

THE EFFECT OF 800M RUNNING IN THE FIELD AND ON THE TREADMILL IN SOME PHYSIOLOGICAL AND KINEMATICAL RESPONSES

Rayan Abdulrazak Al-Hasso

Sport Education dept. – College of Basic Education – University of Mousel

Assistant Lecturer Mohammed Abduljabbar

Duhok Education Directorate

Abstract: The current study aims at finding out the effect of running 800 m in an equal intensity in the field and treadmill on some physiological and Kinematical responses. The sample of the research consisted of (6) athletes. The researcher applied descriptive method due to its appropriateness with the nature of the research. The researchers applied test and measurements as tools to collect the required data. The test was running 800 m twice throw 3 days. The first was running 800m on the field and after 2 days, they applied the second test which also was running 800 m but on treadmill. Then after two tests immediately, the researchers measured the physiological variables which included the measuring of (Hr, Sbp, Dbp, RR) as well as the time of running, the researcher calculated the kinematical variables too which included the length, time, speed, frequency of the step. The researchers applied the following statistical tools: (Mean, Slandered deviation, variance, coefficient, percentage T-test for independent sample). The results show significant differences when comparing the values of physiological and kinematical in pre 800m running using field pre using treadmill.

Introduction and Research Problem:

Sports' exercises are considered the only means to develop the physical work to access a best performance. It is something given that these physical exercises vary in the way of performance whether using certain tools or without using them as well as diversity in terms of utilizing the elements of loads' training. A similar Researches was done like Hall, C., et., al study (2004) : Energy Expenditure of Walking and Running: Comparison with Prediction Equations . This study established the published prediction equations for the energy expenditure of walking and running compared with the measured values. To make this comparison we first determined whether differences exist in energy expenditure for 1600 m of walking versus running, and whether energy expenditure differences occur due to being on the track or treadmill. and Crouter, S. et al., study (2001) : Comparison of incremental treadmill exercise and free range running. The aim of this study was to compare physiological during incremental treadmill exercise and free range running. The importance of the research is in revealing the functional responses and kinematical variations the act causes on the treadmill when running a certain distance in a certain intense compared with performing the same act in the racetrack reaching to suitable recommendations. Research problem appears when using the treadmill by some trainers in performing running exercises as a substitute of the race track in training unit without being aware that training by using the treadmill has the effect in racetrack by affecting some reflecting functional & kinematical variables of the outer load , which represents a problem must be considered .

Research Aims:

Revealing some functional and kinematical variables values when running for a distance of 800 m with equal intensity in the track and on the treadmill and Recognizing the differences between them. when running for a distance of 800 m with equalintens intensity in the track and on the treadmill.

Theoretical studies :**Heart Rate(Hr):**

Performing a sport act that causes some functional changes in the heart to provide the muscle with the increasing demand of oxygen and food to exert that act, this is done via cardiac output(Co) and blood flowing speed (Divid,1978,199).Heart rate is one of the two basic specifier of cardiac output.Heart rate is considered partially important during medium and intensive exercises .There are a number of factors that affect it such as hormones, ions' concentration, change of the core temperature , exercises, sex and age .(Shi, 2002, 17)

Respiratory Rate (Rr):

Respiratory rate is considered one of the two basic variables in increasing or decreasing ventilation and breathing size as well. The increase of these two factors together or one of them leads to increasing lung ventilation (Ricci, 1970, 59).Number of breaths per a minute at a rest is (12-20) and raises to (50-60) per a minute at training (Abdullah, 2000, 36).

Systolic and diastolic blood pressures(sBP&dBP):

It can be defined as "the force imposed by the blood on the walls of blood vessels"(Herlihy & Maebius, 2003,30). Blood pressure is influenced by two factors, the cardiac output (CO) and Peripheral resistance (PR) .Seeley mentions that arterial blood pressure average = $CO * PR$ and that the increase or decrease of (PR) or the two cardiac output factors (HR,SV) that leads to increase or decrease of blood pressures (BP) .This equation explains the effect of (PR, SV, HR) on blood pressure and that any increase in any of these factors results in an increase in blood pressure , and vice versa (Seeley et al.,1998,680).

