THE GENERIC PREPARATION PHASES FOR 100 METER MALE UNIVERSITY SPRINTER

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Abstract

Sprint is an act of running over a short distance (or near) at top speed. The intensity of sprint depends upon muscle fibers type and the flexibility. Sprint in the Athletics is a well-known phenomenon in the modern age as part and parcel of speed. In Athletics event, it is a part of track event in which an athlete has to compete against the time

Keywords: Sprinting, Neuromuscular coordination, Force, Speed.

Introduction

A well-known fact that sprinting is an activity that underlet on the neuromuscular coordination and on the caliber of the central nervous system for fend as many breaking and friction movements as possible.

Mechanically, sprinting is not a complex skill, according to neurologically aspect sprinting is complex series or sequence of firing by motor neurons to activate the muscles to move the human lever system in order to effectively apply force. As we know a sprinter performance laid down by the force and speed with which muscles can contract and relax and, because of the cyclic motion, the correct timing of the change from contraction (force application) to relaxation.(USATF 1999,Schmolinsky 1983,Plaff 2001).

The purpose of developing this paper will give the effective 12 week generic preparation state for 100 meter male university sprinter

Performance Factor in Sprinter

The aim of sprinter in 100m race is to attain the highest maximal horizontal velocity. For elite sprinter this velocity is developed over the course of 43- 46 strides (men) which that make up the 100m race. A stride consists of a support and a recovery phase. The sprinter horizontal propulsion only produced during the support phase. The support leg applies force against the ground in a backward downward direction (the action) and the ground “reaction” result in the horizontal propulsion in a forward upward direction.

There is very inappreciable time available for the sprinter to apply force during the support phase. At the point of maximum velocity, the sprinter foot is only on the ground 0.08 to 0.09 seconds during the support phase. So, the sprinter must be able to effectively apply force and

during this short time period to maintain horizontal velocity. So, alone characteristic the need of sprinting having the ability to apply force in very short time period.

According to Mathematical term, the sprinting velocity is the product of stride length and stride frequency. These two factor are interact in 100m; after that they have reach the certain point following a phase of mutually increasing (within the first 50m) an increase in either parameter will result in a corresponding decreased in the other(i.e. if the sprinter increased his stride length after 50m that the stride rate(frequency) must be decreased). This point in the race depends on many factors like body type, power production, training status, fatigue level, etc, and individual to each athlete. So there is an optimal stride length and frequency for each athlete.

Biomechanical factors in the 100m Sprint.

100 meter sprint is fundamentally divided into different phase:

1. The reaction phase at the start
2. The acceleration phase (increased in speed)
3. The phase of maximum speed (constant speed)
4. The decelerations phase(decreasing in speed)
5. The finish

1. **The reaction time**: (The time between the start signal to the first movement of the sprint) at the point of reaction phase the sprinter use the resistance of the starting blocks to start acceleration him from a complete rest position. An explosive force production in a very short time is play a vital role for a successful start.

   After the start signal the sprinter must develop horizontal force up to reaching 1.5 times body weight in less than 0.4seconds. So the reaction time is respectively small very important to overall phase of the races. However the desired psychological advantage at the start can last through to the finish.
2. **Acceleration phase:** In this phase leaving the block by the sprinter and increased his running speed by continually increasing stride length and stride frequency. Actually these segments begins with the full block clearance and conclude when their no further positive change in velocity and depending on the level of the sprinter this segment occurs from approximately 2 meter to 25-50 meters. The greater velocity developed by the sprinter the longer the acceleration phase.
3. **Maximum speed (velocity) phase**: Started at 50m to 80m where the sprinters cover the distance of 20m to 30m at their highest speed. This segment begins when there is no further positive change in velocity begins. Stride length and stride frequency vary among sprinters and each will have an optimal ratio for maximum velocity. In other word we can say that is also the phase where the ground contact times are the shorter.
4. **The deceleration phase:** The final 10m to 20m constitute the deceleration phase. This phase start when assuming negative changes in velocity and it will end 2 to 4 stride before the finishing line. The length of this segment is dependent on the length of the acceleration and maximum velocity segment.
5. **The finish**: The last final 2 or 4 strides is the decisive stage of the race especially between sprinter with the minimal different in ability. The norm of completion rule is that the clock stops when the sprinter trunk of the body passes the finish line. A strong forward lean is an advantage to the sprinter. This can be achieved by flexing the hip while simultaneously swinging back the arms.

