Strength Training for the Endurance World

Carrie Lane, Director of Sport Performance
Peak Energy Performance Therapy
What is the agenda of the talk?
My perspective

- Distance runner → distance coach → thrower → throws coach → S and C course instructor → speed/power coach and rehab for endurance athletes

My experience with endurance athletes is that they are incredibly eager to learn speed/power skills. They get to be “sprinters.”
Why lift?

Skill re-enforcement

“Neural” day

Recovery/Adaptation

“General” day
RUNNING ECONOMY

VERTICAL FORCE PRODUCTION

COORDINATION
POSTURE
COUPLING
TIME
BALANCE/MOBILITY
The skill of vertical force production:
RUNNING ECONOMY

VERTICAL FORCE PRODUCTION

COORDINATION

POSTURE

COUPLING TIME

BALANCE/MOBILITY
Learning force production skills requires:

1. Element of ballistic firing patterns to elicit more specific “brain-to-muscle” training

2. Positions specific to running

3. Rate of firing pattern should complement and contrast the rate of firing used when running.
When teaching force production skills:
When teaching force production skills:

- Change of direction
- Coordination
- Posture
- Balance/Variety

Vertical force production
Definition of “strength”

More like “Speed/Power/Strength” Training

Not JUST in the weight room. Includes hurdle mobility, plyometrics, throwing, bodyweight work, and traditional “weight training” activities.
Force production skills start here:
Hurdle mobility + sprint development

☑ Vertical force production
☑ Posture
☑ Coupling time
☑ Coordination
Force production skills start here:
Simplify your sprint development “drills”

- Vertical force production
- Posture
- Coupling time
- Coordination
Force production skills progress here:

Jumping and Throwing
(multi-jumps and multi-throws)

Jumping and throwing = more closely matches intensity and velocity that the tissue and joints encounter when running.
Force production skills progress here: Multi-jumps

Coaching Cue Progression:
1. Stiff limbs. NO MUSHY LANDINGS!

2. Long-Short-Long OR Drop and Drive

3. Apply force vertically regardless of direction of movement
Force production skills progress here: Multi-throws

Coaching Cue
Progression:
1. Apply force into ball
2. long-short-long
3. Fast change of direction
4. Apply force into the ground

Key: Choose the right weight!
Force production skills combine with physiological effects:

Olympic and Static lifts

- Now we shift into weight room weights. These exercises help bridge the gap between biomechanical concerns and physiological concerns.

- Heavy weights = largest amount of muscles under tension = largest hormonal response to accelerate recovery.
Force production skills combine with physiological effects: Olympic lifts and ballistic variations

Coaching Cue Progression:
1. long-short-long
2. Fast change of direction
3. Apply force into the ground
4. PUNCH! DROP!

DB
PART VS WHOLE
VARIETY- UNILATERAL VS BILATERAL
Force production skills combine with physiological effects: Olympic lifts and ballistic variations

Alternatives to Olympic lifts: Car pushes, sled pulls, tire flips, Atlas carry relay, hurdle cart pushes.
Force production skills combine with physiological effects:
Static lifts

Why lift slow when we have to move fast? Won’t we get bulky?

- Leg strength—unilateral vs bilateral, static vs ballistic
- Core strength- concentrate on rotational movements and posterior chain.
- Upper body strength- intercostals, with injured athletes
Force production skills combine with physiological effects: Static lifts

Coaching Cue Progression:
1. Posture
2. Posture
3. Posture

STATIC LIFTS = AMAZING CORE EXERCISES
Why lift?

Skill re-enforcement

“Neuro” day

Recovery/Adaptation

“General” day
Strength training for physiological gains starts here:

Circuits: Weights, Bodyweight, MB, Core

Lunges! Planks! Core! Light jumps
Strength training for physiological gains starts here:
What makes an effective circuit?

Move with intent

Physiohit

EFFECTIVE CIRCUIT

Common Theme
Strength training for physiological gains starts here: What makes an effective circuit?

