

# North America, Central America and Caribbean Track & Field Coaches Association

Volume 1 - Number 1 (February 2001)

**Contents:** NACACTFCA Directors - Calendar of Events - Sponsors - Articles: Motor Behavior in Sport and Coaching Science (Brian Maraj); Coaching Sprinting (Leroy Burrell); Entrenando Velocidad (Leroy Burrell); Entrenamiento Funcional de Fuerza para Pistay Campo (Larry Judge, Ph.D., C.S.C.S.) - Membership Information

The NACACTFCA Bulletin will be a semi-annual mailing which will include calendar events (including competitions and coaching education offerings), articles from NACACTFCA Congresses and region coaches, NACACTFCA Congress information, and other news of interest to the coaches in the NACAC region. This first edition is being mailed to all coaches on past NACACTFCA, NACAC, and CAC lists. **In the future, only those current NACACTFCA members will receive the NACACTFCA Bulletin.** Any contributions of materials, news, articles, and calendar information would be greatly appreciated! This Bulletin is separate from the IAAF-NACAC Bulletin published by the RDC in Salinas. NACACTFCA is the official coaches organization of the IAAF-NACAC Region. Please visit our website address: <http://www.sjs.org/sports/T&F/Nacactfca.html>.

2001 NACACTFCA CONGRESS - October 11-14, 2001 in Montego Bay, Jamaica. This year's Congress will feature excellent world-class coaches who have trained several Olympians: Dan Pfaff (USA-Jumps) coach of Donovan Bailey and Mark Boswell - Clyde Hart (USA-400 Meters) coach of Michael Johnson - Ed Miller (USA-Decathlon) coach of Chris Huffins - Santiago Antunez (CUB-Hurdles) coach of Aliuska Lopez and Anier Garcia! Hotel Information: Wyndham Rose Hall Resort & Country Club - P.O. Box 999 Montego Bay, Jamaica. Tel. (876) 953-2650 / FAX (876) 953-2617 Contact person: Jacqueline Sangster - Sales Manager, [email:jsangster@wyndham.com](mailto:jsangster@wyndham.com). \$100.00 per night includes taxes for single/double room. Wyndham Rose Hall is a beautiful Five Star resort and convention hotel with a golf course and private white powder beaches! Check out the pictures at the website: <http://www.wyndhamjamaica.com/index.html>

## NACACTFCA Board of Directors

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## Calendar of NACAC Area Events and News

Following is a list of NACAC, NACACTFCA, CAC, CARIFTA and other events in our region, as well as US, Canadian, and international IAAF events. Please submit any major competitions, camps, seminars, or events to: [rmercado@sjs.org](mailto:rmercado@sjs.org) or [lopezwtr@ruf.rice.edu](mailto:lopezwtr@ruf.rice.edu)

## PRELIMINARY NACAC SCHEDULE FOR 2001

Oct. 13-14 Pan American Race Walk Cup, Lima, PER  
19-21 Pan Am. Junior (U-20) Champs, Santa Fe, ARG  
Nov. TBD Unidad Centroam. (CADICA)Granada, NIC  
10-11 VII Copa El Salvador, San Salvador, ELS  
12-13/17-18 CAC CC Champs, Hamilton, BER?  
27-Dec.3 VII Juegos Centroamericanos, Cdad. Guatemala

## PRELIMINARY NACAC SCHEDULE FOR 2002

May 4-5 X Campeonato Iberoamericano de Atletismo  
La Pedrera, GUA  
Nov. TBA Central American & Caribbean Sports Games  
San Salvador, ELS

## USATF Calendar of Events for 2001

Oct. 6-7 South American Junior Champs TBD  
7 IAAF World ½ Marathon Bristol, England  
18-20 Pan American Junior Champs Santa Fe, ARG  
21 IAU 24 HRS Euro. Challenge Uden Netherland  
27-28 Pan-American Race Walk Cup Lima, Peru  
27-28 S. Am. Race Walk Champs Lima, Peru  
Nov. 7-11 1st Afro-Asian Games New Delhi, India  
12-13 CAC CC Championships Hamilton, Bermuda  
17 NAIA CC Nationals TBA  
TBA NCAA CC- D.I TBA  
TBA NCAA CC- D.II TBA  
19 NCAA CC- D. I Greenville, S.C.  
TBA USATF Fall CC Nationals TBA  
28-3 VII Central Am. Games Guatemala City  
Dec. 1 USATF Fall CC Championships Mobile, Ala.  
8 National JO CC Championships, Lincoln, Neb.

## North America, Central America and Caribbean Track & Field Coaches Association Sponsors:

The following will give a 10% discount on purchases to members

**American Airlines**  
**Athletics Canada**  
**La Cruz Azul de Puerto Rico**  
**M-F Athletics (contact: Holly Kelly-Thompson)**  
**Mondo**  
**Nordic Sport**  
**Pacer International**  
**Track & Field News**  
**UCS / Spirit (contact: Ed Gorman)**

## Technical and Scientific Articles

### Motor Behavior in Sport and Coaching Science

Brian Maraj (A Summary by Richie Mercado)

Dr. Maraj presented information on Motor Behavior that is especially pertinent to the technical events of Track & Field from the beginning to the international level athlete and coach. He focused on what he described as the major emerging topics, those critical in coaches' development and coaching science (sport science), Motor Development, Motor Learning and Motor Control. All of these topics are included under the heading of Motor Behavior in sport and coaching science, and he urged that coaches must elevate their level of education, not just for a specific event, but in terms of the science of coaching - no matter what event area!

#### MOTOR BEHAVIOR

Within this discussion of Motor Behavior there are two important participants: the athlete and the coach, and both must improve their respective skills in relation to motor behavior. Athletes' skills include development, learning, control and acquisition. Coaching skills are important, but perhaps more important are thinking skills! There are several different areas within which a coach must be able to think and comprehend:

- motor behavior
- exercise physiology
- sports psychology
- biomechanics
- coaching science!

