techniques

for Track & Field and Cross Country

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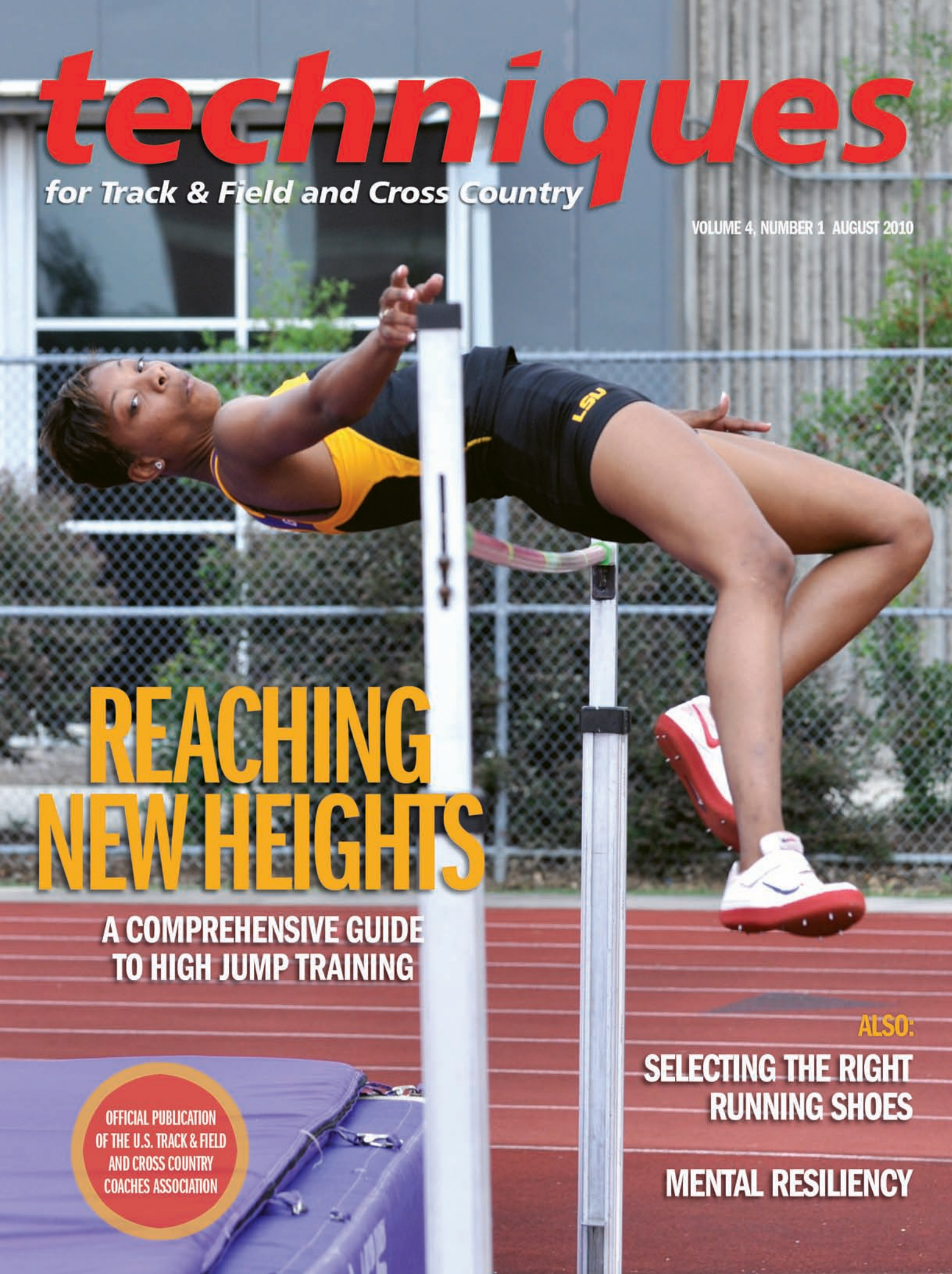

REACHING NEW HEIGHTS

A COMPREHENSIVE GUIDE TO HIGH JUMP TRAINING

ALSO:

