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Relationship of Stride Length Stride Time Stride Frequency on 100m Sprint Performance

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Abstract

The purpose of the study was to find out the relationship of stride length, stride time and stride frequency on 100m sprint performance. For this purpose, 13 university level sprinters were selected from different colleges and athletic club in Chennai. The subjects were captured while running 100 meters sprint on mud track using four Y1 cameras with f/2.8 aperture lens with 155 degrees of view, resolution at 1080p and 60fps. All the 4 cameras were mounted at a height of 0.93 meters with the equal distance of seven meters from plane of motion. Video was captured from 40 meters to 68 meters of 100 m performance. The performance of 100 meter sprint was measured in 1/100 of a second. The captured video was analyzed by KINOVEA software to find out the stride length (meters), stride time (seconds) and stride frequency (strides/s). The collected data were analysed using Pearson product moment correlation to find the relationship of stride length, stride time and stride frequency on 100m sprint performance. In all cases, level of significance was fixed at 0.05. It was concluded that stride length and stride frequency had significant correlation with 100m sprint performance.

Keywords: Stride Length, Stride Time, Stride Frequency.

Introduction

The speed is the determinant component of 100m sprinting performance and the speed is the product of stride length and stride frequency. Success in sprinting depends on the stride length and stride frequency (Sadri, 1994). The stride length is the more contributing factor of speed in 100m performance than stride frequency among average and elite sprinters (Mackala 2007). Maximal velocity running is a result of stride length and stride frequency. Stride length can be greatly limited by an individual's size. Stride frequency can be affected by muscle composition (Majumdar, 2011). The stride time and stride frequency are the major parameters for the elite sprinters (Coh et al. 2001). The shorter sprinters are shorter in stride length and greater in stride frequency. The best sprinters of the world were observed by longer stride length and slower in stride frequency, most of the sprinters prefer to run with a shorter stride length but a faster stride frequency (Rompotti, 1972). The stride length and stride frequency is most essential factor to predict the sprinting performance (Hoffman, 1971). There are many studies reinforcing the fact that stride frequency and stride length are the determinants of 100m sprint speed. But there is no evidence whether stride frequency and stride length at acceleration phase contributes to 100m sprint performance. Hence, the present study investigate whether stride length, stride frequency and stride time at acceleration phase influences 100m sprint performance.

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Methodology

The purpose of the study was to find out the relationship of stride length, stride time and stride frequency on 100m sprint performance. For this purpose, 13 university level sprinters were selected from different colleges and athletic clubs in Chennai. The subjects were captured while running 100 meters sprint on mud track using four YI cameras with f/2.8 aperture lens with 155 degrees of view, resolution at 1080p and 60fps. All the 4 cameras were mounted at a height of 0.93 meters with the equal distance of seven meters from plane of motion. Video was captured from 40 meters to 68 meters of 100m performance. The performance of 100m sprint was measured in 1/100 of a second. The captured video was analyzed with KINOVEA software to find out the stride length (the stride length was measured from toe to toe contact distance of successive steps in meters), stride time (time taken to complete the stride in seconds) and stride frequency (stride frequency is the number of strides taken in a given amount of time in numbers of stride/seconds). The collected data were analyzed using Pearson product moment correlation to find the relationship of stride length, stride time and stride frequency on 100m sprint performance. In all cases, level of significance was fixed at 0.05.

Results and discussion

Figure I

Showing the measurement of stride length, stride duration and stride frequency at acceleration phase of 100m sprint