Areas of research have typically been independent and not directly related to practical situations or have not provided information for coaches. Therefore, we need more motor behavior - biomechanics - coaching science ties, and coaches must provide input to affect research in these areas. We do not need scientists simply telling coaches what to do! There is a great need for important questions from both sides. Coaches must be able to speak and understand the "language" of sport sciences in order to do this. Also, habit and tradition have often overshadowed coaching science improvements (i.e. coaches tend to do what they have always done or stick to what they learned when they began coaching).

Motor Behavior can be simply defined as the study of

movement. It is an old discipline, but not one in the forefront for enhancing aspects of coaching. It includes the areas of:

- motor development
- motor learning
- motor control

Coaching books discuss motor learning, but the other two need clarification.

#### MOTOR DEVELOPMENT

Motor Development has been focused primarily on child development and historically understudied in terms of athletics. It is an important consideration for keeping children interested in the long term. Motor Development can be defined as, "continuous age related changes associated with movements from simple unorganized skills to complex motor actions." Motor Development data mainly comes from child research, but it is applicable to Track & Field skills in that novice athletes move from simple to complex movements in their development. The development of athletes refers to development of the body and the body's systems (a new area of research!). Think of all the systems necessary for even a simple task like running - control of musculature, Central Nervous System (CNS) control, and vestibular system (ear) control for balance. Athletes develop at different rates, and these systems act as rate controllers! An example would be that some infants walk at nine months and others at sixteen months; there are different rates of system development. This is vital to understand as a coach, because it is not just that they (infants or young athletes) are not capable of acting, but that their body systems may not be developed enough for certain skills to function at certain levels.

#### Theoretical Basis of Skill Development -

In development of skill levels, initially the understanding of the specific event and its skill demands is critical; as increased development occurs this is less important. That does not mean, however, that training and skill development should be focused on the specific demands of an event when youth are just beginning to learn about Track & Field. Researchers understand the nature of populations and their actions to be - on a theoretical level - that familiarity with many skills is much better for general long term skill development than getting familiar with only one skill - especially with young athletes!

Developmentally, youth have more neuro-plasticity

than later (this is the same with language). From a longitudinal study in Belgium, results showed that those identified early and tracked through rigid specialization did not develop into high skill level athletes later! Another important related issue is the need to keep young athletes involved in Track & Field. Enjoyment and a general understanding of the sport is key in retaining participation from youth at later age levels, when more developed skills can be realized with more developed systems. It is clear from studies and simple observation that the dropout rate in Track & Field and any sport is directly related to the level of fun! The more fun - the more athletes continue!

#### Practical Applications of Skill Development -

Coaches should encourage fun and basic development by utilizing a variety of running, jumping, and throwing exercises and games of a general and broad type. In terms of strength and jumping skills, athletes should use their own body weight for activities. Heavy weights and loaded jumping are detrimental to safe structural growth and development. At the end of the long bones are sensitive growth plates; if these are damaged during development, growth and development, as well as normal bone maturity, may be retarded.

In this respect, Body Scaling for events is also critical. This means matching implements for the size of athletes, such as lighter shots and discs for younger athletes, and lower hurdlers at closer distances appropriate to athletes' sizes. Be creative and adjust and gradually increase sizes and distance to allow for development. This will also make it easier to avoid injury and discouragement. Coaches should key on development of the body's systems for coordinated, integrated action - not all athletes can be lumped together, but the challenge is to make it fair and balanced for all while retaining basic features to allow for development.

#### MOTOR LEARNING

All body systems are developed and integrated into what we call "ability." Take the best looking form athlete; he or she still must learn to acquire new skills to go to the next level of refinement. Throws, jumps and hurdles are very skills oriented - so how do athletes come to acquire a skill? The answer lies in Motor Learning. Motor Learning is defined as, "a relatively permanent change in motor behavior as a result of practice or experience." This understanding of motor learning has been around for over a century, but it still resides mainly in academia and has not filtered much into the coaching community.

What factors allow you to teach an athlete to acquire a skill well? There are some important research-based ideas which comprise motor learning, including the theory of Stages of Learning (Fitts, 1964). There are three stages of learning in acquiring a new skill, and coaches must recognize what stage an athlete has achieved when constructing skill acquisition training.

#### Stages of Learning -

1. The Cognitive Level - The athlete is thinking about what has to be done when executing the skill, and the skill is characterized by very rigid, mechanical movement.
2. The Associative Level - In this level, the skill is less rigid and characterized by better integration of movement.
3. The Autonomous Level - The skill is virtually automatic at this stage, without thought or rigidity, and movement is fully integrated.

Thus, one way to look at the goal of skill acquisition is to think less!

Coaches can easily recognize these stages, but how can one influence them? One important factor is Practice Organization: the means by which one can facilitate this acquisition by the athlete.

#### Practice Organization -

Blocked practice vs. random practice produce different effects for skill acquisition and should be understood by coaches. Blocked practice means that you spend a certain block of time to practice Skill "A" for say, 100 times, skill "B" for 100 times, etc. Random practice means doing a few repetitions of Skill "A", then a few of "B", then "C", then "A", etc. (varied circuits are an example of this - ed. note). When coaches randomize it, athletes retain the skill in a much better way! In theory, repetition of blocked skill takes over and cognitively the feedback is not as effective; to vary the skills in random fashion requires more cognitive and neuro-physiological feedback. Here is the most difficult part: even though the skill often looks better at the time of blocked practice, it is not learned as effectively or retained at that level for as long as it would through random practice (Shea and Morgan, 1979).