Kinematics of the stride:

When the athlete runs, he try s to cover some distance which depends on two important factors , firstly, is the covered stride(stride) distance and secondly, the frequency of the strides (James,1993 , 396), ,the length of the stride may be affected by the strength when the athlete pushes the ground and the angle of the taking off . As for frequency stride, it represents the number of strides used to cover a specific distance with a certain speed. (Al-Fadhli et al.,2009) mentions that a stride frequency can be determined by the physiological structure of each athlete and can be controlled by the ability of nerves which stimulates the muscles and kind of fibers from which the muscle is

formed as well as legs length where the more the individual has fast twitch fibers in a muscle (Al-Fadhli et al.,2009,2)

Research Procedures

Research Sample:

The research sample has been deliberately chosen from the Basic Education college students. The sample consisted of (6) students / Physical Education Dept./ fourth-year .the (m \pm sd)of the height , weight and age (172, \pm 1.84), (64, \pm 3), (22.1, \pm 0.45) respectively.

Data collecting means:

The researcher has used tests and measurements and he collected information to get his data.

The Used Test:

We used tow tests one of them is 800m maximum speed running test and the other is 800m running test on the treadmill.

Pre-and Post- anthropometrical & physiological measures:

Height and weight measurement .

(Hr) measurement :

It is done by using a stethoscope on the chest after running in the racetrack as well as determining pulse by a pulse sensor which specifies and shows pulse on the treadmill display while running on the device through sitting position for both tests.

(RR) measuring:

It is performed by observing athlete chest immediately before and after physical effort since the first minute duration and at sitting position with the unawareness of the athlete.

(sBP) and (dBP) measuring :

This type is performed by a specialist via using Sphygmomanometer immediately after and before exerting drill and at sitting position of the athlete.

The Main Experience:

The researchers has conducted the two tests shown in (3-5).The first experience has been conducted at 9 o'clock on where the sample has been under the test stress of running 800m in the standard racetrack .After two days the second experience has been conducted through running 800m

on the treadmill as same as the first intensive physical effort in the racetrack, i.e. the same speed that has been calculated by dividing distance on performance time in the racetrack. Post-measures have been conducted directly which were similar to the pre-ones using the same devices and testers who have performed the pre-measures. Afterwards, the post-measures have been written down in data collecting form which also resembled pre-measures except for height and weight ones as well as calculating strides' number during running through observation .Measures have been completed directly after exerting the physical effort through the athlete sitting on a chair prepared for this purpose close to the end point in the first experience and close to the device in the second one.

Presenting and Discussing the results:

Table 1. Shows the Functional Variables Values Immediately After the Two Exerting Physical Effort.

Physio.variables	Running way	\bar{x}	$\pm sd$	Sig
Hr	Track	186	7.589	0.001*
	Treadmill	164.5	7.556	
RR	Track	33	3.098	0.039*
	Treadmill	28.333	3.670	
sBP	Track	176.667	9.309	0.885
	Treadmill	175.83	10.206	
dBP	Track	59.167	8.618	0.023*
	Treadmill	249.167	5.845	

