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Research article

BIOMECHANICAL ANALYSIS OF STRIDE LENGTH AND STRIDE FREQUENCY OF SPRINTERS

P. BALAJI*, & Dr. T. Jothi**

*Research Scholar, YMCA College of Physical Education, Chennai, Tamil Nadu, India.
**Associate Professor, YMCA College of Physical Education, Chennai, Tamil Nadu, India.

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Abstract

The objective of the present investigation was to biomechanically analyze stride length and stride frequency of intercollegiate level sprinters. To achieve the purpose of the study 30 intercollegiate sprinters from various universities in Tamil Nadu from 50 sprinters were selected as subjects. The age of the subjects ranges between 18-25 years. 100m race was video analyzed at three stages of sprinting the acceleration phase, maintenance phase and the deceleration phase. After completion of the test the video was analyzed at each phase. Results: Intercollegiate sprinters of various universities of Tamil Nadu run at an average speed of 11.6 seconds. The average cadence taken to cover the distance in the acceleration phase was 4.3m, in the maintenance phase was 4.6m and during the displacement phase was 4.5. The average stride length during the acceleration phase was 1.78, in the maintenance phase was 2.09 and in the deceleration phase was 2.13m. Each phase of sprinting is essential and crucial for high performance. Understanding biomechanical factors in sprint running is useful because of their critical value to performance (Antti 1992).

Keywords: *Bio mechanics, stride length, stride frequency, sprinters.*

Corresponding Author: *P. Balaji*
e-mail: *sprint.balaji@gamil.com*

INTRODUCTION

Olympic gold in track and field for India is every Indians dream which has not come true till then. Identifying born sprinters and indulging them in scientific sports training makes the road to victory much shorter. Ministry of Youth Affairs and Sport, Department of Sports has formulated 'NSDF Target Olympic Podium Scheme in the National Sports Development Fund (NSDF) with the objective of identifying and supporting potential medal prospects for 2016 and 2020 Olympic Games. This is a positive sign towards future of India in Olympics. Whether it be a born talent or a nurtured one, India is in desperate need to prove in the international competitions. A small step towards the above said focus this study attempts to analyze the biomechanics of stride length and stride frequency of intercollegiate level sprinters. Not all can become a sprinter. We found that exceptional speed prior to formal training is a prerequisite for becoming a world-class sprinter (Michael 2014). Speed is the most important quality that an athlete can possess (George 1988). As speed is the product of stride frequency (SF) and stride length(SL), a wide range of SF and SL combinations are possible for a given speed. Sprint running can be divided into three main parts: an acceleration phase, a maximum speed phase and a deceleration phase (KLAUS 2014). From a biomechanical point of view, maximum sprint velocity is defined by stride frequency and stride length. These two factors need to be understood in a negative relation towards each other: an increase in one factor will result in an improvement in sprint velocity, as long as the other factor does not undergo a proportionally similar or larger decrease (Hunter 2004). Rate and length have an interesting relationship in that at max speed increasing one will lead to a decrease of the other, so it's balance between the two that matter. (Steve Magness 2010). In the Salo et al. (2010) study they mention that increased ability to produce force has been shown to be a determinant of stride length in animal models.

Speed is the most important quality that an athlete can possess. Running is the most natural of athletic activities. There is little point in making a youngster think more than is necessary in doing something as instinctive as running. Sprinting has a charisma about it which is in some way mystical— no tactics, just sheer blinding speed. If we think back to our school—days, the winner of the 100-metres was always looked upon as someone special, whereas the poor winner of the shot put was always scorned for being the 'fattie'. No matter the quality of the performance of the athletes— the sprinter always came outtops. It is because of the charisma of the event that it is heralded as one of the blue rid and events in track and field today.

Many people believe that sprinters are born and not made; a statement we have heard many times over and one which, to a certain extent, has some truth. Natural ability plays a part in a sprinter's career, but it is rarely the record breakers at fifteen and sixteen who go on to become the world-class athletes of the

future. It is the ones who were fifth and sixth on the list who emerge on top. Why? There is no secret formula for success. Athletes at the top have the same basic equipment as other people— namely, one head, two legs, two arms and a body. The magic ingredient—if there is one—is hard work. There are no short cuts, no magic wands. To methe unbeatable combination is a mixture of natural ability, a lot of hard work and the correct training techniques. There are two ways in which to improve speed when sprinting: (a) cadence rate (i.e., leg speed) (b) stride length.