#### Part - Whole Approach -

There is a great deal of debate by coaches on whether to utilize a Whole skill approach to teaching skill acquisition, a Part method, or a combination of the two. Coaches must use their judgement for what is best. The throws and vault

may be able to be broken down at times, but only with the understanding that full integration must be the eventual goal. In this respect, the Whole - Part - Whole method may work best. Coaches must remember an important rule of skill acquisition: The Specificity of Learning hypothesis states that one needs to practice under exact conditions of what must be done, so part learning may not be as pertinent to skill development! This is now being more rigorously tested in labs and field studies.

#### Feedback -

Feedback is information! Feedback is what are one gives back to athletes in terms of information, both during and after practice or competitions. This is the biggest travesty of the Motor Behavior field, when there is no information given to coaches to give back to athletes. What will coaches give them then! Feedback is very well researched in motor learning, but this is one area that has not come back to coaches.

There are many questions that are vital for coaches dealing with skill development. One obvious one is whether instant feedback will facilitate the learning of a skill? Intuitively one might say yes, but it is not that simple. How often should a coach give information? Research suggests that feedback on every trial is not as beneficial as feedback every four to five times (Schmidt, 1988)! The notion that more is better is not shown to be correct in lab skills. The reason is that athletes become dependent on information from coaches rather than relying on what they themselves are doing. Not only do they fail to learn their own bodies and intuition, but they become dependent on coaching feedback and cannot do it without it during competitions, when it may not be available!

How much information is necessary is another good question. The answer depends on the individual athlete, their understanding of the event, and avoidance of information overload. The biggest problem with feedback is that coaches have a hard time keeping their mouths shut! Human beings cannot interpret a large volume of information in a short period of time! With respect to this, simple cues are useful. However, when one focuses on one particular aspect, one can lose sight of other aspects of skill integration. The degree of feedback and use of specific or general cues becomes a subjective thing

What kind of information is useful? This question cuts to the crux of coaching! There are two kinds of information: qualitative and quantitative.

Qualitative: This is descriptive feedback on the nature of the quality in the skill; even general qualitative feedback can be good. This type of feedback is related to:

- movement characteristics
- form
- fluidity
- smoothness
- efficiency

This feedback can differ from the coaches meaning to the athletes understanding, and from athlete to athlete, so be aware.

Quantitative: This is numeric or measurable or positional information of a specific or general nature. It relates to:

- force application - amount and direction
- linear and angular acceleration
- linear and angular velocity (not often available with any precision)
- angle of takeoff
- projection angles & incidence, etc.

It is also important to give quantitative feedback in simple lingo for most athletes; a coach should avoid using information such as, "your angular acceleration was 10 radians per second squared!"

How one puts all this together - the integration of feedback - is the key. This takes coaching to the next level! The ability to change athletes' motor behavior is a result of good integration of feedback, both qualitative to quantitative and quantitative to qualitative. How to translate this to the athlete is important so it is made meaningful in coaching situations.

#### MOTOR CONTROL

How does a coach deal with high level, skilled athletes who the coach wants to acquire even greater skill levels? This is done through Motor Control. Motor Control is defined as, "the mechanisms that give rise to coordination." This area has been researched as far back as the ancient Greeks. In modern times it has been limited in research to clinical populations. There are several factors in motor control, neuro-physiological and otherwise. Three areas that influence control and coordinative action are:

- Degrees of Freedom
- Freeing and Freezing
- Regulatory and Non-Regulatory Factors

1. Degrees of Freedom - Whenever one moves, every joint in the body has certain planes about which they can move, for example shoulder variations in several planes. Degrees of freedom are defined as, "the number of planes about which any joint can move." This is vital to any understanding of coordinated movement. An athlete must limit degrees with respect to some highly coordinated skills. Bernstein asked how does one control the body when there are so many degrees of freedom for every joint? The answer comes with the concept of Freeing and Freezing Degrees of Freedom.

2. Freeing Degrees of Freedom - If motion is desired in the sagittal plane, an athlete must free the joint to allow movement in the sagittal plane, but freeze the other planes of movement of that joint! This incorporates the principles of relaxation and tension in musculature - agonist and antagonist muscle groups. As an example, one can view a comparison of the form of different sprinters to look for those who successfully free and freeze degrees of freedom of joints by viewing stability of posture and the limbs! Coaches should look at pictures in the future from this point of view and make a determination of how successful freeing and freezing is in their athletes when they move!

3. Regulatory Factors - These can be defined as, "the physical factors that have a direct bearing on the physical performance of a skill." (Gentile, 1972) For example, arm carriage has a direct bearing in most events, as does the angle of the hip plane for posture in sprints, jumps and throws! Some major regulatory factors are:

- initiation of movement at start position
- angle of release / takeoff
- approach velocity / arm velocity in throws
- posture or position at critical phases of event

What are the regulatory factors that govern an event and how are they best enhanced? That is the coaches' question and what coaches need to know! Coaches should know the technical aspects of their event, but should think of it in these terms of Motor Control, too.

4. Non-Regulatory Factors! As the performance level gets higher and higher, changes in regulatory factors will become very discreet, minute, and make tiny differences in performances, but non-regulatory factors need to be controlled, too. These are defined as, "factors outside of the physical performance which have an effect on performance!" (Gentile, 1972) For example, an athlete is ready, understands everything about the event and is

prepared at the highest level. Everything is under control and then... IT HAPPENS! The weather is terrible, the crowd noise is distracting, the equipment fails or is different, the time schedule is changed at the last minute: all of these are factors that can affect performance. Even situational factors like fouls in jumps and throws or a hurdle flying into the lane affect performance in a non-regulatory way (they cannot be controlled!). Coaches must ask how specific non-regulatory factors affect performance parameters and avoid a sports psychology solution only. While all looks good for a long jumper, the velocity is down and foot placement is behind board, so what does a coach do to help an athlete before this situation arises, whether this is a regulatory problem with approach velocity or a non-regulatory problem with the track surface or a head wind.