Our research conclusions agree with what (Macardle, 1971) mentions that there is a difference between walking on the treadmill and walking on asphalt or cement in terms of power the body needs (affecting functional variables) which estimated 10% less when walking on the treadmill in comparison with walking on a steady solid ground (Macardle, 1971, 124). Table (1) shows significant differences in post-running (Hr) in the racetrack and running in same intense on the treadmill. The advantage is for running on the treadmill in which (Hr) rate when running on the device is less and with an obvious significant difference . The researcher has ascribed that to running on the treadmill requires less physical effort due to mechanical assistance the device provides its user. It is something given that the more physical effort exerted, the more cardiac output required and consequently heart pulses increase as one of the cardiac output variables to provide a suitable cardiac output to the exerted effort. Heart beating response is due to a escalation and intensity of physical effort (Macardle, 1971, 205). In another place, he mentions that limbs muscles contractions result in heart beating and the cardiac output increases in a proportional relation as more effort exerted (Ibid, 211-221). Concerning number of breaths (R.R) ,table (2) shows that there is a significant difference between its number rate during running on the device and on the ground for the benefit of the device too where number of breaths has been less . The researchers attributes that to the nature of working on the device, as we previously mentioned, which requires less effort and consequently less oxygen to perform the same distance with a same running speed in the racetrack. The more effort you exert, the more food metabolism you need,

which requires more oxygen carried by blood circulation, i.e. more cardiac output. In addition to the chemical effect on the Chemoreceptor in the (Hypothalamus) as a result of the increase in (PCO₂) and decrease in (PO₂) resulting from the difference between the hardness of the two efforts .(Al-Duhooki,2007), quoted from (Al-Dori), mentions that a chemical inducer affects the respiratory center in the (Hypothalamus) as a result of the available quantity of CO₂ in the blood. If its quantity increased in the blood, breathing accelerated until getting rid of the excess quantity of CO₂ and blood reaction gets back to normal (Al-Duhooki,2007,78-79).

As for the significant difference in the diastolic blood pressure (dbp) between running in the racetrack and running on treadmill and in favor of running on the latter, table (1) shows a decrease in (dbp) when running on the treadmill. These results agree with what (Mohammed Tawfeeq,2005) and (Al-Kali,2009) reached where they found a significant decrease in (dbp) after a physical effort too (Al-Kali,2009,93) (Mohammed Tawfeeq,2005,131).The researcher ascribes that to the vasodilation in the Peripheral vascular as a result of the thermal dispersion, where the more the physical exercise or effort is intense, the more body heat is generated and therefore, the need for the mechanisms of heat dispersion to work more effectively arises, which led to more increase in the expansion of vascular when running in the racetrack compared to running on the treadmill in addition to the physiological reflections of cardiovascular which is directly proportional to the intensity of the exerted physical effort as perspiring leads to a decline in body fluids and consequently to a decrease in blood quantity and cardiac output and reduction of heart stroke volume (Al-Hajjar, 1994,91). It may also be attributed to Potassium quantity resulting from the muscular effort which its released quantity could be proportional to the exerted muscular effort leading to a reduction in the peripheral resistance that might lead to a (dbp) reduction. This fact is supported by what (Berne&Slevy) mentioned in that released Potassium from the contracted muscles is considered one of the elements that extend blood vessels in the working muscles (Berne&Slevy, 2001, 273).

Table 2. Show of the Kinematical Variables Values

Kinimatics variables	Running way	\bar{x}	$\pm sd$	SIG
Stride time/sec	Track	0.584	0.045	0.007*
	Treadmill	0.700	0.067	
Stride Speed/m.sec	Track	4.686	0.392	0.882
	Treadmill	4.643	0.56	
Stride distance/m	Track	2.724	0.068	0.001*
	Treadmill	3.213	0.01	
Stride rate	Track	293.667	7.256	0.001*
	Treadmill	249.167	7.757	

Concerning kinematical variables, the researcher ascribes the significant differences reason in time, distance and strides number for the benefit of running on the treadmill in comparison with running on the racetrack where time , distance and strides number for the treadmill are (0.7, 3.213, 249.167) respectively .While on the racetrack, they are (0.584, 2.272, 293.667) respectively too. The

researcher attributes that to the strides number rarity the athlete performs to run 800m on the treadmill in comparison with racetrack as shown in table (2). It is also ascribed to the spacing of the fulcrum points on the treadmill compared to racetrack, which led to stride length and increase in its time and that the speed of the athlete is not real because it doesn't represent the athlete's speed only, but also the speed of the treadmill movement. Hence, this explains the decrease of the runner exerted effort on the treadmill in comparison with running in the racetrack although equal distance and performance speed.

