (BMI) and independent variables (explosive power of legs and the power of arms).From the theoretical terms, it can be noted that the independent variables (explosive power of legs and the power of arms) did not have the ability to explain the regression model as the Adjusted R Square was (0.021) which means that it does not explain any percentage of changes in the dependent variable (BMI). As for the mathematical terms, it can be seen from Table (4) that the value of F was (1.638) at a significant level of (0.203), which means that the overall test is not significant, which means that the proposed linear model is not acceptable to represent the relationship between the dependent variable (BMI) and explanatory variables (explosive power of legs and the power of arms). The overall non-significance of the test means that all coefficients of the regression model are not different from zero (i.e. they are not significant). It is also shown in Table 6 that the t values of the independent variables (explosive power of legs and the power of arms) for men were (0.024) and (-1.808) at significant levels of (0.981) and (0.076), respectively, which means that the partial tests of each of these variables are not significant and that none of them is of great use either individually or in combination with one or other variables in the representation of the relationship with the dependent variable (BMI).It is shown from Table (7), the values of normality tests of the residual were (0.131) at a significant level of (0.012) for the Kolmogorov-Smirnov test and (0.919) at a significant level of (0.001) for the test of Shapiro-Wilk, which means that the residual are not distributed normally and therefore there is no normality tests of the residualfor the Least Square (LS) method of the linear regression model.It is clear from the above that there is not necessarily a relationship between BMI and some motor skills (explosive power of legs and the power of arms) and according to Eckert, the differences in the performance of motor skills can

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be attributed (among other factors) to the different physique structure experienced by man during his life (Eckert, 1993). In this context, some studies have attempted to investigate the effect of these structural properties on the motor aspects. Nunes et al., studied the effect of weight, height and body proportions on transitional skill behavior for ages 6-7 years and concluded that these growth variables do not significantly affect the performance of basic motor skills for these ages. (Nunes et al., 2004). The results of this research are also consistent with the study of Machado et al., Which examined the relationship between body composition and performance of basic motor criteria for children ages 5-8 years. Their motor behavior was assessed by the modified TGMD-2 motor development test. No significant differences were found in the test between body weight, fat mass and fat-free mass(Machado et al., 2002). The above studies promote the independence of the motor skills associated with anthropometric measurements and BMI as one of the structural aspects of 10-year-old female children. The researchers believe that physiological reasons may be what distinguishes performance among children of moderate weight, overweight and obese, not body composition.

VI. Conclusion

There was no correlation between BMI to theexplosive power of legs and the power of arms.

VII. Recommendation

Touse some body composition variables in addition to BMI, such as measuring the percentage of fat.

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