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The Nature Of The Relationship Between Some Anthropometric Measurements And Stride Length Walking: Descriptive Research For Players Renaissance Progress Olympic Volleyball Volleyball Class (09-12)

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Abstract
The study aims to identify the relationship between certain anthropometric measurements and the length of the walking step of volleyball players at Renaissance Progress Olympic Chlef. The descriptive method was used, and the 10-meter walking test was applied to extract the stride length on a sample of 14 players from the Renaissance Progress Olympic Chlef sports club. Results showed a statistically significant correlation between lower limb length and stride length, while the relationships between (foot length, mass) and stride length were correlational but not statistically significant. The researcher recommends conducting studies that include age and sex as factors, while treating lower limb length as an important variable in future research.

Keywords: Anthropometric measurements, stride length, Late Childhood.

Introduction:

Man is always unique, how could it be otherwise when his genetic makeup is singular, his personal development is particular, and the external influences on him are varied, all together shaping his personality. If we compare one person to those around him, we find individual differences not only in their appearance but also in their mental capacities, and likewise in their temperamental and behavioral characteristics (Sana Mohammed Salman, 2006, p. 13). For this reason, individual differences are clearly visible. Children do not all grow in the same way or at the same rates, some grow relatively more in height, others in weight, which leads to a diversity of general body types such as (tall, thin) or (short, tall) (Mohammed Abdul Razak Shafak, 1985, p. 43).

The cultural and geographical environment in which a child lives affects their motor activity. Although children's motor activity across the world is similar in a general sense, they all run, jump, climb, and play, cultural and geographical differences produce some variations in this activity from one culture to another. This is especially visible in the types of games and competitions (Hamid Abdussalam Zahran, p. 263). On this point, (Marwan Abdul Hamid, 1999) notes that "the environment is one of the important and influential factors in physical measurements, as studies and research have shown that the human body differs from one environment to another in relative terms. The superiority of some human races in certain competitive sports activities may be attributed to the effect of environment on physical measurements, and there are environmental factors that affect body proportions, such as temperature and altitude above sea level" (Marwan Abdul Hamid, 1999, p. 1).

Heredity also plays a role in physical differences between individuals. (Ahmad Mohammed Khater, Ali Fahmi al-Bik, 1996) pointed out that "heredity refers to a set of traits determined by genes that transfer inherited characteristics from parents to the fetus. We find that some people inherit certain physical and bodily traits, as evidenced by significant differences in height among individuals of the human race, which reflect the individual's hereditary properties." They also noted that "sports training is one of the factors leading to anthropometric changes in the athlete's body, and practicing any type of sports activity regularly and for a long period grants the athlete certain changes in the external appearance of the body in accordance with the nature of that activity."

Research and studies have confirmed that each sport has specific physical measurements that must be considered, since "every sport requires specific physical specifications that must be taken into account when selecting new athletes for that activity" (Ahmad Mohammed Khater, Ali Fahmi al-Bik, 1996, p. 4). Practicing any sporting activity continuously over long periods causes the practitioner to acquire special morphological characteristics that suit the type of sport practiced. (Essam Helmy, 1987) affirms that regular and long-term practice of activities with a special nature produces a morphological effect on the practicing individual's body. This effect can be identified by measuring the body parts that are actively engaged during the activity, as these parts influence and express muscular strength, speed, endurance, flexibility, the athlete's body response to various surrounding conditions, and physical efficiency in achieving outstanding sports results (Mohammed Hazem Mohammed Abu Yusef, 2005, p. 25).

Understanding how sports education and its various activities affect the body's systems creates a strong incentive, pushing us to pursue these activities and encouraging our children to seek them out rather than waiting for the activities to come to them, making them part of our children's daily behavior. Regular and proper practice also affects the skeletal system, which in turn reflects on the child's posture, resulting in good posture (Sharaf Abdul Hamid, 2005, p. 112). (Iqbal Rasmi, 2007) notes that engaging children in sports activities greatly benefits the child's health, as sport helps strengthen the nervous system, muscles, and bones, and raises the body's immunity against various stimuli and factors that lead to disease (Iqbal Rasmi Mohammed, 2007, p. 83).