Recommendations and Conclusions :

In the light of the statistical processing and conclusion presentation, the researcher has come up with the following findings:

1. There is a decrease in the values of some physiological variables under study (Hr, R.R, dbp) when running a distance of 800m on a treadmill in comparison with the same distance and intensity in the racetrack.
2. The research results have shown an increase in time and stride distance and increase in stride numbers when running 800m on a treadmill compared to running in the racetrack in the same intensity.
3. It is necessary to be aware that using a treadmill doesn't provide the same physiological and kinematical reflections as running equal distances on the ground due to their effects in the results of training.
4. The trainers and researchers must be aware to give an extra physical effort , concerning intensity and size, while using the treadmill to be equivalent to the real effort on the ground.
5. Future researches in the same conditions of the present exercise with controlling different slope degrees when using treadmill are to be conducted.
6. Future researches on different distances with different speeds and slopes are to be conducted.

References:

Abdulah Ayad Mohammed (2000): Impact of usinf deferent methods of Interval training on numbers of physiological variables and performance of 400m running, Unpublished Ph.D. Dissertation, College of Sport Education , University of Mousel.

Al Hajjar, yasen Taha M. A. (1994: Physiological and muscular responses after long distance running, Unpublished Ph.D. Dissertation, college of basic Education, University of Mousel.

Al Hathlly, Sareeh et al.,(2009) : Measuring of speed, length and frequency as indicator of some physical power in 400m running, Al-Kadesia Journal for Physical Education Science, Vol. (9), No. (3).

Algela, Ayad Emadul-Deen (2009): The effect of aerobic effort with the change of relative humidity in some physiological and biochemical variables by football players Unpublished Ms.C. Thesis, College of Basic Education , University of Mousel.

Berne ,Robert M.&levy Matthwe N.(2001) : Cardiovascular physiology , 8Ed , Mosby ,Inc ,U.S.A.

Crouter S., et al., (2001) : Comparison of incremental treadmill exercise and free range; running. *Medicine & Science in Sports & Exercise*: April 2001 - Volume 33 - Issue 4 - pp 644-647

Divid , R., (1978) *Physiology of exercise* , Macmillan publishing co, New York.

Duhoky, Azad Ahmed Kaled (2007): Impact of Different recovery periods using positive and negative recovery at some physiological and biochemical variables and performance of 400m running, Unpublished Ph.D. Dissertation, College of Sport Education , University of Mousel.

HALL, C., et., al (2004) : Energy Expenditure of Walking and Running: Comparison with Prediction Equations, *Med. Sci. Sports Exerc.*, Vol. 36, No. 12, pp. 2128–2134.

Herlihy Barbara & Maebius, Nancy, K. , (2003) , *The human body in health and illness* , 2nd ed ., saunders , an imprint of Elsevier , china.

James G. Hay(1993):*The biomechanics of sports techniques* , 4ed , Hall , Inc , U.S.A

Karpovich Peter. V. and Sinningb Wayne E. (1971): *physiology of Muscular Activity*, 6th ed., W.B. Saunders Company, Philadelphia, U.S.A.

Mcardle , D. et al., (1981) *Exercise physiology , energy nutrition and human performance* , U.S.A.

Mohammed Twfeeg, O. M.T. (2005) : *Physiological and Morphological responses of circulatory system before and after performing aerobic and anaerobic stresses*, Unpublished Ph.D. Dissertation, College of Sport Education , University of Mousel.

Ricci , B., (1970) *physiological basis of human performance* , Lea & Fepiger , U.S.A

Seeley Rod R. et al., (1998) , *Anatomy & physiology* , 4th ed., McGraw Hill , New York .

Shi , Jian Rong (2002) *Cardiac structure and function in young athletes* , Dissertation submitted for the degree of master of applied Science , Department of Human Movement , Recreation and Performance , Victoria University of Technology , U.S.A.