SELECTING THE RIGHT RUNNING SHOES

MENTAL RESILIENCY

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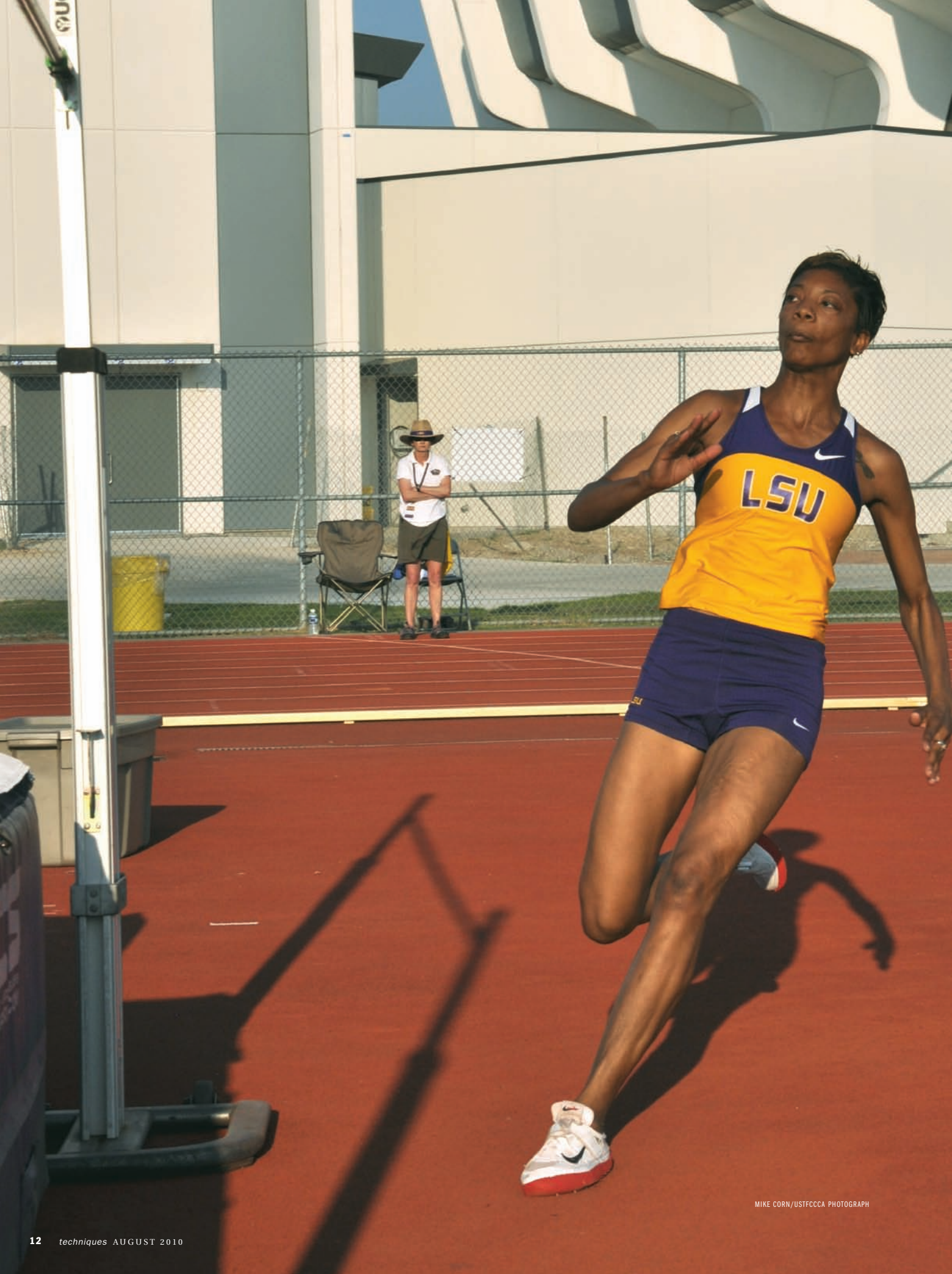

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HIGH JUMP *from* A-Z

BY TODD LANE

The training for all jump athletes (high, long, triple jump and pole vault) is similar across all groups with slight alterations based on event specifics. The goal of physical training is always to create better athletes, who are in turn, better jumpers. Technical training has similarities across event groups as well, with slight alterations also based on event specifics. In this article, we will take a more detailed look at how this is achieved for the high jump.

PHYSICAL TRAINING

The goal of any athlete's physical training plan is to build upon biomotor development and improve these qualities. When evaluating the training needs for any athlete and event group, an evaluation of competition demands should serve as the starting point.

