



INVENTION OF AN ELECTRONIC DEVICE TO ASSESS THE ACCELERATION PERFORMANCE OF SPRINTERS

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Abstract:

This is a modern world in this world every field was mechanized by the support of electronic gadgets these are superfluous precise and constant to bring out the effort successfully. The present investigator made an attempt to create an electronic device to assess the acceleration performance of athletes in sprinting events. Presently acceleration timings are accurately not taken in any sprint training in district, divisional and state level coaching programs because of unavailability of suitable equipment. The acceleration time will influence over the performance of sprinters in major role. To find out that Electronic tools has been invented with accurate starting and finishing technique using the following core parts 1.Infrared Transmitters, 2.Infrared Receivers 3.Interfacing Unit, 4.Computer. To attain scientific realness of the gadget 120 subjects were chosen from Hindusthan College of Engineering and Technology, Coimbatore and the appropriate data were collected using the newly invented equipment while the subjects were running in the 100m sprint training. The collected data were treated with appropriate statistical techniques and obtained Reliability, Validity and objectivity of the device.

Key Words: Infrared Transmitters, Infrared Receivers, Interfacing Unit, Computer, Reliability, Validity & Objectivity

Introduction:

Scientific discoveries and related learning persist enhancing the modern world as incomparable proportions in every days. While all the fields gain the benefit of the scientific blessing, the investigator taught to execute such innovations in the field of athletics. This raw thinking motivated him; consequently this device was invented to assess the acceleration timings of athletes in sprinting events. Presently the timings are taken in track events by manually operated stop watches, which may not be very perfect, because stop watches are operated by human beings; so the timings will be based on the operating ability of the timer. Every individual is not having similar operating ability, which is different from individual to individual, so it will influence over the final result either positively or negatively. Hence an Electronic device was invented with accurate starting and finishing technique. So we can find out perfect acceleration timings of the sprinter.

Statement of the Problem:

The purpose of the study was to construct an Electronic device to attain acceleration timings of all eight sprinters in sprinting events.

Delimitations:

The Study was delimited in these following factors. An instrument was constructed as per the requirement of obtaining reaction time of sprinting events. 120 subjects were used to establish reliability, validity and Objectivity of the instrument.

Limitations:

- Below stated uncontrollable factors related with this was accounted as limitations of this study,
- ✓ The quantum of physical life, Style, Physiological stress and reaction time of stop watch operating persons were considered as limitations.
 - ✓ The uncontrollable changes in climatic conditions and other meteorological factors during the period of testing and their influence on the experimental were considered as limitations.

Hypothesis:

It was hypothesized that the invented electronic device will be valid, reliable and objective in assessing the acceleration time of the sprinters in sprinting events.

Significance of the Study:

- ✓ This study gives additional information to the area of research.
- ✓ The results of the study would be useful to coaches and administrators to assess the acceleration time of sprinters more accurately.
- ✓ This study will help the participants to know their accurate acceleration time.

Methodology:

Details about Electronic Kit:

The following are the vital parts of Electronic Device.

- ✓ IR Transmitter
- ✓ IR Receiver
- ✓ Interfacing Unit
- ✓ Computer

IR Transmitters: The Infra-red transmitter stimulates the process with the help of two different kinds of IC 555 special chips. As soon as power fed they are producing Infra-Red rays and emitting through the infrared Light Emitting Diode (LED) continuously towards IR receiver.

IR Receivers: The IR receivers are having TSO P17 series receivers were used to receive the IR rays from the transmitters. Since the transmitters at various lanes are directly focused towards the receivers in the straight line to receive the IR signal. They initiate their function by converting the received IR rays into data signal and send it to inter facing unit.

Interfacing Unit: This is the brain of the equipment. This unit contains a special micro controller which is programmed with appropriate timers. Whenever the IR receiver's get interruption, a special signals passed to the micro controller and it encodes the timers. This encoded signals converted as data signals and sending it to the computer for displays.

Computer: This is a normal computer, which was installed with special software according to our programme. The computers receive the data signal from interfacing unit and it encodes the software, which decoding the signals and displays the exact acceleration timings of every athlete with precision.