#### Practical Applications of Motor Control -

Determine the effectiveness of drills in promoting coordination patterns seen in events (with non-regulatory factors built in to practice situations). Coaches must evaluate regulatory stimuli in practice and competitions, when working on skill development, and should use video and still frames to help with analysis (be careful with stills - they can be misleading unless the whole sequence is evaluated). Athletes also need to receive non-regulatory stimuli in practice sessions. This can be done by creating or utilizing non-regulatory situations such as different pit placement, practice in wet conditions, practice at different times of the day, approaches into the wind, hurdle runs and relay handoffs with other athletes in surrounding lanes, etc.

Vision and Kinesthesia are important aspects to learn how to control movements. Vision is obvious, but kinesthesia is more subtle, and means how athletes feel internally when performing a skill or movement. Vision and spatial relationships are closely related, and kinesthesia includes temporal relationships as well as directional feedback from the athlete's own body. "That did not feel right," is a statement that coaches need to deal with from athletes! An example of this application to skill development would be to have hurdlers perform standing hurdle drills with their eyes closed to focus on kinesthesia; in other words, get them to feel the movements.

#### Conclusion

Coaches must be equipped educationally and intellectually to deal with these issues of motor behavior and development, and coaches and scientists must be able to ask each other for and exchange information with ease in

order to enhance our understanding of motor behavior. This is what will allow coaches and athletes to be more effective in their development.

### Coaching Sprinting

Leroy Burrell  
The University of Houston

#### I. Introduction

A. Sprinting is defined as the ability to run at maximal or near maximal speed for short periods of time.

B. Sprinting is the product of three factors

1. Stride frequency
2. Stride length
3. Anaerobic endurance

C. The primary areas of coaching concern

1. Running mechanics and proper running technique
2. Running training
3. Flexibility
4. Strength/Power training
5. Practice set up
6. Competition strategy/Racing

#### II. Factors Which Determine Sprinting Ability

A. Stride frequency

1. Limited to the physiology of the athlete
2. Factors which effect frequency

1. Leg Length
2. Overstriding

B. Stride Length

1. Proper technique is required to reach optimal stride length
2. Flexibility and strength enhance stride frequency
- C. Anaerobic endurance-the ability to sustain maximal effort

#### III. Running Technique And Running Mechanics

A. Running technique

1. Driving out
2. Forward lean
3. Head alignment

B. Running mechanics

1. Front leg swing
  - a. Lower leg should not extend behind the body
  - b. Foot should be tucked under the body on the forward swing
  - c. The knee should lead during the forward motion of the leg
  - d. After the knee comes through, the knee joint opens then the foot starts to drop
  - e. The toe should be in at least a neutral position to prepare

for the foot strike

## 2. Foot strike

a. The foot should be slightly prone so as to cause a spring action upon contact with the ground

b. The foot should strike under the body's center of mass

c. The athlete should land on the ball of the foot

d. The athlete should experience a heel strike to start the rebound process

## 3. Back leg push

a. Characteristics

1. Stretch reflex action as a result of the foot strike

2. The foot leaves the ground with the leg extended slightly behind the center of gravity

3. Upon leaving the ground the hamstring flexes bring the lower leg in a tuck position under the body

4. This action is followed by leg swing forward

b. The different looks depending upon the phase of the race

1. Drive phase-distinguished by a powerful down and back push of the ground to propel the body forward

2. Acceleration phase-distinguished by backwards push but you begin to see a little bit of bouncing

3. Maximum speed/maintenance phase-distinguished by a bit more spring of the ground

(a) A result of a stretch reflex action

(b) Helps to maintain speed and minimize deceleration

## 4. Arm Action

A. Arm should swing from the shoulders

B. On the forward swing elbow joint should close

C. On the back swing elbow joint should open slightly

## IV. Flexibility

A. Should be a part of the warm up and warm down

B. Should be done in a slow static manner so as to not cause injury

C. Should be done with the individual athletes needs taken into consideration

## V. Running Training

A. The best way to learn to run fast is to run fast

B. Training program should be well rounded

### 1. Fall

a. Monday aerobic and weight session

b. Tuesday technique session and resistance session

c. Wednesday resistance session I. E. stadiums polymers

d. Thursday aerobic or recovery and weight session

e. Friday start technique and weight session

f. Saturday sprint technique session

### 2. Spring

a. Monday aerobic session weight session

b. Tuesday start techniques session

c. Wednesday sprint technique session

d. Thursday start technique day weight session

e. Friday travel rest/recovery day

f. Saturday competition day

## V. Strength And Power Training

### A. Strength Training

1. Strength training for sprinters should be activity specific

a. Should work the frequently used muscles and motions

b. Should work on the large muscle groups

c. Should not be designed to develop muscle mass not muscle density

d. Should be designed to help to develop balance between muscle systems

e. Should be done in an explosive manner

### 2. Types of lifts

a. Olympic lifts-should focus on these lifts

1. Power clean

2. Snatch

3. Clean and Jerk

4. Squat/jump squat

b. Body sculpting lifts-use these to a lesser extent

1. Bench press

2. Arm curls

3. Leg extensions

4. Hamstring curls

5. Hip flexor exercises

### B. Power training

1. Used to develop event specific motions

a. Program must be designed to supplement running and strength training program

b. Must be diverse so as not to over stress or over work the muscles, tendons and bones

1. Types of power training exercises

a. Plyometrics

1. Bounding

2. Boxes

3. Hurdle hops

d. Depth jumps

2. Resistance exercises

a. Hill running

b. Stadium stair climbs

c. Sled/tire pulls

d. Resisted running/push running

e. Running with a weight vest

f. Resistance bounding

## VI. Practice set up

### A. Conditioning phase

1. Characterization of this period

a. 2-4 weeks duration of general conditioning

b. This period is lean and adapt to lifting and running

c. Time to get in shape to train

## 2. Typical week of training

### Day / Workout

Mon. One mile run

Lift-3x10 Power Clean

Bench press

Squat

Standing dbl. arm curls

Tue. 800,600,400m or 2x800 4x100

600,500,400m or 2x600 4x100

Wed. Lift-3x10 Bench press

Leg curl/leg extension

Dumb bell raises

Thur. 15-30 min run

Fri. (same as Monday)