A gross evaluation of the competition demands for all jumping events will reveal the following:

- Competition efforts of each attempt lasting up to 5 seconds at 100% intensity
- Rest intervals of 2-15 minutes between efforts
- 3-15 total jumping efforts
- Coupling times of .110 to .180 at take-off
- Speeds in the approach of 6.5 meters per second to 10.0 meters per second, with specific high jump approach velocities of 7-8 meters per second for males and 6.5-7.5 meters per second for females

Training goals for the jump athletes are geared toward these end result parameters. Biomotor training to work toward these results should focus on the speed, strength and coordination (technical) qualities. The improvement in these qualities is the end goal, but all biomotor training must be sequenced and progressed in training. A lack of proper progression and sequencing is often a common error that leaves the jumper injured or failing to reach optimal gains in a biomotor area.

RUN TRAINING

SPEED TRAINING AND PROGRESSIONS

A high jumper's ability to run technically correct from the beginning of the run allows greater force to be applied during the run. This is an essential precursor to the mechanics required for the jump itself. Training speed and its qualities serves to train and enhance elastic properties, train and improve inter and intra-muscular coordination and enhance rate coding. All contribute to potential improvement in the high jumper's performance.

Acceleration training is a staple of the high jumper's speed training program. The ability to accelerate correctly is the ability to maximize momentum development. Acceleration should demonstrate large horizontal displacements of the center of mass and horizontal force mechanics early in the run and gradually progress to more vertical mechanics. The athletes should feel like they are trying to push their hips a great distance past the support foot; the thighs are moving in a forward and upward direction; and the heel recovery of each step is low to the track. Acceleration in the high jump occurs during the first three steps. The "pushing" nature of acceleration cannot be overstated and is the earliest determinant of the athlete's chance of success or failure at the bar.

Acceleration training should be performed year round and done at a maximum distance of 40 meters. Progressions should start with short incline runs, resisted runs and shorter acceleration runs on the track and gradually move to runs from various start positions such as crouch, rollover and even from starting blocks. This work is performed at maximum effort.

Another aspect of speed training occurs in the form of maximum velocity training. This training serves to develop and improve sprint running mechanics, inter and intra-muscular coordination and improve power output. Some of the key qualities that are desired in maximum velocity sprinting are vertical force application, dorsiflexed foot contacts, large amplitudes of movement and upright postural positions. Maximum velocity type running and qualities are seen in the last five steps of the approach run.

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Maximum velocity sprinting is vertical in its force application. Stadium stair runs are the early training modality used to begin to teach the athlete the vertical nature of maximum velocity running. The interval lengths are kept short to allow for the high intensity nature of the work.

Progressing from stadium runs, the athlete would move to fly in runs on the track. Here the athlete accelerates for 20 meters, to a fast, "flying" run of 20-30 meters with the focus on the mechanics of fast sprinting as mentioned earlier. Up to eight total repetitions of this work could be performed and should be broken into sets. The high quality of the work demands greater rest intervals.

The "pushing" nature of acceleration cannot be overstated and is the earliest determinant of the athlete's chance of success or failure at the bar.

"Ins and outs" runs, a training tool used to model 100-meter races, also benefits the high jumper in training speed. "Ins and outs" runs are performed with a 20-meter acceleration run, followed by a 20-meter upright run as in the fly run, followed immediately by a 10-meter zone of relaxed run with less force application, followed immediately again by a 20-meter upright run as in the fly in run for a total of 70 meters. The elastic qualities of the high jump athlete and the short requirements of event length, dictate that high intensity sprinting not move beyond 70 meters. These are excellent opportunities to teach and reinforce posture as the athlete moves between zones of the run. The tendency will be for the athlete to want to re-accelerate and lean forward to do this. Cueing of vertical pushing qualities and front side mechanics of the run are key points to achieve the desired actions. The approach run itself is considered speed training also. The velocities achieved during the approach run, while not maximal, are optimal velocities. Approach running is high jump specific speed training and can be classified both as speed training and technical training.

STRENGTH TRAINING

For the purposes of this article, the goals of strength training for the high jump athlete are to:

- Produce more force.
- Produce more force in a shorter time period, referred to as power.
- Produce more force utilizing the stretch shortening cycle.