Volleyball is among the sports that lead to a proper and beautiful body appearance, as is the case with other sports. Its players are distinguished by high physical fitness across all its components (balance, flexibility, agility, strength, endurance). They are also known for their tall stature, the length of the arms, feet, and fingers facilitates performing all offensive and defensive skills. Height holds great importance in many sports activities, whether total body height or the length of specific body parts, as is the case in football. The proportional harmony of limb lengths is also important for acquiring neuromuscular coordination in most sports. Height can lose importance in some activities, where excessive stature weakens balancing ability because the center of gravity is farther from the ground. Short-statured individuals therefore tend to have better

balance than tall ones in most cases. Many studies have confirmed that height correlates with age, weight, agility, accuracy, balance, and intelligence (Mohammed Sobhi Hassanin, 1995, p. 32).
Based on what has been presented above, and in an effort to establish some normative walking values for children in our society by comparing different normative walking values according to each sport and the extent to which these sports affect the child's gait in the future, we wanted to understand the importance of some anthropometric measurements in determining certain normative walking values in volleyball. The problem of the study lies in the following question:

- Is there a relationship between some anthropometric measurements (lower limb length, foot length, and mass) and stride length in volleyball players aged (9–12) years?

Research hypothesis:

- There is a correlational relationship between (lower limb length, foot length, and mass) and stride length.

2. Study Methodology:

2.1 Study method:

The researcher adopted the analytical descriptive method for its suitability to the nature of the research, using a correlational study approach.

2.2 Study population and sample:

2.2.1 Study population:

The study population consists of players practicing physical and sports activity in the volleyball specialty in the municipal teams of Chlef in the (9–12) years age category.

2.2.2 Study sample:

The sample is defined as "a procedure that aims to represent the original population by a limited number of units through which measurements or data related to the study or research are taken" (Mohammed Nasreddin Ridwan, 2003, pp. 14, 17). We therefore selected the research sample purposively. The sample consisted of 14 players from the Renaissance Progress Olympic Chlef volleyball team.

Table 1, Descriptive characteristics of the sample members:

	Sample	**Minimum**	**Maximum**	**Mean**	**Standard Deviation**	**Skewness coefficient**
Mass (kg)	14	29.80	54.30	38.38	8.70	0.74
Height (m)	14	1.34	1.57	1.46	0.08	−0.21
Foot length (cm)	14	20.00	25.00	22.21	1.25	0.36
Lower limb (m)	14	0.71	0.78	0.75	0.03	−0.75

From the results in Table 1, we observe the following:

- Sample members' weight ranged from 29.80 kg to 54.30 kg, with a mean for the mass variable of (38.38 ± 8.70), and a skewness coefficient value of (0.74). These are acceptable values indicating homogeneity of the sample.
- Sample members' height ranged from 1.36 m to 1.57 m, with a mean for the height variable of (1.46, ± 0.08), and a skewness coefficient value of (−0.21). These are acceptable values indicating homogeneity of the sample.
- Sample members' foot length ranged from 20 cm to 25 cm, with a mean for the foot length variable of (22.21 ± 1.25), and a skewness coefficient value of (0.36). These are acceptable values indicating homogeneity of the sample.
- Sample members' lower limb length ranged from 0.71 m to 0.78 m, with a mean for the lower limb length variable of (0.75 m, ± 0.03), and a skewness coefficient value of (−0.75). These are acceptable values indicating homogeneity of the sample.

2.3 Research tools:

2.3.1 Data collection tools:

- Review of Arabic and foreign sources.
- Markers to define the walking path.
- Digital video camera: 26* Wide Optical Zoom 12.1 Megapixels. Pentax Lens 4.6 mm–119.6mm
- Lightweight tripod with water level (Lightweight Tripod)
- Reference calibration markers
- Height measurement device
- Mass measurement device: Ross Max

2.3.2 Analysis tools:

- Lenovo computer:

Intel ® Pentium ® CPU B960 @ 2.20 GHz 2.20 GHz

- Kenova 0.8.24 software for kinematic analysis.

2.4 Measurements and tests:

2.4.1 Measurements:

- Measurement of total height.
- Measurement of lower limb length.
- Measurement of foot length.

2.4.2 Tests:

Normal walking test over 10 meters: The walking test is the distance walked by the subject, which is 10 meters. It is a test used in laboratories to extract various temporal and spatial variables. (Éric Viel, 2000, p. 97)

Note: A single video camera with a speed of 25 frames per second was used, placed on the player's right side at a distance of 9 meters, at a height of 0.85 m.