Sat. 10x100m strides or 6x150m run

### B. Anatomical adaptation

1. Characterization of this period

a. 4-6 weeks of training used to start the adaptation to more event specific training

b. Long period of hard to moderate training in various areas of development

2. Typical week of training

Day Workout Mon. 600,500,400m-2x600 4x100

500,400,300m-2x500 4x100

Tue. Lift-3x8-10 Power Clean

Bench press

Squat

Standing dbl. arm curls

Wed. Drills, Stadiums, Boxes, Plyometrics, hurdle hops

Thur. 15-30min run

Fri. Lift-3x8-10 Hanging Clean

Bench press

Jump Squat

3 way Dumbbell raises

Sat. 10x100m or 6x150 or 6x200

### C. Pre-Early season training

1. Characterization of this period

a. This period is a transitional period where you are preparing for Competition

b. The athlete is allowed time to rest

2. Typical week of training

Day Workout

Mon 500,400,300m or 2x500 4x100

400,300,200m-2x400 4x100

Tue Starts

Lift-3x6-8 Power Clean

Bench press  
Squat  
Standing dbl. arm curls  
Wed Drills, Stadiums, Boxes, Plyometrics, hurdle hops  
Thur Starts  
Lift 3x4-6 Hanging Clean  
Bench press  
Jump Squat  
3 way Dumbbell raises  
Fri Rest or 10x100 or 6x150  
D. Competitive phase  
1. Characterization of this phase  
a. Training emphasis should be quality not quantity  
b. Everything should be done fast but relaxed  
2. Typical week of training  
Day Workout  
Mon 400,300,200m-2x400 4x100  
300,200,100m-2x300 4x 100  
Tue Starts, Relay handoffs  
Lift-3x4-6 Power Clean  
Bench press  
Squat  
3x10 standing dbl. arm curls  
Wed 10x100m or 90,80,70,60 m, Boxes  
Thur Starts  
Lift-6,4,2 Hanging Clean  
Bench press  
Jump Squat  
3 way Dumbbell raises  
Fri Rest  
E. Ultra competitive phase  
1. Characteristic of this phase  
a. All work is quality  
b. Athlete should focus on preparing for competition  
2. Typical week of training  
Day Workout  
Mon 300,200,100m-2x300 4x 100  
300, 4x100  
Tue Starts  
Wed 90,80,70,60 m, Boxes  
Thur Starts or rest  
Fri Rest  
VII. Competition/Racing  
A. Block setting  
1. Front leg approximately 90 Degrees  
2. Back leg approximately 120 Degrees  
B. The race  
1. The start phase  
2. Acceleration phase

3. The maximum speed phase  
4. Maintenance phase  
C. Post Race Evaluation

### Entrenando Velocidad

Leroy Burrell - Universidad de Houston

#### I Introducción

a. Velocidad se define como la habilidad para correr al máximo o casi al máximo en el menor tiempo posible  
b. La velocidad es el producto de 3 factores

1. frecuencia del paso

2. largo del paso

3. resistencia Anaeróbica

a. Las áreas de preocupación en el entrenamiento

1. mecánica al correr y técnica apropiada

2. entrenamiento para correr

3. flexibilidad

4. entrenamiento de fuerza / pesas

5. practicas

6. estrategia para Las competencias

II Factores que determinan Las habilidad para ser velocista

a. Frecuencia del paso

1. depende de la fisiología del atleta

2. factores que afectan la frecuencia

a. largo de Las piernas

b. "alargando"

c. Largo del paso

1. La técnica apropiada es necesaria para conseguir el largo óptimo del paso.

2. La flexibilidad y la fuerza aumentan la frecuencia del paso.

a. Resistencia Anaeróbica

La habilidad para mantener el esfuerzo.

III. Técnica y mecánica al correr

a. Técnica

1. Salida

2. Inclinación

3. Alineación de la cabeza

a. Mecánica

1. Movimiento de péndulo de la pierna delantera

a) La pierna baja no debe extenderse detrás del cuerpo.

b) El pie debe estar bajo el cuerpo en el movimiento de péndulo hacia al frente.

c) La rodilla debe ser conducida por la pierna durante el movimiento hacia adelante de la misma.

d) Después de la salida de la rodilla se abre y el pie comienza a bajar.

e) La bola del pie debe estar en por lo menos una posición neutral para prepararse para el golpe del pie.

1. Golpe del paso

a) El pie debe estar un poco inclinado para que cause la acción de salto(rebote) cuando tenga el contacto con la pista.

b) El pie debe hacer contacto bajo el centro de gravedad del cuerpo.

c) El atleta debe caer en la planta del pie.

d) El atleta debe sentir para comenzar el proceso.

1. Empuje de la pierna trasera

a. Características

1. La acción de estirarse como reflejo y como resultado del golpe del paso.

2. El pie sale de la pista con la pierna extendida un poco detrás del centro de gravedad.

3. Cuando sale del pavimento el bíceps femoral.

4. Esta acción es seguida por un movimiento de la pierna hacia adelante.

a. Cómo se ve depende de la fase de la carrera.

1. Salida: se distingue por el empuje hacia abajo y hacia atrás para propulsar el cuerpo hacia adelante.

2. Aceleración: se distingue con el empuje hacia atrás pero ya se ve un poquito de salto.

3. Velocidad máxima/mantenimiento se distingue por a) Como resultado del reflejo de estiramiento

b) Mantiene la velocidad y minimiza la deceleración.

1. Acción del brazo

a) El brazo se debe mover desde el hombro.

b) El codo se debe cerrar cuando el brazo está hacia adelante.

c) El codo se debe abrir un poco cuando el brazo está detrás.

