

Evaluating the Acceleration Skill and 100mts Sprinting Performance of Athletes with a Newly Designed Electronic Device - An Analysis

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Abstract: *This is a technological world. In This methodological time, all fields are automated by electronic outfits with extreme specific, which are vital to bring out our determination positively. The present investigator has created an electronic tool to assess the Acceleration and 100 mts Sprinting Performance. These are the supreme segments in sprinting event, these segment's performance are the resilience of sprinting event. Acceleration is the vital part in every sprinting event, Presently acceleration and 100mts Sprinting Performance are not assessing in most of sprint event like district, divisional and state level events due to lack of appropriate devices with cost effective. The result of every sprinting event is based on the influence of acceleration proficiency of the athlete. This has led the investigator to craft an electronic expedient to find out accurate acceleration ability and sprinting performance of sprinters. The device has some essential parts namely 1. Microphone 2. Infrared Transmitters, 3. Infrared Receivers 4. Interfacing Unit and Computer. The outcome of the innovations must have scientific authenticity which is also indispensable at any conditions. To attain the scientific authenticity of the device, 120 subjects were chosen from Hindusthan College of Engineering and Technology, Coimbatore and the appropriate data were collected using the newly designed kit while the subjects were participating in the 100m race. The collected data were evaluated with appropriate statistical procedures and obtained Reliability, Validity and objectivity of the device. Based on international athlete's performance in 100mts sprint, starting point to 40mts prevailing as an acceleration phase.*

Keywords: Acceleration, Performance, Microphone, Infrared Transmitters, Infrared Receivers, Interfacing Unit, Computer, Reliability, Validity and objectivity.

1. Introduction

Technical revolutions and allied knowledge remain improving the contemporary world as unparalleled magnitudes in every day. Despite all the domes gain the benefit of the scientific harmony, the investigator was driven to achieve such innovations in the field of athletics. This different thinking motivated me; consequently this device was invented to assess the acceleration ability and 100 mts performance of athletes in sprinting events.

At present the performance of athletes are assessing by manually operated stop watches in basic level competitions, which may not be very perfect, because stop watches are operated by human beings; so the performance will based on the operating ability of the timer. Hencean Electronic expedient was constructed with accurate starting and finishing technique to find out split timings of athletes. So we can find out perfect assessment of the sprinter.

Statement of the Problem

The purpose of the study was to evaluate the Acceleration ability and Sprinting Performance of 100 mts of athletes with a Newly Designed Electronic Device.

Delimitations

- The Study was delimited in these following factors.
- The gadget was designed to obtain acceleration ability and 100mtsp performance (Split Time in various phases) of sprinters in 100 mts sprint.
- 120 subjects were used to establish reliability, validity and Objectivity of the device.

Limitations

The following uncontrollable factors associated with this study was accounted as limitations,

- 1) The quantum of physical life, Style, Physiological state and reaction time, acceleration ability and sprint performance of the athletes were considered as limitations.
- 2) The uncontrollable changes in climatic conditions and other atmospheric factors during the period of testing and their impacts on the experimental were considered as limitations.

2. Hypothesis

It was hypothesized that the invented electronic device will be valid, reliable and objective to assessing the Acceleration ability and 100 mts Performance of the sprinters I 100mtssprinting event.

3. Significance of the study

- 1) This study adds additional information to the area of research.
- 2) The results of the study would be beneficial to coaches and administrators to assess the acceleration ability and 100 mts performance of sprinters perfectly.
- 3) This study will assist the contestants to know their precise acceleration and performance skills.

4. Methodology

Details about the Electronic Device

The following are the primary parts of Electronic Device.

- 1) IR Transmitter
- 2) IR Receiver
- 3) Interfacing Unit
- 4) Computer

IR Transmitters

The Infra - red transmitter having two different types of IC 555, while power fed, they are generating Infra - Red rays and it is emitting through the infrared Light Emitting Diode (LED) continuously towards IR receiver in a straight stripe.

IR Receivers

The IR receivers are equipped with TSO P17 series ICs, which receive the IR rays from the corresponding transmitters incessantly. The transmitters at every lanes are directly attentive towards the corresponding receivers in straight line to receive the IR signal. The IR receivers converting the received IR rays into data signals and sends it to the interfacing unit.

Interfacing unit

This is the dynamic part of the equipment. This unit encompasses a special micro controller which is programmed with appropriate timing elements. Whenever the IR receiver gets interruption through the receiving IR signals, a special signal passed to the respective micro controller and it encodes the timing modules. This encoded signals converted as data signals and sending it to the computer which decodes the signals and displays the timings of athletes.