Weight room training activities focus around force and power training. The primary exercises used to train towards more force intensive goals are static lifts such as the squat. Olympic lift movements such as the clean and snatch and ballistic lifts such as jerks, weighted squat jumps and weighted lunge jumps serve to train more power intensive goals.

Training of force and power must be done in relative balance and blend together within the training program. Many strength programs place an overemphasis on high force activities and neglect more power oriented weight room activities until too late into the competition cycle.

The progression of training should see the intensity increasing through the general preparatory phase (GPP) and early special preparatory phase (SPP) with the static lifts. Sets should range from four to six and repetitions from four to eight in the 60-85% intensity range. These ranges work best for developing, and most importantly, making sustained gains in force production. The squat is an excellent static lift and a staple of the preparatory period of training. The depth of the squat varies and should vary throughout the training year from a deep squat to a quarter squat, from double leg to single leg squats and step ups, from eccentric holds at the bottom of the squat to ballistic squat jumps.

Since static squatting has a negative effect on the elastic abilities required of the high jumper during the competition period it is removed from the training inventory during the competition season. Ballistic activities such as squat jumps, lunge jumps and step up jumps replace squatting. The ballistic movements and the maintenance of Olympic lifts are able to sustain strength levels.

Olympic lifts also play a role in force development and most importantly in developing power. Olympic lifts are performed in sets of three to eight with repetitions of two to five in the 60-95% range. Work can be done from the floor, just below the knee and from the thigh at different times of the year with different intensities. As with the static lifts a progression of intensity through the preparatory period allows for adequate development of strength. Speed of movement in Olympic lifting is necessary. Proper teaching to gain effective execution is necessary for Olympic lifting to achieve the desired effect.

Elastic training is the bridging of gained power into

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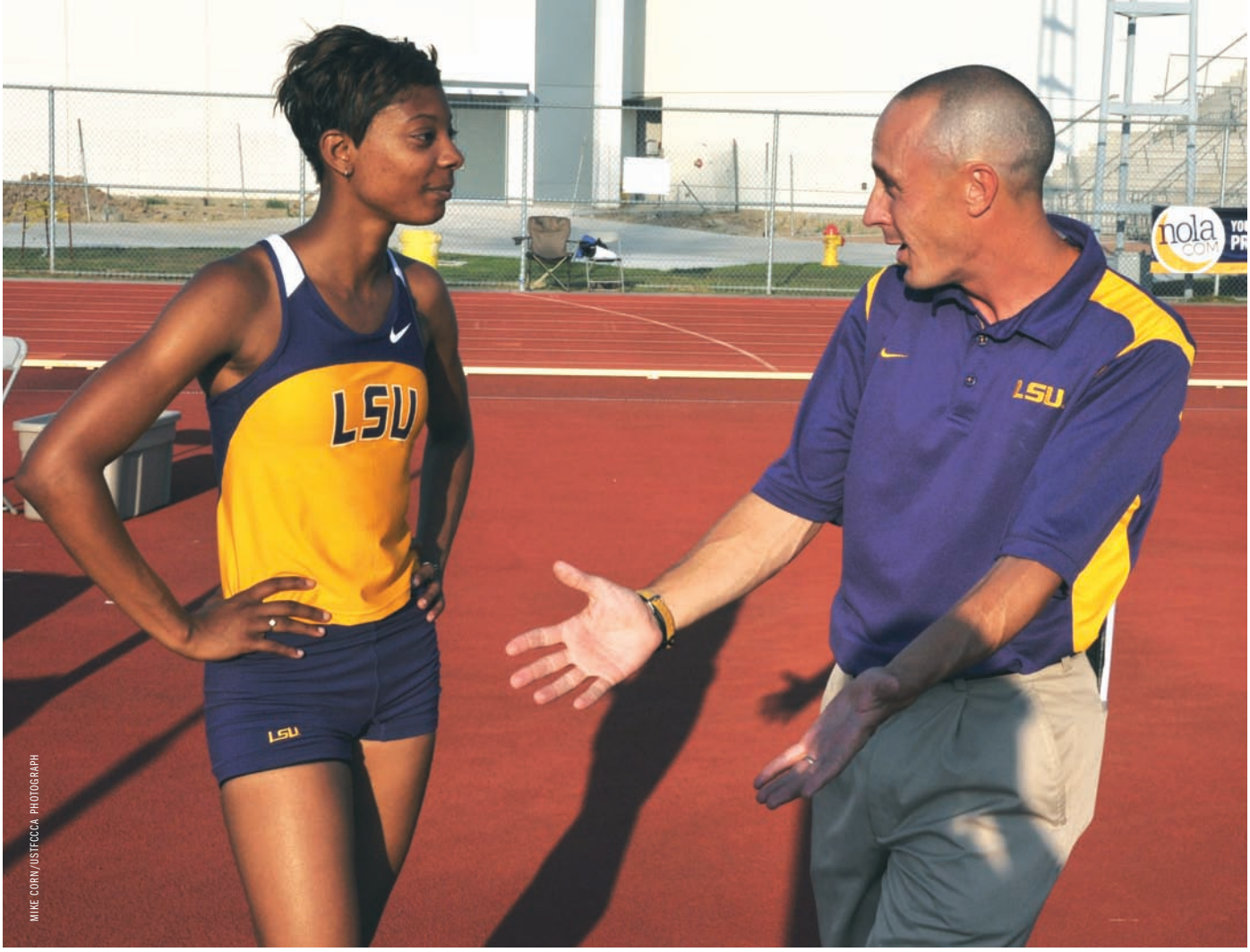