Table I for a summary of important biomechanical factor for the 100meter sprint (Pfaff 2001, Seagrave et al., Schmolinsky 1983, IAF Biomechanical Research Project 1997, Dyson 1977)

Table I: Important biomechanical data of the 100m sprinter USAIN BOLT in (2009), Berlin, World Championship*

100m	**Men**
World Record	9.58s (2009), Berlin
Reaction time at the start	0.09-0.12s
Duration of acceleration	45-60m
Maximum speed	10.44m/s
Average speed	12.42m/s
Position of maximum speed	45-60
Stride length	2.47m
Stride frequency(strides/s)	4.23m
Number of strides/100m	All -40.92 (Take off from LL-20.1, Take off from RL – 20.8)

*modified from IAAF Biomechanics Research Project (2009)

Athlete Characteristics

Coordination: Is an ability to use different part of the body together smoothly and efficiently, as same as in the skill of sprinting demand a high rate of movement required great coordination of nervous system control, it's often overlooked in many training programs and it is the most critical aspect of effective sprinting.

Speed: Speed is an important factor in sprinting. Speed is closely tied to coordination (nervous system again) the ability to move the limbs at high velocities and express power through those movement to propel the body down the track at high velocities.

Strength/ Power sprinter must overcome their own inertia as quickly as possible, development of the ability to produced large amount of power with the muscles involved is absolutely necessary.

Flexibility: Is refer to the absolute range of movement in a joint or series of joint, so the good sprinters possess a high degree of flexibility in a hips and ankles. Increased flexibility allow for loss muscle resistance through any given range of motion

Reaction time: Reaction time is the amount of time it takes the respond to a stimulus a short reaction time is a must for an event that is over in 10-12 second.
All elite sprinter have short reaction times (0.12-0.19 second) (Schmolinsky 1983, Bowerman et. al. 1991, Belloti, Pfaff. 2001).
For the sprint event, Torim (1988) identifies physical performance capacities and their important rank for the sprint. The table is also given an accurate description of the demand of the 100m sprint.

Table II: Physical Performance capacity and importance rank for sprints.
(1= most important)

CAPACITY	**100M**
Reaction Speed	3
Acceleration	2
Maximal Speed	1

***From Torim (1988)**

RANK-1=Maximal speed (i.e velocity in m/s) is the most important factor. A high maximal speed is essential and without it the other components don't matter as other, faster athlete will win the race.

RANK-2=Acceleration (m/s) is the second most important because the slowest segment of the 100m is the first 30m out of the block.

RANK-3=Reaction time is also important, time in lost in the period between firing of the gun and initiation of the movement by the athlete.
Development of these three characteristics, and considering the skill component of sprinting in 100m sprinting in how training program should be based (Torim 1988, Schmolinsky 1983, Pfaff 2001).

From the above event parameter a training program should be directed toward the development of power, maximal speed and short term speed endurance (i.e. anaerobic capacity) in the 100 meter sprinter.

So the athletes need to run workout that allow him to experience running fast in order to learn how to coordinate his limbs at those velocities. He also need to learn and assumed the correct technique of sprinting under supervision of the coaches and experts so he can exert the minimum amount of time while minimizing errors in technique that may slow the sprinter.

Periodizaton

The 12 week programs are given and the explanation of the terms used is given below. The 12 week period are defined as the Generic Preparation phase. The Generic Preparation phase is laid down into 3 mesocycles (Mesocycle I-September, Mesocycle II- October, and Mesocycle III-November). Each mesocycle divided into 4 weekly microcycles with three week of conditioning and 1 week of recovery/testing.

Type of training desired in any given week include: 1 day (Monday) of acceleration/ speed development, 2 days strength and polymetric work usually Tuesday and Thursday,2 days of speed endurance work usually Wednesday and Saturday,1 day of active rest (Sunday).

Explanation of Program Terms:

Workouts are stated in the following format – Repetition x distance @ intensity (given as % of 100m race pace) w/rest interval (i.e 5x100m@90%w/3' rec)

Warm up: consist of a 600m jog, stretching, dynamic flexibility, and about 200m total of sprint drills.
Cool down: consist of walking or light jogging and stretching

Weight Training: weight-room sessions of mainly Olympic lifts. The weight training program would be a whole separate paper and will not be discussed here. However, the athlete can be assumed to be working on Olympic lifts (Monday, wednessday, Friday) to increased power production and supplementary lifts (Tuesday, Thursday, Saturday) the increased strength.

Jump: Refer to some of plyometrics. A circuit is a series of 8-10 different jump, each one done for the specified amount of time. Jump technique is a series of four exercises performed into the sand pit, each are measured to distance and recorded to the chart improvement over the course of season. Jump hurdle hop is a simply a number of hurdles set close to each other and the athlete hops over each one (two-footed). Jumps bounds are a series of bounds on grass.

All of these plyometrics on the explosive power of the sprinter. The goal with these plyometrics is to develop the ability to apply force in a short amount of time because the ground contact time in the 100m sprint is very short.