I. Flexibilidad

A. Debe ser parte del calentamiento y del enfriamiento.

B. Debe hacerse estáticamente y despacio para evitar lesiones.

C. Deben hacerse considerando Las necesidades individuales de cada atleta.

I. Entrenamiento

A. La mejor manera de correr rápido es corriendo rápido.

B. El programa de entrenamiento debe ser completo.

1. Otoño

a. Lunes: aeróbico y pesas.

b. Martes: técnica y resistencia.

c. Miércoles: resistencia (por ejemplo "stadium polymers")

d. Jueves: aeróbico y pesas.

e. Viernes: salidas y pesas.

f. Sábado: técnica de velocidad.

1. Primavera

a. Lunes: aeróbico y pesas.

b. Martes: salidas

c. Miércoles: técnica de velocidad.

d. Jueves: salidas y pesas.

e. Viernes: viajes/descanso

f. Sábado: competencia

I. Entrenamiento de fuerza/pesas

A. Fuerza/pesas

1. El entrenamiento de pesas para los velocistas debe ser para una actividad específica.

a. Debe trabajar con los músculos que se usan con más frecuencia y con los movimientos.

b. Debe trabajar con los grupos grandes de músculos.

c. No debe diseñarse para desarrollar la masa del músculo ni la densidad del mismo.

d. Debe diseñarse para ayudar a desarrollar un balance en el sistema muscular.

e. Debe hacerse en forma explosiva.

1. Tipos de levantamientos.

a. Levantamiento olímpico: deben enfocar en los siguientes levantamientos.

1. "Power clean"

2. "Snach"

3. "Clean and Jerk"

4. "Squat/Jump Squat"

a. "Body sculpting lifts": usarlos mínimamente.

1. "Bench press"

2. "Arm curls"

3. "Leg extensions"

4. "Hamstring curls"

5. "Hip flexor exercises"

A. Entrenamiento de fuerza

1. Se usa para desarrollar movimientos para eventos específicos.

a. El programa debe de estar diseñado para complementar el entrenamiento de velocidad y de pesas.

b. Debe ser diversificado para no sobreentrenar o trabajar con los músculos, tendones y huesos.

1. Tipos de ejercicios de entrenamiento de fuerza.

a. Poliometría

1. "Bounding"

2. "Boxes"

3. "Hurdle hopes"- salto de vallas

4. "Depth jumps"

5. Ejercicios de resistencia

a. "Hill running" -correr en subidas o pendientes

b. "Stadium stair climbs" - subir escalones

c. " Sled/tire pulls"

d. "Resisted running/ push runing"

e. "Running with a weight vest"

f. "Resistance bounding"

I. Prácticas

A. Acondicionamiento

1. Características de este período

a. 2-3 semanas de acondicionamiento general.

b. Este período es para aprender y adaptarse al levantamiento de pesas y a correr.

c. Tiempo para ponerse en forma para poder comenzar a entrenar.

1. Semana típica de entrenamiento

Día Trabajo

Lunes Correr una milla

Pesas 3x10 "Power clean"

"Bench press""Squat""Standing double""Arm curls"

Martes 800,600,400m o 2x800,4x100

600,500,400m o 2x600,4x100

MiércolesPesas 3x10 "Bench press"

"Leg curl/leg extension""Dumb bell raises"

Jueves Carrera 15-30 min

Viernes(lo mismo que el lunes)

Sábado10x100m "strides" o carrera 6x150m

A. Adaptación anatómica

1. Características de este período a. 4-6 semanas de

entrenamiento usadas para comenzar la adaptación a un entrenamiento para un evento específico.

b. Período largo de un entrenamiento fuerte o moderado en varias áreas de desarrollo.

**Entrenamiento Funcional de Fuerza para Pista y Campo** Larry Judge, Ph.D., C.S.C.S.

La Espina Dorsal de Cualquier Programa de Pista y Campo

Un programa organizado de práctica y entrenamiento

Fuerza y acondicionamiento es la Clave para el Rendimiento

Muchos deportes están usando los elementos del entrenamiento de pista y campo

Planificación es la Clave

Fallar en planear/ Planificar para fallar

Fuerza y Acondicionamiento es una Disciplina

Las escuelas superiores y las universidades han empleado entrenadores de fuerza

Pista y Campo es Todo Sobre Rendimiento

Hay que estar involucrados en la elaboración del programa de fuerza y acondicionamiento

Diseñando un Programa

Conceptos generales

Fisiología Muscular

El Cuerpo Humano es un Sistema de Palancas

Los músculos proveen la fuerza para mover las palancas

¿Qué es un Músculo?

Una masa de energía

Cuando se activa puede producir movimiento de los huesos alrededor de un eje

Se compone de miles de fibras

La Composición del Músculo

Agua (75%)

Proteínas (20%)

Sales inorgánicas (5%)

Definición de Fuerza

La habilidad para ejercer la fuerza máxima

Definición de Poder

La habilidad de ejercer la fuerza máxima en el menor tiempo posible

Dominio de la fuerza - Necesitada por la resistencia externa

Dominio de la velocidad - Necesitada por la resistencia restringida

Perspectivas de la Fuerza

Fuerza básica "Core"

Fuerza óptima

Fuerza en patrones diagonales rotativos (multiplanos)