Functioning Method:

Assessing the Acceleration Performance of Sprinters:

The IR transmitters and receivers were placed at the 20mts and 40 mts of every lane to find out split timings. The output of the IR receivers was connected with interfacing unit. When we fed the appropriate power to the IR modules, the IR transmitters emits IR rays and it injected into the corresponding IR receivers placed at the top. The IR receiver directed the signals getting from IR transmitters to the Interfacing unit. Thus the data signals were encoded by interfacing unit and sent it to the computer for appropriate function. During the race or training, while the athletes crossing the 20mts and 40mts, the continuously emitting IR rays getting interruption; this interruption is sensed by the corresponding IR receiver and sending it to the interfacing unit. The micro controller of the interfacing unit decodes the interruptions with the corresponding timer. The computer displayed the exact acceleration timings of the every athlete. When the starting gun was fired to commence the race, the athletes were started the race simultaneously all the eight timers in the computer were started by operating switch on operation. Consequently all 8 timers get operated simultaneously and flashed in the computer screen. During the race, the athletes when crossing 20mts and 40mts of every lane, the IR rays gets interruption, when IR receivers sensing the interruption and stimulated in the interfacing unit to record the time of the athletes in every lane and it will displayed in the computer. Its photography is presented in the figure 1.

Figure 1: Assessing method of Acceleration Timings of all athletes



Results and Discussions:

Computation of descriptive statistics

Testing Period	Mode of Assessment	Mean & SD	Speed Performance	
			Starting Point to 20m	20m to 40m
1	New Device	Mean	3.20	2.29
		SD	0.10	0.27
	Stop Watches	Mean	3.24	2.30
		SD	0.12	0.29
2	New Device	Mean	3.21	2.26
		SD	0.11	0.28
3	New Device	Mean	3.24	2.31
		SD	0.13	0.29

Table above table shows the mean values of 20mts and 40mts phases of sprinters. The mean values of the subjects' 20m split timings between, starting point to 20m during testing periods 1 to 3 are 3.20, 3.24, 3.21 and 3.24 with standard deviations of ± 0.10 , 0.12, 0.11 and 0.13 respectively. The mean values of the subjects' split timings between 20m to 40m during testing periods 1 to 3 are 2.29, 2.30, 2.26 and 2.31 with standard deviations of ± 0.27 , 0.29, 0.28 and 0.29 respectively.

Reliability of Starting Point to 20m Split Time:

To obtain reliability test and re - test method was used. Analysis of variance with repeated measures for Starting point to 20m split time (sec.) & Intraclass correlation acceleration performance.

Source	SS	df	MS	F	Intraclass correlation	
Subjects	2.947	119	0.024	1.54	MS _E	R
Trials	0.004	1	0.004		0.003	0.003
Residual	0.310	119	0.0026			

The ANOVA table value of required for significance at 0.01 level of confidence with degrees of freedom 1 & 119 is 4.78. The Intraclass correlation table value required for significance at 0.01 level of confidence with degrees of freedom 1 & 119 is 0.234. The above table specifies that the attained F ratio 1.54 is less than the table value of 4.78 required at 0.01 level of significant. This illustrate that there is no significant difference between the test and re-test scorers signifying that the process of testing of the 20mts split time is perfect and consistent. Hence intraclass correlation was obtained for 20mts split time. The obtained intraclass (R) value 0.90 is higher than the table value 0.234 required at 0.01 level of significant. It indicates that the 20mts split time assessed by the device during the test and re-test are significantly related.

Reliability of Split Time from 20m to 40m:

Analysis of variance with repeated measures for split time from 20m to 40m (sec.) & Intraclass correlation acceleration performance:

Source	SS	df	MS	F	Intraclass Correlation	
Subjects	19.533	119	0.164	0.92	MS _E	R
Trials	0.006	1	0.006		0.008	0.95
Residual	0.840	119	0.007			

The ANOVA table value of required for significance at 0.01 level of confidence With degrees of freedom 1 & 119 is 4.78. The Intraclass correlation table value required for significance at 0.01 level of confidence with degrees of freedom 1 & 119 is 0.234. Above table indicates that the obtained F ratio 0.92 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 split time from 20m to 40m is perfect and consistent. Hence intraclass correlation was obtained for 20m to 40m split time. The obtained intraclass correlation (R) value 0.95 is higher than the table value 0.234 required at 0.01 level of significant. It denotes that the split timings from 20m to 40m recorded by the device during testing and re-testing periods are significantly related. The above results proved that the newly constructed electronic device is reliable to assess the split timings from starting point to 20m and 20m to 40m of sprinters.