2.5 Operational definition of research variables:

These are the most important kinematic variables specific to the research sample, selected by the researcher based on previous and similar studies, in addition to personal meetings with specialist professors in the field of kinematic analysis. This research focuses on the effect of (lower limb length, foot length) and mass on determining stride length, where:
— **Lower limb length:** the distance from the prominent pelvic bone opposite the hip joint down to the heel.
— **Foot length:** the distance from the farthest point on the heel border to the farthest point on the toes.
— **Stride length (stride length):** the longitudinal distance from one heel strike to the next strike of the same heel, representing one complete walking cycle.

2.6 Study domains:
Human domain: The study was conducted on the Renaissance Progress Olympic Chlef volleyball club. POC
Spatial domain: The study took place at the team's training venue, the multi-sports hall in Chlef.
Temporal domain: From 20/04/2023 to 10 May 2023.

2.7 Statistical methods used:
Data were extracted and coded in preparation for computer entry, turning them into numerical variables measurable using the statistical analysis program (SPSS). This program is the abbreviation for (Statistical Package for Social Sciences) and is among the most widely used statistical software by researchers in educational, social, artistic, engineering, and agricultural fields for conducting the necessary statistical analyses (Bashir Saad Zaghloul, 2003, p. 8). The following statistical methods were used:

- Mean, standard deviation, and skewness coefficient.
- Stepwise multiple regression, correlation coefficient.

3. Results:
— Testing the hypothesis results:

- There is a correlational relationship between (foot length, lower limb length, mass) and stride length.

Null hypothesis H0:
The regression between the dependent variable (stride length) and the independent variables (foot length, lower limb, mass) equals zero, meaning the regression is not significant and the independent variable (foot length, lower limb, mass) is not related to the dependent variables.
Alternative hypothesis H1:
The regression between the dependent variable (stride length) and the independent variables (foot length, lower limb, mass) does not equal zero, meaning the regression is significant and the independent variable (foot length, lower limb, mass) is related to the dependent variables.
Means and standard deviations were calculated for the sample across the study variables. Table 2 shows:

Table 2, Means and standard deviations for the study variables:

	Mean	Standard Deviation	Sample size

Stride length	1.47	0.12	14
Foot length	22.21	1.25	14
Lower limb length	0.75	0.03	14
Mass	38.38	8.70	14

- The mean stride length for sample members was (1.47) with a standard deviation of (± 0.12).
- The mean foot length for sample members was (22.21) with a standard deviation of (± 1.25).
- The mean lower limb length for sample members was (0.75) with a standard deviation of (± 0.03).
- The mean mass for sample members was (38.38) with a standard deviation of (± 8.70).

Table 3, Correlation matrix between variables and statistical significance values for correlation:

	Stride length	Foot length	Lower limb	Mass
Pearson correlation				
Stride length	1	0.448	0.534	0.414
Foot length	0.448	1	0.589	0.769
Lower limb	0.534	0.589	1	0.457
Mass	0.414	0.769	0.457	1
Significance level				
Stride length	.	0.054	0.025	0.071
Foot length	0.054	.	0.013	0.001
Lower limb	0.025	0.013	.	0.05
Mass	0.071	0.001	0.05	.
Sample				
Stride length	14	14	14	14
Foot length	14	14	14	14
Lower limb	14	14	14	14
Mass	14	14	14	14

Table 3 shows the correlation matrix between the independent variables and the statistical significance values (sig) for the correlation. The correlation coefficient between stride length and lower limb length is (0.534), a moderate positive correlation with a significance level of 0.025, statistically significant. The correlation coefficient between stride length and foot length is (0.448), a weak positive correlation with a significance level of 0.054, not statistically significant. The correlation coefficient between stride length and mass is (0.414), a weak positive correlation with a significance level of 0.071, not statistically significant.

Table 4, Names of variables entered into the regression equation and the method for excluding other variables using the stepwise approach:

Variables Entered/Removed [a]			
Model	**Variables**	**Variables**	**Stepwise multiple regression method**

	entered	excluded	
1	Lower limb length	.	Stepwise: Criteria: probability of entering variables where F values have significance level < = 0.050; probability of excluding variables where significance level > = 0.100 (F<).
a. Dependent Variable: Full stride length			

Table 4 shows the names of the variables entered into the regression equation, only lower limb length, and the method for excluding other variables using the stepwise approach.