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improving coupling times to the jump events. Elastic training is performed through activities, which involve the use of the stretch shortening cycle. Exercises that are categorized as plyometric in nature are those that are predominately used to improve elastic abilities. The stretch shortening cycle involves an isometric preparation of muscle before contact, an eccentric contraction immediately followed by a concentric contraction. Exercises begin with in-place and remedial activities progressing to more intense activities throughout the year, such as a bounding series and hurdle hops. Attention to posture, isometric preparation, ground contact and coupling times deserve attention and coaching. These aspects also determine the effectiveness of the exercise.

Static strength training must be coordinated with plyometric training. The relationship of the two training modalities is inversely proportional to the intensity and/or volume of each. The volume and intensity of the work in the weight room and plyometric strength training is a relationship that must be managed and balanced carefully.

Another activity used to enhance power training is multiple throw routines. Medicine balls or shots are used and provide excellent power training because unlike the weight room, no deceleration of the implement is required at the end of the activity. Overhead back toss, between the legs forward and a squat chest push are all examples.

In designing strength programs, it is important to consider that too many repeated mesocycles in a row of similar qualities creates a staleness and regression of gains made from previous sessions in those qualities. An alteration of cycles that are more force oriented and those that are more power oriented is an effective way to keep training moving forward in a balanced fashion.

General strength routines and circuits play an important role in developing stamina for the jump athlete, supporting weight room strength routines and endocrine system maintenance. Body weight strength circuits, core strength circuits, weight room circuits and medicine ball routines all fall into this category. These activities are utilized often in each microcycle throughout the entire training year.

THE TECHNICAL MODEL

APPROACH DESIGN

Most approaches will be 10 steps in length, with steps five and six being entry into the curve. In determining the athlete's approach, the coach should start anew each year. The approach run can be designed through the following process:

Have the athlete run 10 steps on a straight with a tempo that is similar to that of a high jump approach. Mark the fifth and 10th step. The athlete should repeat this 10 times.

Have the athlete run straight for five steps then initiate a curve run throughout the next five steps with a small take off action on the 10th step. Allow the athlete to take whatever angle is comfortable in the curve run. Mark the 10th step. The athlete should repeat this 10 times.

Measure the distance from the take off step, out to the perpendicular line of the start mark. Measure back to the start

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mark. The distance back to the start mark should be very close in length to the distance recorded in step one.

Take the measurements gained in step three to the runway.

The take off mark should be placed inside the near take-off standard, approximately an arm's length away from the bar and just inside the near standard. Measure the distance out and then back as measured in step three.

This gives the coach and athlete an approximate start which can be adjusted through practice runs on the apron.

Adjust the start mark based on practice and re-measure utilizing the standard as the measuring start point.

THE APPROACH RUN

Mechanics, as part of the approach, have been identified through acceleration and maximum velocity training as discussed earlier. Approach runs are typically nine to 11 steps; with five of those steps run on the curve.