Examples:

Jump circuit	Lung jumps, Tuck jumps, Lateral Squat jumps, Straddle jumps
Jump tech	Standing long jump, Standing triple jump, 3 double leg bounds, Left-Left-Right-Right.
Jump hurdle hops	10 hurdles lined up.
Jump bounds	Straight leg bounds, Bent leg bounds, Left-Left, Right-Right bounds.
Hurdle mobility	A series of hurdle drills done to improve flexibility, strength and coordination. Example: Hurdle Walkovers, Hurdle Walkover skips, Lateral alternate lead leg skips (straight and bent leg), etc.
Throw	A series of throws with a medicine ball or, when in a testing phase, a metal shot. Done to improve strength while completing a movement (i.e resistance during a twisting movement, etc.)
Hills	Runs up a short, relatively steep hill to improve the athletes to produced power while running and increasing leg strength.
Testing	Occur during rest weeks. These weeks are used to quantify improvement of the season progresses and to give the athlete rest in order to compensate and prepare for the next mesocycle.

Generic Preparation
Mesocycle I – September -3 week
Weekly Microcycle

DAY	**INTENSITY**	**WORK-OUT SCHEDULE**
MONDAY	HARD	(1)warmup (2) 5x20m, 5x30m, 5x40m @ 90-95% with 1'+3' rest interval. (3) Jump – circuit x1 (30" on ,60" off) (4) Weight traning (5)cool down
TUESDAY	EASY	(1)Warm up (2).Jump – tech x3 set (3) Hurdle Mobility – 3x10 hurdles,(4) weight training,(5) Cool down.
WEDNESDAY	HARD	(1)Warm up (2) 3x350m@75% with 3min rest interval, (3)Throw – Medicine ball 3x10 (4)Weight training, (5) Cool down.
THURSDAY	EASY	(1)Warm up (2) 3x350m@75% with 3min rest interval, (3)Throw – Medicine ball 3x10 (4)Weight training, (5) Cool down.

FRIDAY	MODERATE	(1(1)Warm up (2) Hills – 3x5x40m@ your pase with walk back recovery and 3 min between sets, (3) Jump – circuit x 1(30"on ,60"off), (4) Weight training,(5) cool down.
SATAURDAY	HARD	(1) Warm up (2)week 1-5x250m @75-80%, week 2- 6x200m @ 80%,week 3- 8x150m@ 80-85% with 2 min rest (all three weeks) (3) Throw- medicine ball 2x10,(4) Weight training,(5) Cool down.
SUNDAY	EASY	ACTIVE REST

Recover week – September

DAY	**INTENSITY**	**WORK-OUT SHEDULE**
MONDAY	MODERATE	(1)Warm up (2) 8-10x30m @your pace with full recovery.(3) Throw – Testing (measure for distance). (4) Weight testing, (5) Cool down.
TUESDAY	EASY	(1)Warrm up(2) Jump – 3x10 hurdle hops (3) Weight-testing, (4) Cool down
WEDNNESDAY	EASY	(1)Warrm up(2) Jump – 3x10 hurdle hops (3) Weight-testing, (4) Cool down
THURSDAY	HARD	(1)Warm up, (2) 5x50m build ups, (3) Test – 300m time trial, (4) Weights- testing (5) Cool down.
FRIDAY	MODERATE	(1)Warmp up, (2) 8-10x30m as Monday (3) Weights – Testing, (4) Cool down
SATURDAY	EASY	Complete Rest
SUNDAY	ESAY	Active Rest

Generic Preparation
Mesocycle II – October – 3 weeks
Weekly Microcycle

DAY	**INTENSITY**	**WORK-OUT SCHEDULE**
MONDAY	HARD	(1)Warm up (2) 4-5x30,40,50m ladde@ 90-95 % with walk back recovery and 3` between sets (3) Jump – 2x30-40m bounds (4) Weights (5) Cool down
TUESDAY	ESAY	(1)Warm up (2) G S circuit 2x10 (3) throw medicine ball 1x10 (4) Hurdle mobility 3-4x5 hurdle (5) Weights (6) cool down
WEDNESDAY	HARD	(1)Warm up (2)8-10x100m build up with 3`-5` recovery (3) Throw medicine ball 1x5 (4) Weights (5) cool down
THURSDAY	EASY	(1)Warm up (2)Jump – 4x50-100m bound on grass (3)G S – circuit (4) Weights (5) cool down
FRIDAY	MODERATE	(1)Warm up (2) Hill-3x6x40-50m@ your pace with walk back recovery and 3` between thw sets (3) Jump – tech 1x5 (4)Weights (5) Cool down