Relación a la técnica o la destreza

Prevención de Lesiones

Proporcionalmente entre grupos de musculares opuestos

Mejoramiento de posturas

Joint Integrity	Reclutamiento de Fibras Musculares	Mejoramiento de la propiocepción postural. 3 a 5 ejercicios remediales en una sesión dependiendo del grado de trabajo remedial necesario.
Balance con el grupo muscular	Cada músculo tiene miles de unidades motoras	
Balance con el tipo de contracción	Cada unidad motora envía una señal para contraerse	
Funciones de la Acción Muscular	Factores que contribuyen en la fuerza	Ejercicios Auxiliares-Un ejercicio o ejercicios que promuevan la calidad de los ejercicios de enfoque. 1 o 2 ejercicios auxiliares por sesión.
Movimiento de una parte del cuerpo	Arreglo de fibras musculares	
Resistencia del movimiento de una parte del cuerpo	Activación de células musculares	Ejercicios de enfoque- El ejercicio o ejercicios que son esencialmente absolutos para hacer ejercicios. Usualmente músculos grandes demandan ejercicios de todo el cuerpo. De 2 a 3 en una sesión.
Estabilizar o fijar una parte del cuerpo	Concentración de enzimas en la célula	
Factores en el Aumento de Fuerza	Sensibilidad del órgano del tendón golgi	
Neuromuscular	El índice de fibras rápidas vs. Fibras lentas	Métodos del entrenamiento de fuerza
Muscular	Palanca músculo esquelética	Isométrica Estática/Dinámica Eccéntrica Rápida Lenta
Bioquímico	Coordinación de movimientos	Equivalente Elástica
Estructural	Número de elementos de miofibrilla en células activadas	Entrenamiento de Potencia Máxima (MPT)
Biomecánico	¿Cuanta Fuerza es suficiente?	Entrene movimientos no músculos (Irwin Korr)
Factores Neuromusculares en el Aumento de Fuerza	¿Cuales son los requerimientos de fuerza de tu evento?	"La espina dorsal es el teclado en cual el cerebro toca cuando llama por actividad".
Frecuencia del estímulo	Demanda de fuerza de eventos	El cerebro piensa en términos de movimientos completos, no músculos individuales.
Reclutamiento	Que grupos musculares son utilizados en tu evento?	Cada actividad esta sujeta a modulación refinada y ajuste por retroalimentación.
Activación predecible y en secuencia de las unidades motoras a medida del aumento de la intensidad	Que movimientos son requeridos?	Parámetro de estímulo- El estrés de entrenamiento mínimo necesario para aplicación de fuerza
Adaptación neurológica	Cuál es la dirección de la aplicación de la fuerza?	El entrenamiento es acumulativo y sinérgico.
Factores Musculares para el Aumento de Fuerza	Cuál es el Rango de Movimiento?	Es una acumulación de las demandas ejercidas en todos los sistemas del cuerpo.
Hipertrofia	Definiciones funcionales de la fuerza	-muscular, metabólica, nerviosa, endocrina/hormonal.
Largo de la fibra muscular	Fuerza General: Ejercicios de pesas tradicionales. La velocidad de movimientos es importante.	También es adaptación al efecto sinérgico de la demanda de trabajo en las diferentes cualidades biomotoras.
Arquitectura muscular	Fuerza Especial: Movimiento con resistencia que incorpora la dinámica de las articulaciones de la habilidad. Velocidad del movimiento es importante.	- Entrenadores tienden a enfocarse demasiado en 1 o 2 factores a expensas de otros.
Coordinación intramuscular	Fuerza Específica: Movimiento con resistencia que limita la dinámica de la habilidad.	Respiración Inhalar durante contracción excéntrica Exhalar durante contracción concéntrica. Velocidad de movimiento Lento y controlado
Coordinación intermuscular	Involucra la imitación de movimientos reales con resistencia y asistencia. La velocidad del movimiento es de primera importancia.	
Número de Fibras Musculares	Organización del programa de entrenamiento de la fuerza.	
Este número se establece por 4 o 5 meses	Divida la sesión del entrenamiento de pesas en tres áreas distintas.	
No aumenta	Ejercicios remediales- ejercicios fundamentales diseñados para atender necesidades básicas para la estabilidad de las articulaciones.	
Cross Sectional Area		
Se aumenta con el entrenamiento de resistencia		
Los músculos aumentan en tamaño y fuerza		

Trabajo excéntrico y fases concéntricas Eligiendo la cantidad de peso en el ejercicio	Frecuencia	Los 5 elementos biomotores: Fuerza Rapidez Coordinación Resistencia Flexibilidad
Inicie con un peso que pueda controlar por 10 repeticiones	Numero de sesiones de entrenamientos por semana	
Técnica deberá ser enfatizada en un principio.	2-3 veces por semana	
Selección de ejercicios	Clasificación metabólica de eventos de atletismo	Actividades de entrenamiento
Grupos musculares grandes deberán trabajarse primero	Conocimiento de los sistemas de energía es de la mas alta importancia	Considerando los 5 elementos biomotores
Movimientos multi-articulares	-Esta es la clave para diseñar un problema exitoso	Fuerza Pesas Saltos Pelota medicinal Ejercicios peso corporal Lanzamientos Rapidez Pesas Velocidad Coordinación Pesas Ejercicios de agilidad Movilidad con vallas Trabajo técnico Resistencia Pesas Entrenamientos variados de carrera Entrenamiento en circuito Flexibilidad Pesas Ejercicios de rango de movimiento Rutinas de estiramientos
Lleve un registro	¿Cuales son los sistemas de energia?	
Importante para análisis posterior	ATP-CP corta duración (0-15 segundos) tramos cortos, eventos de saltos, lanzamientos.	
Carga progresiva	Duración mediana de Glycolisis (15 segundos a 2 minutos) 400m., 800m.	
Gradual y sistémica.	Sistema aeróbico-larga duración ( 2 min. y arriba) 1500m y arriba.	
Descanso y recuperación	Clasificación Neuro-muscular de eventos de atletismo	
Importante como la carga.	ATP-CP corta duración: tramos cortos, saltos, lanzamientos (fibra rápida)	
Intensidad	Duración mediana de glycolisis: 400m. 800m.(combinación)	
El promedio o cantidad absoluta de peso por repetición.	Sistema aeróbico de larga duración: 1500m.y arriba (fibra lenta)	El programa debe enfocarse en el sistema adecuado de energía
-porcentaje máximo de repeticiones	Clasificación Biomecánica de eventos de atletismo	Si usted entrena corredores de fondo - usted deberá determinar quienes son ellos: 1 500m o 10,000m.
Volumen	Grupo ciclico: acción repetida - corriendo o caminando	Cada plan anual debería tener diferente tema
Cantidad de trabajo realizado durante el ejercicio de levantamiento.	Grupo aciclico: Habilidades motoras - Lanzamientos	Este sera específico a cada individuo en un plan de largo plazo
Carga x numero de series x numero de repeticiones	Combinación aciclica: movimiento ciclico seguido por uno aciclico - saltar.	Ejercicios y cargas pueden categorizarse dentro de tres áreas.
Numero de series	Diseño de programas de entrenamiento para atletismo	Ejercicios Generales
3-6	Una vez que el entrenador haya identificado los componentes fisiológicos dominantes en determinado evento.	Ej. Específicos
No cuentan las series de calentamiento	- Puede escoger ejercicios, volúmenes, e intensidades que puedan mejorar la eficiencia de cada componente.	Ej. Específicos de competencia
Continuidad de repeticiones	Teoría de Delormes	Entrenamiento general
La carga es lo mas importante	100% 50% 100%	Mejora capacidad de trabajo no específico de un atleta.
6 repeticiones- ideal para fuerza/potencia	1 rep 8 rep 20+ rep	Construye las bases de fuerza, potencia, y movilidad
15-20 repeticiones-resistencia	Entrenamiento por temas. Centralizado alrededor de 5 elementos biomotores.	Sea específico
3-5 reps- fuerza máxima		Programa de pre - temporada
1-3 repeticiones - peaking		Carreras- 100-200m. at 80%, índice de descanso a trabajo 3 al
Periodos de descanso		
Fuerza/Potencia: 3-5 minutos entre series		
Resistencia: 30 segundos a 1 minuto entre series		