Table 5, Correlation coefficient between the dependent variable and the independent variables:

Model Summary [b]				
Model	**Correlation coefficient**	**R^2**	**Adjusted R^2**	**Standard error of estimate**
1	0.534[a]	0.285	0.225	0.10525
a. Predictors: (Constant), lower limb length				
b. Dependent Variable: stride length				

Table 5 shows the correlation coefficient between the dependent variable and the independent variables in the second column, which is (0.534), as well as R^2 in the third column (0.285), adjusted R^2 (0.225), and the standard error of estimate (0.10525). The independent variables therefore explain 28.5% of the variance in the dependent variable (stride length), a proportion with statistical significance.

Table 6, ANOVA results for testing regression significance:

ANOVA [a]					
Model	**Sum of squares**	**df**	**Mean square**	**F**	**Significance level**
Regression	0.053	1	0.053	4.780	.0490
Residual	0.133	12	0.011		[b]
Total	0.186	13			
a. Dependent Variable: stride length					
b. Predictors: (Constant), lower limb length					

Table 6 shows the ANOVA results for testing regression significance. The F value is 4.780 with a probability value Sig = 0.049, which is less than 0.05. We therefore reject the null hypothesis and accept the alternative hypothesis, the regression is significant, not equal to zero, and consequently there is a relationship between the dependent variable (stride length) and the independent variables (lower limb length, foot length, mass).

We still don't know exactly which of the independent variables (lower limb length, foot length, mass) added meaningful explanation to the variance in the dependent variable (stride length), so we turn to the regression equation coefficients table for clarification.

Table 7, Regression model coefficients, which help derive the regression line equation between variables:

Coefficients [a]					
	Standardized coefficients		**Non-standardized coefficients**		
Model	**B**	**Standard error**	**Beta**	**t**	**Significance level**
1 (Constant)	−0.276	0.799		−0.345	0.736
Lower limb length	2.32	1.061	0.534	2.186	0.049
a. Dependent Variable: stride length					

Table 7 shows the regression model coefficients that help derive the regression line equation between variables. The regression line equation is:

Predicted Y (stride length) = (−0.276) + ((2.320) × lower limb)

The data in the table above indicate that the only statistically significant variable is lower limb length, as is evident from the significance level.

Table 8, Names of variables excluded using the stepwise approach:

Excluded Variables [a]					
Model	**Beta In**	**t**	**Significance level**	**Partial correlation**	**Collinearity statistics, Tolerance**
1 Foot length	0.205[b]	0.663	0.521	0.653	0.653
Mass	0.214[b]	0.767	0.459	0.225	0.791
a. Dependent Variable: stride length					
b. Predictors in the Model: (Constant), lower limb length					

Table 8 shows the names of the variables excluded using the stepwise approach, foot length and mass, since the partial correlation between them and stride length is not statistically significant, as is clear from the Sig values in the table (0.521, 0.495) respectively.

3.1 Interpretation of results:

Stride length:

The mean stride length for sample members was (1.47, with a standard deviation of ± 0.12), as shown in Table 2. These values fall within the range indicated by (Whittle, W. Michael, 2007, p. 224) and the study by (Belhadj Larbi et al., 2022), although these values do not have statistical significance with (foot length, mass), while there was a statistically significant relationship between lower limb length and stride length, as noted by the study of (Abdul Mohsen A Awn, Abdurrahman S Alangari, 2014, pp. 21–30), which pointed out that lower limb length is one of the factors influencing gait length or stride length.

After presenting and discussing the results, the researchers found the following:

- We conclude that there is a statistically significant correlational relationship between lower limb length and stride length.
- We conclude that there is a correlational but not statistically significant relationship between lower limb length and foot length and mass.

4. Conclusion:

Sports training is one of the factors leading to anthropometric changes in the athlete's body, and practicing any type of sports activity regularly and for a long period grants the athlete certain changes in the external appearance of the body in accordance with the nature of that activity. Studies and research have confirmed that each sport has specific physical measurements that must be noted, since every sports activity requires specific physical specifications that must be taken into account when selecting new athletes for that activity. The research results revealed a statistically significant correlational relationship between physical measurements and stride length, particularly lower limb length. For this reason, normative walking values for each activity must be established according to each age group, in order to compare which type of these sports preserves normal walking movement, especially in the advanced age stages, to maintain the integrity of the child's motor system, guide athletes toward the optimal activity at an early age, and provide these data to specialists so they are available for comparison, making the assessment process easy, especially in cases of walking pathologies.