Computer

This is a normal computer, which installed special software according to our programme. While the computer receives the data signal from interfacing unit, it encoded by the

software to displays the exact acceleration and 100mts performance of every athlete with exactitude timings.

5. Functioning Method

Evaluating the acceleration and 100mts performance of Sprinters

The IR transmitters and receivers were placed at the 40mts and 100mtsofevery lane of 100mts track to find out split timings. The output terminals of the each and every IR receiver were connected with interfacing unit.

While we fed appropriate power supply to the IR modules, the IR transmitters emits IR rays towards the corresponding IR receivers located over the IR transmitters with straight line. The IR receivers directed the special signals to the Interfacing unit when ever getting data signal from IR transmitters. Thus the data signals were encoded by interfacing unit and sent it to the computer for suitable function.

During the sprintrace, a gun was fired to commence the sprint race, instantaneously all the athletes were started their race, meanwhile all the eight timers in the computer were exploded by operating switch on operation. Consequently the entire8 track's respective timers get operated simultaneously and it flashed in the computer screen.

In the race, while the athletes intersected the40mtsand 100mts (finishing point) the continuously emitting IR rays got disruption; this interruption is sensed by the corresponding IR receiver and sending it to the interfacing unit as data signal. The micro controller of the interfacing unit decodes the data signal to the respective timer and sent to the computer for display, which shows the exact acceleration and 100mts sprint performance of the every athlete.

Figure 1

Assessing method of acceleration proficiency of all athletes



6. Results and Discussions

Computation of descriptive statistics

Testing Period	Mode of Assessment	Mean & SD	Speed Performance	
			Acceleration (Starting to 40mts)	100m Speed Performance
1	New Device	Mean	3.32	13.32
		SD	0.17	0.75
	Stop Watches	Mean	3.18	13.37
		SD	0.18	0.72
2	New Device	Mean	3.57	13.5
		SD	0.24	0.78
3	New Device	Mean	3.27	13.28
		SD	0.16	0.77

The mean values of the subjects' split timings between starting point to 40m during testing periods 1 to 3 are 3.32, 3.18, 3.57 and 3.27 with standard deviations of ± 0.17, 0.17, 0.24 and 0.16 respectively.

Table above shows the mean values of 100mts performance of sprinters. The mean values of the subjects' during testing periods 1 to 3 are 13.32, 13.37, 13.5 and 13.28 with standard deviations of ± 0.75, 0.72, 0.78 and 0.77 respectively.

Reliability of starting point to 40m split time Analysis of variance with repeated measures for Starting point to 40m split time (sec.) sprint performance

Source	SS	df	MS	F
Subjects	2.774	119	0.023	1.48
Trials	0.004	1	0.004	
Residual	0.332	119	0.0027	

The table value required for significance at 0.01 level of confidence with degrees of freedom 1 & 119 is 4.78.

The above table specifies that the obtained F ratio 1.48 is less than the table value of 4.78 required at 0.01 level of significant. This disclosed that there is no significant difference between the test and re - test scorers signifying that the process of testing of the starting point to 40mts split time is perfect and consistent.

Source	SS	df	MS _E	R
Subjects	2.774	119	0.002	0.87
Trials	0.004	1		
Residual	0.332	119		

The table value required for significance at 0.01 level of confidence with degrees of freedom 1 & 119 is 0.234.

Hence intraclass correlation was obtained for 40mts split time, which indicates that the obtained intraclass (R) value 0.87 is higher than the table value 0.234 required at 0.01 level of significant. It denotes that the 40mts split time assessed by the device during the test and re - test are significantly related.

The above results proved that the newly constructed electronic device is reliable to assess the acceleration (40mts split) of sprinters.

Validity of Split Time Starting Point to 40m Pearson product moment correlation for Split time starting point to 40m (sec.)

Mode of Assessment	Mean	SD	r
New Device	3.32	0.17	0.89
Stopwatch	3.18	0.19	

The table value required for 2 & 118 degrees of freedom at 0.01 level of significant is 0.236

The table indicates that the obtained correlation value 0.89 is higher than the table value 0.236 required at 0.01 level of significant. It denotes that the split timing taken from starting point to 40m using the newly constructed electronic device and stopwatches simultaneously are significantly related.

The above results proved that the newly constructed electronic device is valid in assessing the Acceleration (split timings) from starting point to 40mts of sprinters.

Objectivity Starting Point to 40m Split Time Analysis of variance with repeated measures For starting point to 40m split Time (sec.)

Source	SS	df	MS	F
Subjects	2.68	119	0.022	1.33
Trials	0.008	2	0.004	
Residual	0.669	238	0.003	

The table value required for significant at 0.01 level of confidence with degrees of freedom 1 & 119 is 4.78.