A 10-step approach would have five steps run on a straight and five steps on the curve. The approach begins with the athlete moving from a standing position into a three-step acceleration. The start of the approach typically begins with a modified rollover start to create proper momentum development. As stated earlier, momentum development is essential for success at bar clearance. A lack of momentum development early in the run is typically compensated for later in the run as the athlete attempts to create it with poor body positioning while attempting to re-accelerate.

At steps four and five, the athlete should be transitioning into mechanics that resemble maximum velocity sprinting. Initiation of the curve begins slightly on step five as the athlete contacts with a slight inward turn of the right foot (for a left-footed high jumper). The following left step (#6) will cross to the mid line of the body. The athlete should apply outward foot pressure in the run through the curve. The outward pressure along with the left foot on the mid line creates an inward lean. A common error is for the athlete to create a lean by bending the torso at the waist. Coaches should observe inward leaning that occurs from the ankles up. The athlete should feel the inward lean is much like the inward lean when riding a bicycle around a corner.

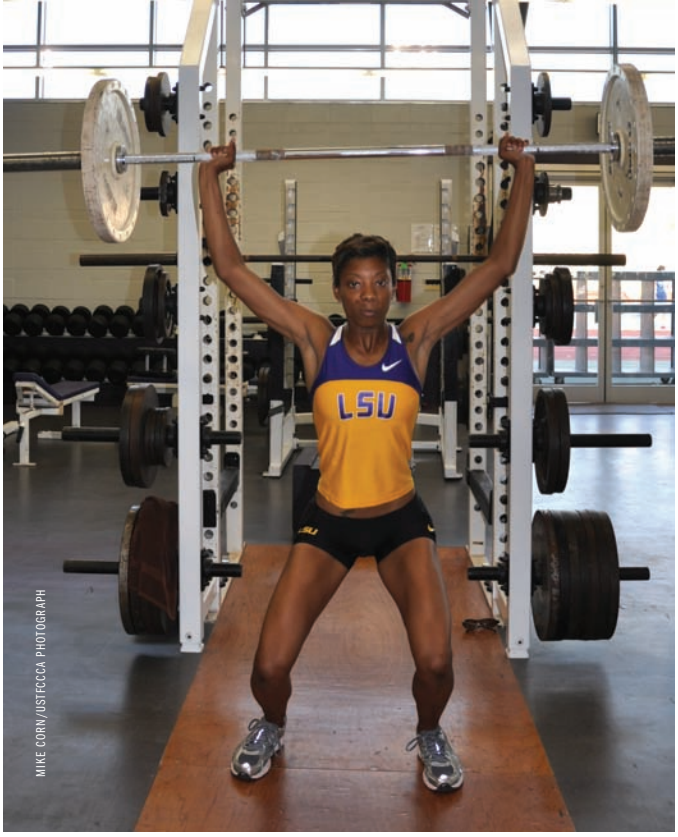
An imaginary curved line can be drawn from the curve initiation point through to the take-off point and into the high jump pit. This is the line that the center of mass will follow through the approach. This line should cross the crossbar in the middle at its lowest point and continue through the pit between the far back and far front corners. The athlete should think of this line as bisecting the body. The hips and shoulders should remain perpendicular to this line throughout the run of the curve.

TAKE-OFF

The penultimate step is the second to last step, utilized to lower the center of mass prior to take-off. The goal is to lower the center of mass without compromising horizontal velocity. Lowering in a flat-footed (dorsiflexed) manner, in which the athlete moves forward and downward, allows this to happen.