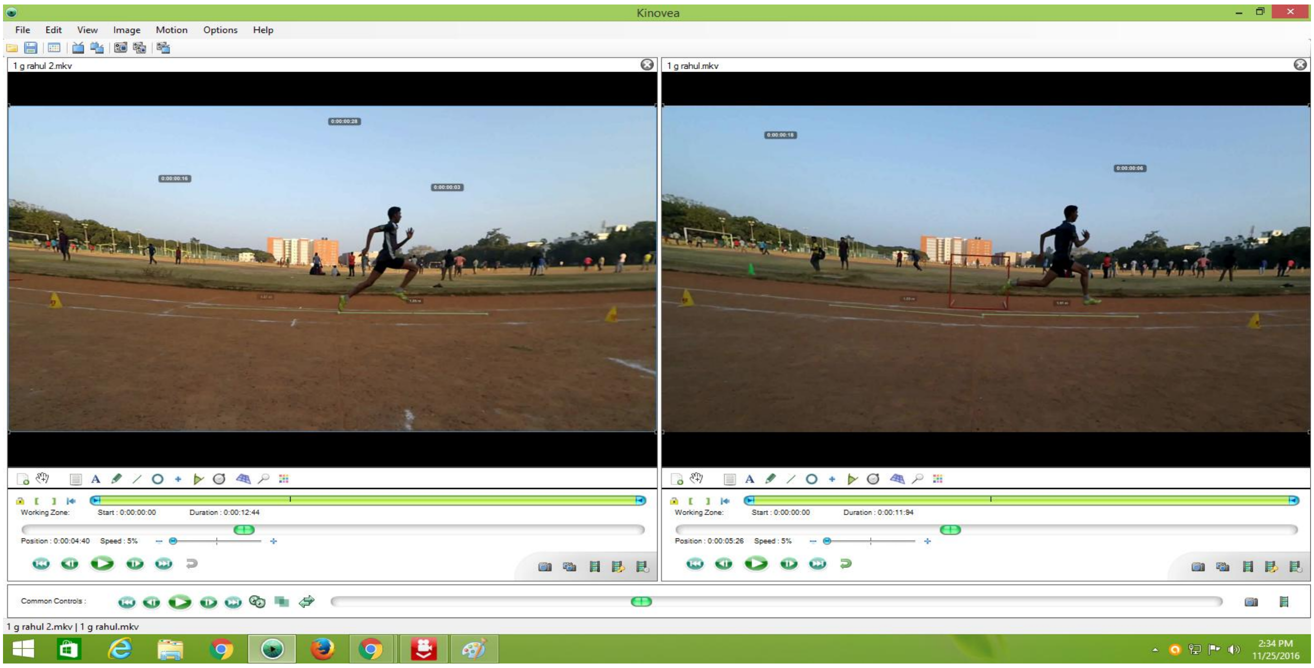

Table1

Descriptive data of the selected variables

S. No.	Variables	N	Min	Max	Mean	Std. Deviation (±)
Dependent variable						
1.	100m Sprint Performance (Seconds)	13	11.18	12.81	12.06	0.57
Independent variables						
2.	Stride length (Meters)	13	1.92	2.65	2.35	0.23
3.	Stride time (Seconds)		0.13	0.24	0.17	0.04
4.	Stride frequency (No of strides/Seconds)		4.86	6.95	5.61	0.55

Table – 1 shows the mean value and standard deviation values of 100m sprint performance (mean - 12.06 seconds, ±0.57), stride length (mean - 2.35 meters, ±0.23), stride time (mean - 0.17 seconds, ±0.04) and stride frequency (mean - 5.61 strides/seconds, ±0.55).

Table 2

Showing the correlation analysis of selected variables

Variables	Sprint Performance	Stride Length	Stride time	Stride frequency
100m Sprint Performance	*	**-0.674***	0.171	**-0.568***
Stride length		*	-0.409	**-0.642***
Stride time			*	0.154
Stride frequency				*

Table 'r' value with df 11 = 0.553 at 0.05 level of confidence

It was evident from the Table – 2 that the stride length and stride frequency had a moderate negative correlation with 100m sprinting performance. The stride time has weak positive correlation on 100m sprint performance. The stride length has moderate negative correlation with stride frequency.

Figure II
Showing relationship between stride time and 100m sprinting performance

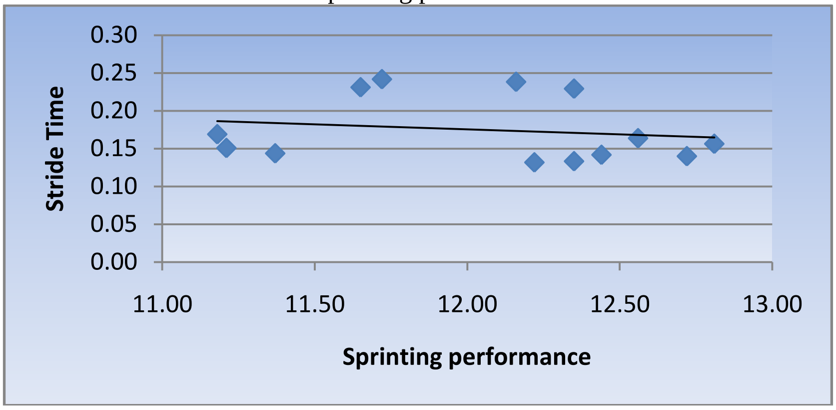

Figure III
Showing relationship between stride frequency and 100m sprinting performance