METHODS AND MATERIALS

Sampling: To achieve the purpose of the investigation, 50 intercollegiate sprinters from various universities of Tamilnadu were chosen as the subjects. 10 extremely high performers and 10 extremely low performers were excluded from the study for their performance may affect the results of the research. ***Variables:*** stride frequency and stride length were the variables chosen for this biomechanical analysis. ***Methods:*** The 100m speed of the selected middle 30 athletes' was recorded. Using three separate cameras fixed at each displacement zone. Every 10m was marked with a dotted line for the counting of steps to be easy and precise.

RESULTS

Intercollegiate sprinters of various universities of Tamilnadu run at an average speed of 11.6 seconds. The average cadence taken to cover the distance in the acceleration phase was 4.3m, in the maintenance phase was 4.6m and during the displacement phase was 4.5. The average stride length during the acceleration phase was 1.78, in the maintenance phase was 2.09 and in the deceleration phase was 2.13m.

TABLE-1
SHOWING STRIDE LENGTH AND STRIDE FREQUENCY OF THE THREE DIFFERENT DISPLACEMENTS

SNO	Variable /Displacement	30m	60m	100m
1.	Stride Frequency (steps)	4.3	4.6	4.5
2.	Stride Length (m)	1.78	2.09	2.13

FIGURE-1
GRAPH SHOWING STRIDE FREQUENCY FOR VARIOUS DISPLACEMENTS

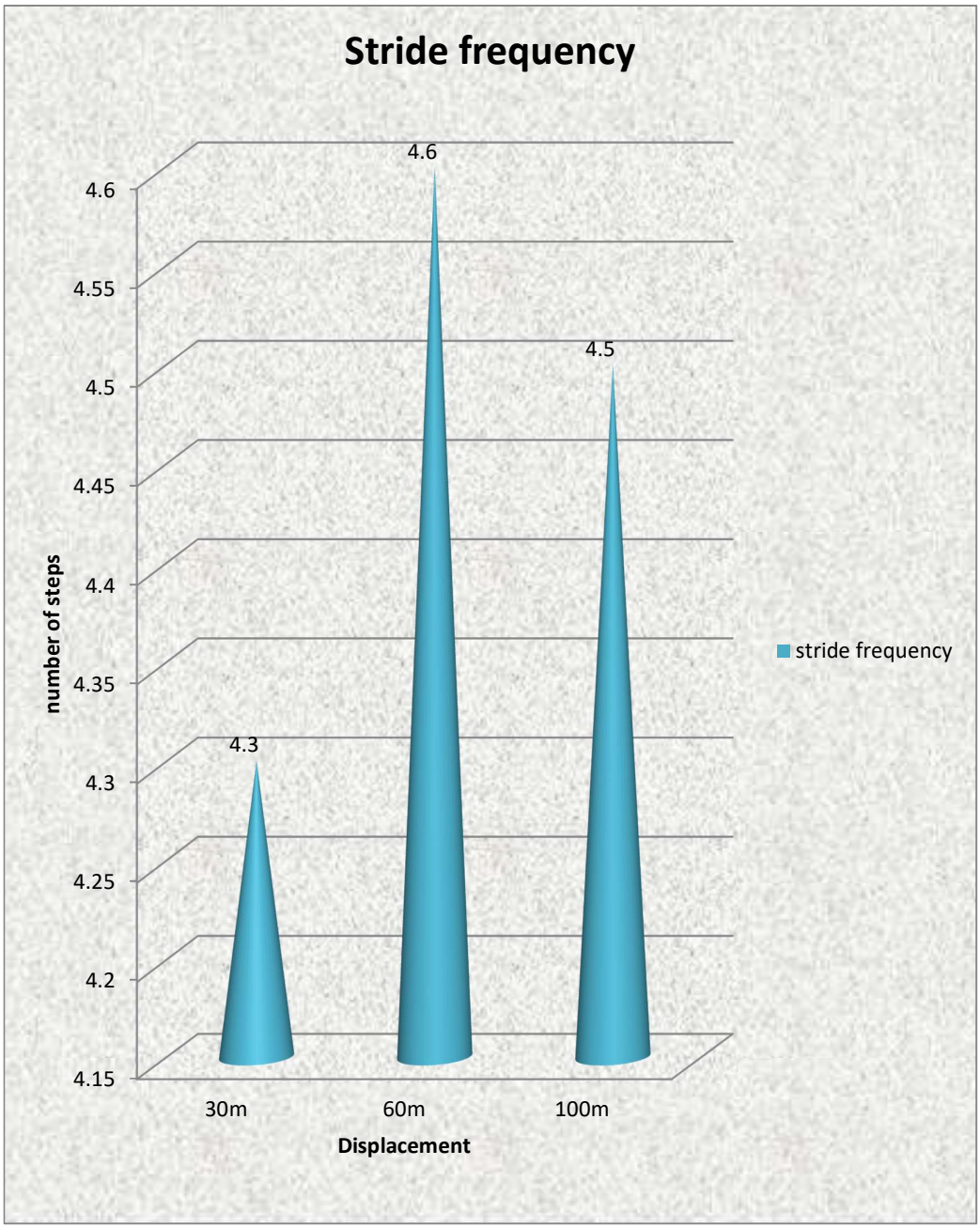
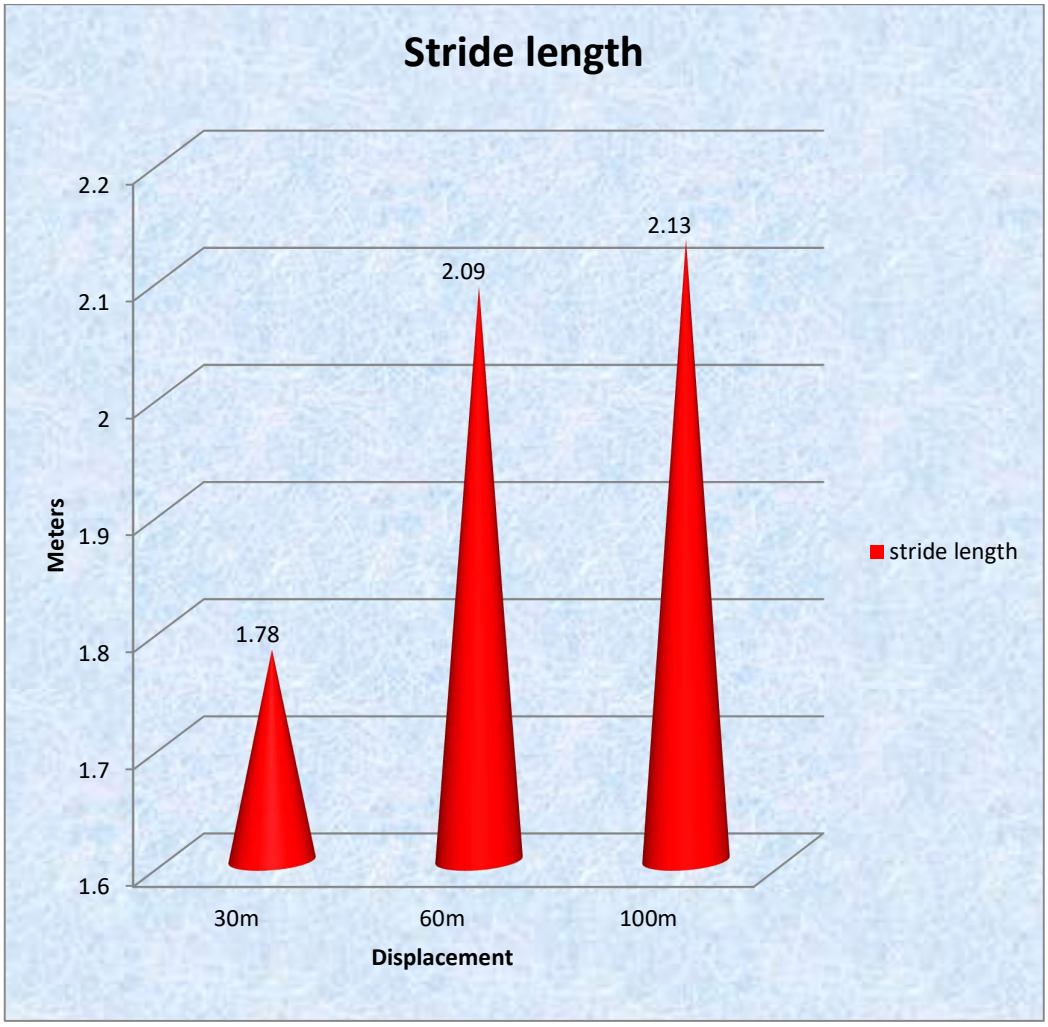


FIGURE: 2
GRAPH SHOWING STRIDE LENGTH FOR VARIOUS DISPLACEMENTS



CONCLUSION

Each phase of sprinting is essential and crucial for high performance. Understanding biomechanical factors in sprint running is useful because of their critical value to performance (Antti 1992).Customized training at Institutes having world class facilities and other necessary support is being provided to the elite athletes, which would result in improved performance and a higher position in medals tally for the country in international sports events.

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