GENERAL PREPARATION PHASE

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
SPEED Acceleration Runs from three point stance 10, 20, 30 meters x 4 MULTIPLE JUMPS Standing Long Jump x 5 Standing Triple Jump x 4 3 Double Leg Hops x 4 STRENGTH Clean from floor x 5 x 5 @ 65% Deep Squat x 4 x 6 @ 65% Bench Press x 4 x 6 @ 65% MULTIPLE THROWS Overhead back, between the legs forward, squat chest x 4 @ 10-pound ball for women, 16-pound ball for men	TECHNIQUE Skip for distance x 4 x 20 meters Skip for height x 4 x 20 meters Repetitive take-offs x 4 x 20 meters Hurdle jumps x 4 x 20 meters GENERAL STRENGTH 20" (30") x 12 body weight exercises 20" (20") x 12 core body exercise 2 x 12 repetitions of 12 ancillary weight room exercises	SPEED Stadium Run x 12 x 20 steps (1st 6 sets at singles, 2nd 6 sets at doubles) MULTIPLE JUMPS 2 x 10 steps single leg hops- forward, medial, lateral STRENGTH Snatch from floor x 2 x 5 @ 70% Snatch from knees x 2 x 5 @ 70% Snatch from thigh x 2 x 5 @ 65% Overhead squat x 4 x 6 @ 50% Incline Press x 4 x 6 @ 70% MULTIPLE THROWS Overhead back, between the legs forward, squat chest x 4 @ 10 pounds for women, 16 pound for men	TECHNIQUE Skip for distance x 4 x 20 meters Skip for height x 4 x 20 meters Repetitive take-offs x 4 x 20 meters Hurdle jumps x 4 x 20 meters Circle runs x 8 GENERAL STRENGTH Isometric pillar holds x 30 inches Low barefoot walks x 2 x 10 meters 2 x 12 repetitions of 12 ancillary weight room exercises	SPEED 10 x 40 meter resistance runs MULTIPLE JUMPS 2 x 15 inches (30 inches) x 8 in place multi jump exercises STRENGTH Clean pull from floor x 5 x 5 @ 75% Front deep squat x 4 x 6 @ 70% Bench press x 4 x 6 @ 70% MULTIPLE THROWS Lunge chest, shoulder step, overhead step x 4 @ 10 pound ball for women, 16 pound ball for men	STAMINA 10 x 100 meters @ 65% (1 foot) GENERAL STRENGTH 2 x 12 repetitions of 12 ancillary weight room exercises



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The athlete should feel the knee of the penultimate foot move forward and past the penultimate foot while still in contact with the ground. If done correctly, the athlete will move quickly over the penultimate step and on the take-off step. The take-off foot should also contact the ground with a flat foot action. The inward lean of the athlete through the approach run, will begin to move to an upright and vertical inclination on the latter half of the stance of the penultimate. The take-off foot should be pointed between the far back and far front corner of the high jump pit. The hips and shoulders should be aligned in the same plane and perpendicular to the axis of the curve of the run. The shoulders should not turn until the athlete begins moving vertical off the ground. A common error is for the foot to be planted parallel to the cross bar and consequently the shoulders turn early on the ground. These two actions dissipate much of the centrifugal force developed in the approach run. The free leg will be driven vertically and parallel to the crossbar and blocked just below the waist. The take-off arm(s) should be directed vertically and be blocked at shoulder height.

Take-off should be vertical and not demonstrate a hinging towards the crossbar. Movement and rotations toward and about the high jump crossbar should occur as the athlete leaves the ground, not while they are still in contact with the ground. The athlete's rise and rotation should progress at similar rates, in front of the crossbar. Rotations will directly reflect the quality of the approach run and the actions of take-off. If executed properly, very little if any volitional work is required for clearance.

Take-off should occur just inside the near standard, approximately an arm's length away from the crossbar. Clearance is desired in the middle of the bar – the lowest point. The faster the athlete approaches and the higher the athlete jumps, the further out from the crossbar take off should occur.

TECHNICAL TRAINING

The curved approach run in the high jump makes it unique to the other jumping events. It also makes the ability of the athlete to run the curve a critically important aspect of technical training in the high jump.

The technical jump training of the high jumper begins with remedial exercises that teach foot contacts, postural positioning, isometric preparation and segment usage.

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SPECIAL PREPARATION PHASE

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
SPEED Acceleration Runs from rollover or blocks 20, 30, 40 meters x 3 STRENGTH Clean from floor x 6 x 4 @ 80% Squat x 6 x 4 @ 80-85% Bench Press x 5 x 4 @ 75% MULTIPLE THROWS Overhead back, between the legs forward, squat chest x 4 @ 10-pound ball for women, 16-pound ball for men	TECHNIQUE 6 step jumps x 10-15 GENERAL STRENGTH 45 inches (20 inches) x 12 medicine ball exercises 12 repetitions x 12 body weight exercises	SPEED & TECHNIQUE Approach Runs x 10 with modified take off over bar MULTIPLE JUMP Bounding routine x 2 x 20 meters STRENGTH Snatch from thigh x 6 x 4 @ 75% Dumbbell walking lunges x 4 x 6 Dumbbell Incline Press x 5 x 5 @ 70% MULTIPLE THROWS Overhead back, between the legs forward, squat chest x4 @ 10 pounds for women, 16 pounds for men	GENERAL STRENGTH Isometric pillar holds x 20 inches with leg raises 15 repetitions x 12 body weight exercises	SPEED 5 x 30 meter fly in runs @ 95% (3 feet) MULTIPLE JUMPS 2 x 15 inches (30inches) x 8 in place multi jump exercises STRENGTH Clean thigh x 5 x 3 @ 85% Step Ups x 4 x 6 @ 70% Dumbbell bench press x 4 x 6 @ 70%	STAMINA 8 x 80 meters @ 75% (2') GENERAL STRENGTH 2 x 10 repetitions of 12 ancillary weight room exercises

