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Exercises designed on statistical methods and their impact on the development of physical and motor capabilities of the legs and on achieving 100 metres race for juniors runners

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Abstract:

This study focuses on what has been achieved from showing the effective contribution of physical and motor capabilities of the runners' legs muscles in (100) metres race for juniors, their achievement in it. It also investigates the extent of contribution of each of these capacities in that achievement, and the effects of the exercises designed upon the statistical methods on developing those capabilities and improving the achievement. The authors have empirically carried out many tests related to the capabilities and executed the items of the designed exercises (before and after the experiment) with 72 attempts. The data of these tests results have been dumped and analyzed statistically, taking into consideration the requirements of presentation and registration required to comply with rules and legal procedures.

From the above mentioned it was concluded that there are high correlative links between some of the investigated capabilities and the achievements of the runners in the competition. This matter inevitably contributed to developing runners' capabilities and improving their recorded achievement, relying on the impact of statistically designed exercises.

Keywords: designed exercises, statistical methods, physical and motor capabilities, (100) metres runners, achievement

1. Introduction:

People strive to achieve goals and successes they look forward to; these don't come arbitrarily. They are fruits of the development processes for most of concerned life aspects by applying the scientific basis for the development of talent in any of human's activities, especially in the fields of sports. The scientific progress extended to include many sports, as athletics. This sport is of great importance for its multiple competitions. The most important of these competitions is the (100) meters race, which is of high qualities in its components of physical and motor capabilities. It also grants the runner and audience lots of fun and suspense through competition and motor

performance. The reason is that it deals with the maximum speed of the competitor and accuracy of performance from the beginning of the competition to its end.

To obtain such capabilities, the competitors must undergo systematic training aiming for their comprehensive development, and this development in all its aspects can only be achieved through the quantitative calculations of the components of the excersise load and also the relationship between them. Accordingly, the process of the scientific approach in the planning of exercises for junior athletes in (100) meters race upon the extent of their contribution in their achievement is of great importance in the diagnosis and determination methods for any of these capabilities concerned with the legs muscles of the junior runners in (100) meters competition, especially those related to their achievement. As the scarcity and the weakness of them will cause a problem that requires designing proper exercises based on the right scientific planning for developing the physical and motor capabilities of the legs which have the biggest role in improving the records of the competition's juniors runners.

As far as the authors know, such studies, especially those concerned with the planning of training upon statistical methods, have not been studied. However, the contributions of predecessors in dealing with such a problem should not be neglected. This study can be considered as continuation of what precedes (if any) or qualitative addition helps researchers and teachers to apply planning processes to achieve the objectives of their teaching processes. There is no solution to the problem of our research only by achieving the following objectives:

1. To know which of the physical and motor abilities of the legs muscles of runners in 100 metres junior contest is of effective contribution in their achievement, as well as the rate of the contribution of each of these capabilities which caused achievement.
2. Knowing the effect of the designed exercises upon the statistical methods in developing the physical and motor capabilities of the leg muscles which contributed to achieve (100) metres competition and improve that achievement of junior runners.

2. Research Methodology:

For achieving the research goals, the authors have undertaken the following procedures:

1. Adopting the empirical approach in solving the problem of the research as they are matching together or as it is the most appropriate one for it. Such a method is the most transparent solution to many scientific problems in both practical and theoretical ways. (215: 3)
2. The research community was identified by the juniors contestants in the (100) meters competition. These juniors were members of local clubs in the city of Najaf in Iraq numbering(16) runners ,(12) of them were selected randomly to be the primary sample of the research (106:4). the tests were applied at a rate of (6) attempts for each of runners. So The total of the sample items were (72) attempts.
3. Identifying the physical and motor capacities of the legs muscles of junior runners in (100) metres competition with their tests. This can be obtained by presenting them in statistical forms on 15 experts and in the range of (0-10) for the capabilities, and 25 experts for the tests that were determined between (3-5) tests for each capability. After processing the responses statistically by using the test of coefficient of determination (r2), the results have nominated (4) (physical and motor) capabilities and a test for each capability to represent it.
4. Verifying validity and transparency of the chosen tests through executing an preliminary experiment on a random specimen of (6) runners on 23/10/2016.

5. To provide the objective conditions for conducting the exercises planning process to be applied on the research sample, the authors conducted the main experiment. In the experiment, the pre-tests were conducted for the (100) m running within the legal conditions, as well as measuring the physical and motor capabilities of the individuals of the research sample, as the tests have been repeated (6) times over a period of (12) days started off 2016/9/25. Thus, they were able to obtain a sample of (72) operational attempts for the race and the capabilities conducted by (12) junior runners.

6. To enable the authors to achieve their goals, a set of statistical methods in the analysis and processing of research data was used, such as; arithmetic mean, standard deviation, standard error, Kay square, spearman correlation test, T test for correlation, regression coefficient, T test for two interrelated samples. (1: 127-295), and the Law of Impact Size (2: 211).