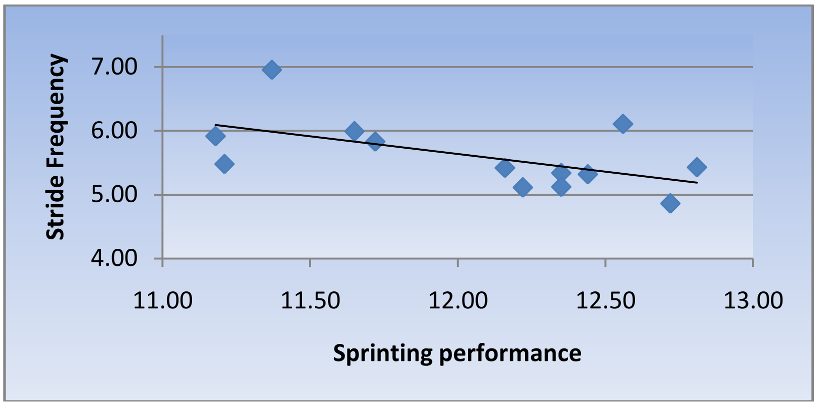

Figure IV
Showing relationship between stride length and 100m sprinting performance

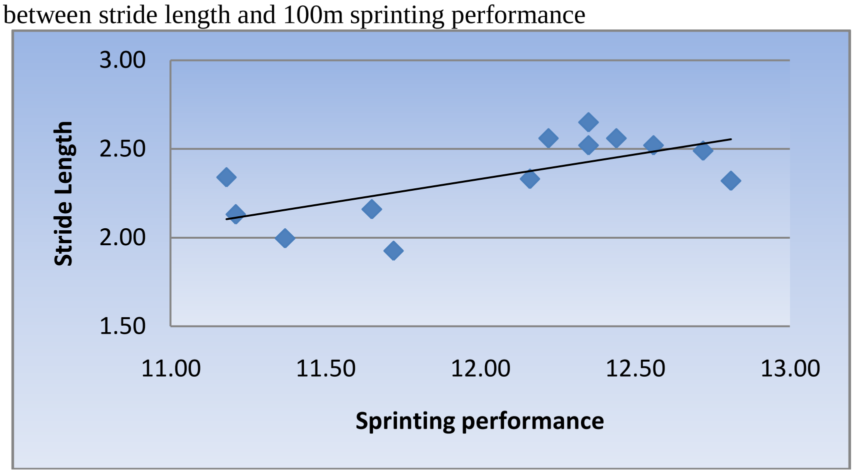

Table 3
Showing 't' test analysis of correlation value

	Stride Length	Stride frequency
'r' Value	-0.674	-0.569
Number of Subjects	13	13
't' Value	3.03	2.29

Table't' Value with df 11 = 2.20 at 0.05 level of confidence

From the table 3 it was found that the‘t’ value of stride length was 3.03 it was higher than the table value of 2.20. Hence, there is sufficient evidence to conclude that there was a significant correlation between stride length and 100m sprint performance at acceleration zone (40 to 68m).

It was also found that the‘t’ value of stride frequency was 2.29 it was higher than the table value of 2.20. Hence, there is sufficient evidence to conclude that there was a significant correlation between stride frequency and 100m sprint performance.

The stride frequency decreases as the stride length increases at 100m acceleration phase. The sprinters’ stride length is higher in acceleration phase and they should maintain the same tempo still end of the race. Similarly, elite athletes tend to have relatively longer stride length at acceleration phase.

Conclusion

The stride length and stride frequency at acceleration phase had a moderate negative correlation with 100m sprinting performance whereas the stride duration had a weak positive correlation.

Reference

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