Pliométricos - planos, saltos "tuck", cajones arriba y abajo 30 trabajo-90 segundos descanso	2 - H L M H L M	Ejercicios de acondicionamiento
Levantamientos: 8 ejercicios, 12 rep en ejercicios de fuerza	3 - V H V L L M L M L	Circuito de fuerza general
5-6 repeticiones para levantamientos olímpicos.	4 - L V L M L L M L	Pelota medicinal- general/específico
Pelota medicinal: Pelota medicinal no específica, lanzamientos sobre la cabeza- pelotas pesadas.	Legenda: (M=mediana, H=alta, L=baja, V= volumen)	Pliometría
Entrenamiento especial	Calidad de la Intensidad	El programa se divide en fases Determinadas por el calendario
Desarrolla características de técnica y acondicionamiento específico para un evento	Porcentaje del esfuerzo máximo	Fase Precompetitiva
Específico a un sistema de energía para el evento es el enfoque.	Intensidad de series y repeticiones	Carreras - 30-100m. a 90%, índice de descanso trabajo 3 a 1
Periodización	Muy pesado 95-100%	Pliometría- Saltos profundidad, cajones, 20m. saltos
Entrenamiento cíclico que manipula variables agudas y crónicas.	Pesado 85-90% Medio-pesado 80-85% Medio 75-80% Medio-ligero 70-75% Ligero 65-70% Muy ligero 60-65%	Levantamientos: 4 ejerc. 6 reps. En ejerc. de fuerza -3-5reps. para Lev. Olímpicos
Duración de la periodización	Calidad de la intensidad Int. Peso Carrera Lanz. Saltos	Pelota Medicinal: Específico al evento, sobre la cabeza lanz de 3 pasos- para jabalina pelotas pesadas
Sesión - plan diario	Alta 90% Vel. Max Salto profundidad Med. 80% Vel. 90% saltos "C" Bajo 70% Trancos 85% Vel	Entrenamiento específico en competencias
Microciclo- Plan semanal	Facil 60% trote 80% Trancos	Técnica y acondicionamiento son especialmente practicadas
Mesociclo - Plan Mensual	Estimado de repeticiones máximas	Volumen es bajo y la intensidad es alta
Macrociclo - Plan por temporada	Entrenamientos basados en porcentajes	Practicar situaciones de competencia
Monociclo - Plan anual	Sistema de porcentaje Entrenamiento 1 2	Llegar al pico en la fase competitiva
Variables Agudas	Semana 1 75%(5) 90%(3) 2 80%(5) 95%(2) 3 75%(5) 100%(1)	Carreras - 10-30m. desde los blocks.
Selección de ejercicios	Levantamientos primarios Pecho Sentadilla Clin Jerk	Pliometría- Saltos profundidad, cajones por altura
Orden de ejercicios	Levantamientos secundarios Arranque Jalones altos Inclinado Press militar Levantamientos auxiliares Mariposa Desplantes Subidas a cajón Dominas	Levantamientos: 2-3 reps en ejercicios de fuerza
Resistencia	Abdominales Hiper-extension de espalda	De 1-3 reps. para Lev. Olímpicos
Duración del descanso		Pelota med. Específico al evento, una vez a la semana para velocidad
Numero de series		Factores que influyen los efectos del entrenamiento Intensidad Frecuencia y duración Especificidad Limitaciones genéticas Principio de la sobrecarga
Variables Crónicas		Resistencia debe aumentar al irse dando la adaptación
Pre-temporada 10-12 reps.		Ejemplo de programa
Precompetitiva 4-6 reps.		3 días a la semana
Pico 3-2 reps		Lunes Abdominales 3x30 Clean Pecho
Descanso activo		
Tabla de periodización		
Semana L M M J V S		
1 - M H M H M M L M		

Sentadillas

Miercoles Abdominales 3x25  
Arranque  
Inclinado  
Despalnte  
Press militar

Viernes  
Abdominales  
Clean  
Pecho  
Sentadillas

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Richie Mercado  
NACACTFCA  
P.O. Box 56284  
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Or, email the following information to:  
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Membership Fee is \$20.00 US annually  
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