3. Results and Discussion

For achieving the research goals, it is important to know the results of the research variables, they are as the following:

1. For the purpose of showing the correlative relationships between the total achievement of the competition and the investigated capabilities, the results have been processed statistically. and the researchers obtained the correlation matrix shown in Table 1. The results in Table 1 shows that all the correlative relationships between the achievement of the junior runners of (100)m competition and their physical and motor abilities of the muscles of the legs are high with significant statistical indication. This helps the authors with calculating regression coefficients to calculate the time estimates for training any physical and motor capacity for runners. Thus, the authors performed the statistical analysis(regression) using (step wise) on the research data for the purpose of obtaining the rates of the contribution of each influential capability in the achievement of the competition as explained in Table 2.

Table 1 Correlation between the achievement of the competition of (100) m and the physical and motor capabilities of the junior runners

NO.	Related variables	Correlation Coefficient (r)	Coefficient Of Determination (r^2)	Coefficient Alienation $\sqrt{1-r^2}$	Correlation trust rate Confidence Level	Indication level	Statistical Indication
1	Explosive power of the legs	0.943-	0.889	0.333	67%	0.001	Morality
2	Power of speed in the legs	0.960-	0.922	0.280	72%	0.000	Morality
3	Legs flexibility	0.667-	0.445	0.745	26%	0.030	Morality
4	Fitness	0.723	0.523	0.691	31%	0.017	Morality

2. The results of Table 2 show that the time of each physical or motor capability contributed in achieving (100) m running competition can be calculated. As the contribution rate of each capability is figured out, and from which its time can also be calculated. For example, the training time of the explosive power of the athlete's legs muscles is calculated as follows:

Explosive power time = 144, 38/100 × 60 (training time in the main phase of the training unit)
=22,886 = 23 minute

Table 2: Values of regression equation coefficients derived from correlations of achievement and capacity

Dependent variable (the achievement)	Independent variables (capability tests results)	Constant value (A)	Regression coefficients (B_1,B_2,B_3,B_4)	Standard Error	Error rate	Variable contribution rate
Achievement of (100) m competition	long jump from stillness (physical)	12.955	0.033	0.077	0.000	%38.144
	Long jump forward (10) sec (physical)		0.042-	0.010	0.017	%43.247
	Sit and Reach (mobile)		0.008	0.005	0.047	%8.247
	Crossed running between barriers		0.010	0.016	0.000	%10.309
Total			0.097			100%

Thus, it is possible to calculate the training time for all the physical and motor capabilities required to be trained in each training unit as planned. The result of the time planning for the researched capacity training is described in Table 3.

Table 3: Contribution rate of the training capabilities and its allotted time in the training unit

Achievement	Trained capabilities	Contribution rate in the achievement	Time spent on training	Total time (minute)
Final achievement running competition (100)m	Explosive abilities of the legs	38.144	23	60
	The power of speed for legs	43.298	26	
	Legs flexibility	8.247	05	
	Fitness	10.309	06	
		100%	60 training minutes	

3. After analyzing the rates of the contribution of the physical and motor capabilities investigated in the achievement and representing it by the time units and according to the time of the main part of the training module of (60) minutes, it was necessary for authors to apply them on the exercises (using the staircase style) in order to develop these capabilities and improve achievement within the training modules of the total time (90) minutes,Table 4 shows a sample for dividing this training module.

Table 4: Model of the division of the training unit and the content of the training according to the scheduled time and the required target.

No	**Module Parts Training**	**Goal**	**Content**	**Time**
1	Preparatory	General warm-up	Jogging - general exercises	5 minutes
		Private warm up	Flexibility exercises, lengthening, and accelerations	13 minutes
2	The main	Develop the most important physical and mobility for in the muscles in achieving (100)m running	Fitness exercises	6 minutes
			Legs Explosive abilities exercises	23 minutes
			Legs Flexibility exercises	5 minutes
			Special strength with speed exercises for the legs	26 minutes
3	Final	The body returning to normal state	Relaxing and calming exercises	12 minutes
Total				90 minutes

4. Table 5 contains statistical estimates for the results of the sample tests in the physical and motor capabilities investigated and the total achievement of the (100) m running. However, these quantitative estimates have changed from they were before subjecting the members of the sample to the designed exercises upon statistical means. Despite all of this, the distribution of each of them were moderate.

5. After the process of applying the exercises of capacities development and improving the performance of the runners in the (100) m running competition which extended over(8) weeks with (24) training units at a rate of (3) training units per week, the post-measurement with the same procedures were performed under the same pre-experiment measurement conditions, after the expiry of the training period by two days. To know its details, look at Table 5.