Validity of Split Time from Starting Point to 20m:

Pearson product moment correlation for split time from starting point to 20m (sec)

Mode of Assessment	Mean	SD	r
New Device	3.12	0.11	0.97
Stopwatch	3.26	0.12	

The table value required for 2 & 118 degrees of freedom at 0.01 level of Significant is 0.236. Table indicates that the obtained correlation value 0.97 is higher than the table value 0.236 required at 0.01 level of significant. It denotes that the split timings from starting point to 20m by using the newly invented electronic device and stopwatches simultaneously are significantly related.

Validity of Split Time from 20m TO 40m:

Pearson product moment correlation for Split time from 20m to 40m (sec)

Mode of Assessment	Mean	SD	r
New Device	2.13	0.19	0.95
Stopwatch	2.32	0.30	

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 0.95 is higher than the table value 0.236 required at 0.01 level of significant. It denotes that the split timings from 20m 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 split timings from starting point to 20mts and 20mts to 40mts of sprinters on the track simultaneously for eight athletes.

Objectivity Starting Point to 20m Split Time:

Analysis of variance with repeated measures for starting point to 20m split Time (sec)

Source	SS	df	MS	F	Intraclass correlation	
Subjects	2.87	119	0.024	1.80	MS _E	R
Trials	0.30	2	0.15		0.009	0.62
Residual	1.82	238	0.008			

The ANOVA table value of required for significance at 0.01 level of confidence with degrees of freedom 1 & 119 is 4.78. The Intraclass correlation table value required for significance at 0.01 level of confidence with degrees of freedom 1 & 119 is 0.234. The table indicates that the obtained F ratio 1.80 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 20m is perfect and consistent. The obtained intraclass (R) value 0.62 is higher than the table value 0.234 required at 0.01 level of significant. It denotes that the split time from starting point to 20m recorded by the three testers using the newly constructed electronic device at three different periods are significantly related.

Objectivity of Split Time from 20m to 40m:

Analysis of variance with repeated measures for split time from 20m to 40m (sec)

Source	SS	df	MS	F	Intraclass correlation	
Subjects	32.66	119	0.271	0.98	MS _E	R
Trials	0.007	2	0.003		0.011	0.95
Residual	2.703	238	0.011			

The ANOVA table value of required for significance at 0.01 level of confidence With degrees of freedom 1 & 119 is 4.78. The Intraclass correlation table value required for significance at 0.01 level of confidence with degrees of freedom 1 & 119 is 0.234. Above table indicates that the obtained F ratio 0.98 is less than the table value of 4.78 required at 0.01 level of significant. This proved that there are no significant differences among three different testers. It reveals that the process of testing the split time from 20m to 40m is perfect and consistent. The obtained intraclass (R) value 0.95 is higher than the table value 0.234 required at 0.01 level of significant. It denotes that the split time from 20m to 40m recorded by the three testers using the newly invented electronic device at three different periods are significantly related. The above results strongly proved that the newly constructed electronic device possess objectivity to assess the split time from starting point to 20m and 20m to 40m of sprinters on the track simultaneously for eight athletes.

Analysis of Data and Interpretation of the Study:

The main purpose of the study was to invent a relevant device to assess the acceleration performance of the sprinters and also to establish scientific accuracy of the instrument. Hence establishment of reliability, validity and objectivity have done. Reliability was established by test and re-test method. In this method data were collected on three occasions on different two days using the newly designed instrument, the same subjects and data were collected again. The attained two sets of scores were subjected to univariate correlation procedure which resulted in a coefficient of correlation of 0.96 indicating that 94% association between these scores. Validity was established by the Data were collected using the stop watches for one twenty subjects' along with the newly invented equipment was used and data were collected for the same subjects. With these two sets of data, Pearson Product moment correlation was applied and coefficient of correlation was found out. Its value 0.96 indicates that 94% association between these two sets of scores hence the validity of the instrument was established. Objectivity was established by collecting data using the same subjects and same instrument by three different testers on three occasions. The three sets of scores were subjected to univariate correlation procedure which resulted in a coefficient of correlation of 0.97 indicating that 95% association between these scores.

Conclusion:

It is concluded that the device is more reliable, valid and objective to assess the acceleration performance of sprinting events.

Recommendation:

Device like this may be designed to measure the analysis of other track and field events. Related device may be invented to assess various motor fitness components.

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