SATURDAY	HARD	(1)Warm up (2) Week 1-2x250m@80-85%, Week -2 2-2x3x200m@@85%, Week -3 2x4x150@ 90% with 3`-5` recovery (in all three week). (3)Hurdle mobility- 2x10 hurdles (4) Weights (5) Cool down
SUNDAY	EASY	ACTIVE REST

Recovery Week October

DAY	**INTENSITY**	**WORK-OUT SCHEDULE**
MONDAY	MODERATE	(1)Warm up (2) 12x30-50m@ your pace with full recovery (3) Weights testing (4) Cool down
TUESDAY	MODERTAT	(1)Warm up (2) Test 100m Crouch Start (3) Weight testing (4) Cool down
WEDNESDAY	EASY	Compete Rest
THURSDAY	HARD	(1)Warm up (2) Test – 300m Time trial (3) Weight- testing (4) Cool down
FRIDAY	MODERATE	(1)Warm up (2) 4-6x50m Build ups (3) Jump – test (4)Weights-Testing (5) Cool down
SATURDAY	EASY	Active Rest
SUNDAY	EASY	Complete Rest

Generic Preparation
Mesocycle III – November 3 Weeks
Weekly Microcycle

DAY	**INTENSITY**	**WORK-OUT SHEDULE**
MONDAY	HARD	(1)Warm up (2) 5x20,30,40m ladder @ 90-100% With Walk Back recovery and 3`-4` Between Sets (3) Jump-2x10 hurdles hops (4) Weight training (5) Cool Down
TUESDAY	EASY	(1)Wram up (2) Circuit Training 2x20 (3) Throw medicine ball 2x10 (4) Hurdle mobility – 1x10 hurdles (5) Weight training (6) Cool down
WEDNESDAY	HARD	(1)Warm up (2) 3x4x100m build ups with 3 recovery and 5-8 between sets. (3) Throw medicine ball 1x5 (4)Weight Training (5) Cool Down.
THURDAY	EASY	(1)Warm up (2) Circuit training 2x25 (3) Throw medicine ball (4) Hurdle mobility – 2x10 hurdle (5) Weight training (6) cool Down.
FRIDAY	MODERATE	(1)Warm up (2) Hills stride – 6-8x40-50m@ your pace with walk back recovery and 3 between sets.(3) Jump – 8x5 hurdle hops (4) Weight training (5) Cool down.
SATURDAY	HARD	(1)Warm up (2) (Week 1)-2x2x250m@85-90%, (Week 2) 2x3x200@90-95%, (Week 3) 2x4x150m @ 90-100% with 3+5 recovery all 3 weeks (3) Hurdle mobility – 2x10 Hurdles (4) Weight training (5)Cool down
SUNDAY	EASY	ACTIVE REST

Recovery Week – November

DAY	INTENSITY	WORK-OUT SCHEDULE
MONDAY	**MODERATE**	(1)warm up (2)10-12x20-30m at your pace full recovery (3) Jump 5x5 hurdles hops (4) weight training (5) cool down.
TUESDAY	**EASY**	(1)warm up (2) Jump – tech 1x4 (3) Weight – testing (4) Cool down
WEDNESDAY	**HARD**	(1)Warm up (2) Test – 100m time trial (3) Hurdle mobility 2x10 hurdles (4) Cool down
THURSDAY	**EASY**	Complete Rest
FRIDAY	**MODERATE**	(1)warm up (2) Test – 100m Time trial (3) Crcuit training 2x10 (4) Hurdle mobility -2x10 Hurdle (5) Cool down
SATURDAY	**EASY**	Active Rest
SUNDAY	**EASY**	Complete Rest

Conclusion

This Program is play a prominent role to development of maximal speed and power in a 100 meter university male sprinter .To make improvement in maximal speed an athlete needs multiple runs or near maximal speed (Pfaff 2001,Schmolinsky 1983) . This program also gives the new learning material to athlete to apply force correctly to result in a higher maximal elan. Merit in this 100 meter sprint that are addressed in this training program are power (snatch and clean and jerk (Olympic lift), Hill running Plyometric bound, etc.) maximal velocity (run up to 80-100 meters, plyometrics,etc.), and for acceleration development (20-40 meters)

Reference;-

- Belloti, P . A few aspects of the theory and practice of speed development.
- Bowerman, W. and Freeman, W. (1991) High – performance training for track and field. Leisure Press, Champaign,IL
- Dyson, G.(1977) The mechanics of athletics. Holmes and meier Publishers, New York.
- IAF Biomechanical Research Project (1997) Scientific Bulletin. Athens
- Pfaff, D. (2001) Personel conversations.
- Schmolinsky, G. (1983) Track and Field. Sportverlag, Berlin.
- Seagrave, L. and Winkler, G. A brief review of sprint mechanics at maximal velocity.
- Torim, H. (1988) Maximal speed in the sprints. Track technique, 104, p3331.