Table 5: Statistical estimates of the results of the tests on capabilities and achievement before and after the planned exercises

No.	Research variables	Esteem and measurement units	Mean		Standard Deviation		Standard Error		Distribution Indication
			Before	after	before	after	before	After	
1	Legs explosive ability	Meter and its parts	2.101	2.68	0.217	0.043	0.342	0.009	Moderate
2	Legs power with speed	Meter and its parts	30.85	36.95	2.31	1.56	0.472	0.318	Moderate
3	Legs flexibility	Centimeter	10.42	15.96	3.08	2.29	0.628	0.467	Moderate
4	Fitness	Second and its parts	11.08	8.39	1.58	0.786	0323	0.160	Moderate
5	(100) m running achievement	Second and its parts	11.92	11.21	0.278	0.201	0.057	0.041	Moderate

6. The results have referred to the validity of the research tools, the devices and utilities, sufficiency of the work team, handling the difficulties associated with the work, and choosing the proper time for work, etc. It is also characterized by scientific coefficients in term of objectivity and consistency, ranged between (0.86- 0.92) which are significant coefficients in the correlation when selected in the test (t) for indication of the coefficient of correlation with the value of (3.37 – 4.69) in comparison with the value of (t) scalability of (2.78) at (4) degree of freedom and (0.05) significance level.

Effect of the designed exercises statistically using the staircase method on the investigated capabilities and the achievement of the (100) m running.

In order to know the magnitude and size of the effect of the statistically designed exercises implemented by the style of staircases on the muscular and motor capacities of the legs muscles for the juniors runners and the achievement in the (100) m running. Table (6) suggested that there is an effect of the exercises on the development of the physical and motor capabilities of the leg muscles and the achievement of the junior runners in the competition of (100) m, because of the difference

of statistical estimates values (means and standard deviations) obtained from the measurements (before and after application). For the purposes of obtaining the varieties and the differences in these values, the tests were tested by (Test T) for the correlative samples. The calculated T- test values were significant ,at a level of indication less than (0.05). This means that the development of capabilities and improvement in the recorded achievement is confirmed to a reliable degree. For the purpose of knowing the magnitude of the impact exercises in both physical and motor capabilities and overall achievement, the equation of effect size (r^2) has been used as follow:

$$r = \frac{\sqrt{t^2}}{t^2 + \text{Degree of freedom}}$$

where:

r= effect size

t= t-test, comparison of means between two groups

The equations results shows that the effect effect size of the designed exercises executed with the staircase style were large in all of the physical and motor capabilities and the total achievement of the (100) meter competition, as shown in Table 7.

It is no wonder that the results obtained by the authors indicate that there is a significant impact on the physical and motor capabilities of the runners legs in (100)m competition for juniors, that helped to improve their recorded achievement in this competition. The reason behind that was the actual and significant relationship with statistical indication between each of them, in varying degrees, and that is because of the differences in the contribution rates of each capability in the achievement. These rates were also the basis for the planning of exercises related to their developing. The staircase training style supports that. This style is considered an exciting exercise that elevates the runner to new levels by "taking advantage of reducing body weight, and increasing the strength and ability highly that makes the body a mass of power and strength" (6b-y). This exercise also focuses on working on the muscles of the leg, thigh and back muscles greatly through the use of different and varied exercises interspersed with the identification of new goals in the training with generating challenges and pressures that help stimulating the brain of the runner and increasing the desire to train, especially when these exercises include continuous change in intensity and density.

Table 6: Demonstrate the effect of the planned(statistically schematic) training of the stairs for the development of physical and motor(kinetic) abilities and the achievement of (100)m running meters for juniors

No.	Researched abilities	The before evaluation		The after evaluation		Calculated value of (T)	Indication level	Statistical indication
		Mean	Standard Deviation	Mean	Standard Deviation			
1	Explosive ability of the legs	2.102	0.217	2.68	0.043	19.970	0.000	moral

2	Legs power with speed	30.85	2.31	36.95	1.56	27.650	0.000	moral
3	Legs flexibility	10.417	3.08	15.96	2.29	13.432	0.000	moral
4	Fitness	11.08	1.58	8.39	0.786	11..696	0.000	moral
5	(100) m running achievement	11.92	0.278	11.212	0.201	32.974	0.000	moral

Table 7: The amount of the magnitude of the impact (t) and the degree of impact for each of the researched abilities and the achievement

No.	Researched abilities	The value of the calculated impact	The standard	The impacts degree
1	Explosive abilities of the legs	0.92	0.50 and above	Very high
2	Legs power with speed	0.96	0.50 and above	Very high
3	Legs flexibility	0.85	0.50 and above	Very high
4	Fitness	0.81	0.50 and above	Very high
5	(100) m running achievement	0.97	0.50 and above	Very high

Summary

The following conclusions can be drawn from the results found:

1. The performance of the sample of the junior runners of (100) m the competition in all physical and motor capabilities measured (before and after the development of the exercises) and the overall achievement of the competition is distinct with moderate distribution.
2. The results showed high correlation between the abilities of the runners and their achievements of (100) m because of the contribution of each one to that achievement.
3. In light of the relative significance of the physical and motor capabilities of the contestants in the competition of (100 m) for juniors, the training has been developed, planned and implemented scientifically, which helped in its development and impact in the achievement

4. The results indicate an increase in the size of the impact of the designed exercises according to the statistical methods in developing the physical and motor abilities of the leg muscles of the competitors in the competition of (100) m and improving their recorded achievement.

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