The researchers recommend:

- Treating lower limb length as an important factor in future studies.
- Conducting studies that include the (age, sex) factor and their effect on stride length.
- Studying differences in children's gait across various team and individual sports in the early age stages, to determine the optimal type of sport for maintaining normative walking values. This would help guide parents toward the optimal sport for each child's specifications to preserve the integrity of their motor system.

5. References:

5.1 Arabic

1. Ahmad Mohammed Khater, Ali Fahmi al-Bik. (1996). *Measurement in the sports field* (4th ed.). Nasr City: Modern Book House.
2. Iqbal Rasmi Mohammed. (2007). *Posture and care for our bodies (postural deviations and their treatment)*. Cairo: Dar al-Fajr for Publishing and Distribution.
3. Bashir Saad Zaghloul. (2003). *Your guide in the statistical program SPSS*. Baghdad: Arabic Statistical Training and Research.
4. Hamid Abdussalam Zahran. (no date). *Childhood and adolescence* (1st ed.). Cairo: The World of Writers.
5. Sana Mohammed Salman. (2006). *Psychology of individual differences and their measurement* (1st ed.). Cairo: World of Books.
6. Sharaf Abdul Hamid. (2005). *Sports and motor education for typical children and those with challenges between theory and practice*. Egypt: Book Publishing Center.
7. Mohammed Hazem Mohammed Abu Yusef. (2005). *Bases for selecting youth in football* (1st ed.). Alexandria, Egypt: Dar al-Wafa for Printing and Publishing.

8. Mohammed Sobhi Hassanin. (1995). *Measurement and evaluation in physical and sports education*. Cairo: Arab House of Thought.
9. Mohammed Abdul Razak Shafak. (1985). *School classroom management* (edition unspecified). Cairo: Arab House of Thought.
10. Marwan Abdul Hamid. (1999). *Tests, measurement, and evaluation in sports education*. Amman, Jordan: Arab House of Thought.

5.2 Foreign

1. Éric Viel. (2000). *La marche humaine, la course et le saut: biomécanique, explorations, normes et dysfonctionnements*. Spain: Grafos.
2. Whittle, W. Michael. (2007). *Gait Analysis, an introduction* (4th ed.).

Journals

1. Abdulmohsen A Awn, Abdulrhaman S Alangari. (2014). Normal biomechanical values of walking for healthy Saudi children in Riyadh city. *Saudi Journal of Sports Medicine*, 14(1), 21–30. doi:10.4103/1319-6308.131604
2. Belhadj Larbi, D., Benhenni, A., & Guebli. (2022). Kinematic analysis of the walking cycle of primary school pupils (9–12): a comparative study between practitioners and non-practitioners of physical and sporting activity. *Journal of Science and Technology for Physical and Sporting Activities*, 19(2), 203–218.

In English:

1. Ahmad Mohammed Khater, Ali Fahmi al-Bik (1996). Measurement in the sports field (version 4). Nasr City: Modern Book House.
2. Iqbal Muhammad Rasmi. (2007). Strength and care for our body (perversions and treatment). Cairo: Dar al-Fajr for publishing and distribution.
3. Bashir Saad Zaghloul. (2003). Your guide in the statistical program SPSS. Baghdad: Arabic Statistical Training and Research.
4. Hamid Abdussalam Zahran. (No history). Childhood and adolescence (version 1). Cairo: The World of Writers.
5. Sana Mohammed Salman. (2006). Psychology and measurement of individual differences (version 1). Cairo: World of Books.
6. Sharaf Abdul Hamid. (2005). Sports and motor education for fitting and challenging children between theory and practice. Egypt: Book Publishing Center.
7. Mohamed Hazem Mohamed Abu Yusef. (2005). Football Junior Selection Bases (Version 1). Alexandria, Egypt: Daralwafia printing and publishing.
8. Mohammed Sobhi Hassanin. (1995). Measurement and evaluation in physical and sports education. Cairo: Arab House of Thought.
9. Mohammed Abdul Razak Shafak. (1985). School grade management (version without edition). Cairo: Arab House of Thought.
10. Marwan Abdul Hamid. (1999). Tests, measurement and evaluation in sports education. Amman, Jordan: Arab House of Thought.
11. Belhaj Larabi, D., Benhenni, A., & Guebli. (2022). Kinematic analysis of the walking cycle of primary school pupils (9–12) is a comparative year of study between practitioners and

non-practitioners of physical and sporting activity. *Journal of Science and Technology for Physical and Sporting Activities*, 19(2), 203–218.