Activities early in the training year that serve this purpose are skipping for distance and height, continuous take-offs, continuous take-offs with two easy run steps between and low level hurdle jumps. These are exercises that all jump athletes perform and can be performed together as a group. Eventually the high jump athletes perform these exercises on a circle.

As the athlete begins to improve and understand run mechanics, exercises to progress into curve running are introduced. One such exercise is the serpentine or weave run, which is performed on the track. This exercise is set up by placing eight cones 10 meters apart over 80 meters. The cones are placed on the lane line between four and five. The athlete then runs between the cones in a serpentine fashion, running to the lane line of lane two and lane eight between every other cone. Hips and shoulders in the same plane, an inward lean from the ankle created by outward pushing of the feet, and good run mechanics are things that should be observed and cued by the coach.

Circle runs serve as the next progression for approach running. A circle 20-25 feet in diameter is created with chalk or cones. The faster the athlete the larger the circle may need to be. The first progression is for the athlete to start the run on the circle. The next progression is for the athlete to start approximately 10 meters from the circle and run a tangent into the circle to simulate curve initiation.

The final progression is for the athlete to begin approach runs on the runway and into the high jump pit. An approach should never be run without the athlete going into the pit in some type of take off action. A modified take-off of some form can be utilized when working on the approach.

Take-off and bar clearance are trained in unison with approach training. Short approach jumps which allow for a higher number of repetitions are utilized to work on takeoff mechanics. These start as four-step jumps and move to six-step jumps. The full approach run should be mastered as the athlete is ready to move into full-approach jumps. The effect that the curved approach has on the resultant rotations at take-off make full approach jumps a priority in high jump training.

Specific activities for bar clearance such as standing back over jumps are common drills seen in high jump training literature and video however these drills poorly replicate bar clearance since there is no horizontal speed utilized and take off positions in the actual high jump never occur with the back to the bar.

FINAL THOUGHTS

The high jump is as physically and technically challenging an event as there is in the sport of Track & Field. An approach to training for the high jumper that addresses the biomotor demands of the event and adherence to technical development, will create better athletes and in turn will result in higher jumps and greater success in the event. Take great care, and spend the time necessary to develop the special skills required of the event, and both the athlete and coach will be rewarded with positive results.

Todd Lane has been the Jumps coach at LSU since 2007. He is a Level 1 and Level 2 Jumps instructor in the USA Track & Field Coaching Education Program.

COMPETITION PHASE

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
SPEED Acceleration Runs from rollover 8 x 30 meters MULTIPLE JUMPS 15 inches (30 inches) x 8 in place multi jump exercises STRENGTH Clean from thigh x 6 x 3 @ 80-85% Squat Jumps x 4 x 8 @ 30% of body weight Bench Press x 4 x 6 @ 65% MULTIPLE THROWS Overhead back, between the legs forward, squat chest x 4 @ 10 pound ball for women, 16 pound ball for men	GENERAL STRENGTH 40 inch (20 inch) x 12 medicine ball exercises 2 x 8 repetitions of 12 ancillary weight room exercises	SPEED Full approach jumps x 5-6 2 x 70 in and out runs MULTIPLE JUMP Hurdle Hops x 4 x 8 STRENGTH Split Snatch from floor x 4 x 4 @ 70% Dumbbell Lunge jumps x 4 x 6 @ 30% of body weight	GENERAL STRENGTH Isometric pillar holds x 20 inches with leg raises	SPEED 3-5 full approach runs STRENGTH Close Grip Snatch 4 x 4 @ 65 % MULTIPLE THROWS Overhead back throw, between legs forward throws x 3 with 4 kilogram ball for women, 16 pound ball for men	COMPETITION