The table indicates that the obtained F ratio 1.33 is less than the table value of 4.78 required at 0.01 level of significant. This proved that there is no significant difference among three different testers. It reveals that, the process of testing the split time from starting point to 40m is perfect and consistent.

Intraclass correlation for Acceleration (split time) from Starting point to 40m (sec.)

Source	SS	df	MS _E	R
Subjects	2.68	119	0.017	0.77
Trials	0.008	2		
Residual	0.669	238		

The table value required for significant at 0.01 level of confidence with degrees of freedom 1 & 119 is 0.234.

The above table indicates that the obtained intraclass (R) value 0.77 is higher than the table value 0.234 required at 0.01 level of significant. It denotes that the acceleration from

starting point to 40m recorded by the three testers using the newly constructed electronic device at three different periods are significantly related.

Reliability of 100m speed performance
Analysis of variance with repeated measures for 100m (sec.) sprint performance

VARIABLES	ANALYSIS OF VARIANCE WITH REPEATED MEASURES						
	Source	SS	df	MS	F	MS _E	R
100m SPEED PERFORMANCE (sec.)	Subjects	127.86	119	1.074	0.05	0.85	0.93
	Trials	0.0048	1	0.004			
	Residual	10.155	119	0.085			
The table value is 4.78						The table value is 0.234	

The above table indicates that the obtained F ratio 0.05 is less than the table value of 4.78 required at 0.01 level of significant. This proved that there is no significant difference between the test and re - test scorers indicating that the process of testing of the 100m sprint performance is perfect and consistent.

The result of intraclass correlation for 100m sprint performance is indicates that the obtained intraclass (R) value 0.93 is higher than the table value 0.234 required at 0.01 level of significant. It denotes that the 100m sprint assessed by the device during the test and re - testing periods are significantly related.

The above results proved that the newly constructed electronic device is reliable to assess the 100m sprint performance of sprinters.

Validity of 100m speed performance
Pearson product moment correlation for

100m (sec.) Speed performance

Variables	Pearson Product Moment Correlation			
	Mode of Assessment	Mean	SD	r
100m Speed Performance (sec.)	Sprint Analyzer	13.33	0.75	0.98
	Stopwatch	13.39	0.73	
The table value is 0.236				

The table indicates that the obtained correlation value 0.98 is higher than the table value 0.236 required at 0.01 level of significant. It denotes that the 100m speed performance using the newly constructed electronic device and stopwatches simultaneously are significantly related.

The above results proved that the newly constructed electronic device is valid in assessing the 100m speed performance of sprinters.

Objectivity of 100m speed performance
Analysis of variance with repeated measures For 100m (sec.) speed performance

Variables	Analysis of Variance with Repeated Measures						
	Source	SS	df	MS	F	MS _E	R
100m Speed Performance (sec.)	Subjects	187.22	119	1.57	2.24	0.09	0.94
	Trials	0.378	2	0.19			
	Residual	20.07	238	0.08			
The table value is 4.78						The table value is 0.234	

The above table indicates that the obtained F ratio 2.24 is less than the table value of 4.78 required at 0.01 level of significant. This proved that there is no significant difference among three different testers. It reveals that the process of testing the 100m speed performance is perfect and consistent.

The results of intraclass correlation is indicates that the obtained intraclass (R) value 0.94 is higher than the table value 0.234 required at 0.01 level of significant. It denotes that the 100m speed performance recorded by the three testers using the newly constructed electronic device at three different periods is significantly related.

The above results strongly proved that the newly constructed electronic device possess objectivity to assess the 100m speed performance of sprinters.

7. Analysis of Data and interpretation of the study

The main purpose of this study was to expertise an electronic device to assess the acceleration and 100mts sprint performance of sprinters at the respective phase and also to establish scientific authenticity of the instrument.

The scientific authenticity is obtained by establishment of reliability, validity and objectivity.

Reliability was established by test and retest method. The obtained two sets of scores were subjected to univariate correlation procedure and Reliability was established

Validity was established by the Data was collected using the stop watches along with the newly constructed equipment and the data were collected from the same subjects. Using these two sets of data, Pearson Product moment correlation was applied and coefficient of correlation was found and the validity of the instrument was established.

Objectivity was established by gathering data using the same subjects and the same instrument, also similar conditions were provided but two different testers have been collected the data. Thus two sets of scores were obtained and they were subjected to univariate correlation procedure which indicating that 88% association between these scores.

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8. Conclusion

It is concluded that the device is more Valid, reliable and objective to assess the acceleration and sprint performance of sprinters.

9. Recommendation

New Equipment may be constructed to assess the reading of other track and field events.

Similar gadget may be planned to measure various motor fitness components.

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