Sample Themes:
- Full body variety (ex- burpees, pushups, v-sits, mountain climbers, rocket jumps)
- Core specific (ex- crunches, bicycles, supermans, toe touches)
- Core stability (ex- pedestal work)
- MB catch and toss
Strength training for physiological gains starts here: What makes an effective circuit?

Themes continued:

1. VARIETY WITHIN the theme: Vary the amplitude, vary the force

2. Challenge their coordination

3. Rotational and posterior chain movements should dominate your circuits.

4. Consider “pre-fatigue”. Big muscles get tired early. Work the little muscles later in the session (feet, deep pelvic core muscles) when the big muscles are already tired.
Strength training for physiological gains starts here: General strength circuits

Coaching Cue Progression:
1. Move with intent
2. No wasted movement
3. High power output

Keep circuits short
Disciplined with work: rest ratios
Mild lactate levels → growth hormone release
Strength training for physiological gains progresses here:
MB Catch-and-toss

Coaching cue progressions:
1. Cue the catch first (stretch reflex)
2. Move with intent
3. Accelerate the ball
Strength training for physiological gains progresses here: Advanced Core Development

Coaching cue progressions:
1. Brace for impact
2. Anchor the feet.
NO STUMBLING!
Strength training for physiological gains progresses here:

Bodybuilding Circuits
Physiological hit:
Simple weight movements addressing entire body
Glycogen depletion ➔ energy system adaptation
Strength training for physiological gains review:
# Metabolic Circuit 1

<table>
<thead>
<tr>
<th>Makalu (Calisthenics)</th>
<th>Meru (Core Stability)</th>
<th>Mount Blanc</th>
<th>Rainier (Calisthenics)</th>
<th>Cotopaxi</th>
<th>Kilimanjaro</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Side shuffle R</td>
<td>1 Elbow Hip sq. R</td>
<td>1 Standing dumbbell press</td>
<td>1 L-over</td>
<td>1 Shock jumps</td>
<td>1 Forward UH</td>
</tr>
<tr>
<td>50m</td>
<td>2 Elbow Hip sq. L</td>
<td>2 Bulgarian squats R</td>
<td>2 Backward lunge return</td>
<td>2 Skiers with pause</td>
<td>2 Forward scoop R</td>
</tr>
<tr>
<td>10 reps</td>
<td>3 Prone Trail leg R</td>
<td>3 Bulgarian squats L</td>
<td>3 V-ups all R</td>
<td>3 SL feed/bwd w/ pause</td>
<td>3 Forward scoop L</td>
</tr>
<tr>
<td>10m</td>
<td>4 Prone Trail leg L</td>
<td>4 Dumbbell row R</td>
<td>4 Seated squats</td>
<td>4 Skaters</td>
<td>4 Backward OH</td>
</tr>
<tr>
<td>5 reps</td>
<td>5 Hand Side Plank Abduction R L</td>
<td>5 Dumbbell row L</td>
<td>5 Russian twists</td>
<td>5 Lateral line hops</td>
<td>5 SL hops to R and L</td>
</tr>
<tr>
<td>50m</td>
<td>6 Standing side crunch R</td>
<td>6 Seated tricep extension</td>
<td>6 SL hops to L and R</td>
<td>6 DL 3 way hops</td>
<td>6 DL X hops</td>
</tr>
<tr>
<td>5 reps</td>
<td>7 Standing side crunch L</td>
<td>7 Standing Fig 8 pass R</td>
<td>7 Shock jumps MB OH or chest</td>
<td>7 DB or BB upright row</td>
<td>7 X hops fed/bwd</td>
</tr>
<tr>
<td>50m</td>
<td>8 My hammy taps</td>
<td>8 Plate pull-over</td>
<td>8 Wall sits</td>
<td>8 Stationary Cossack R</td>
<td>8 Single leg RDL R</td>
</tr>
<tr>
<td>1 rep</td>
<td>9 Fire hydrant R</td>
<td>9 Weighted sit-ups with feet anchored</td>
<td>9 DB or BB upright row</td>
<td>9 Single leg RDL R</td>
<td>9 Split jumps</td>
</tr>
<tr>
<td></td>
<td>10 Fire hydrant L</td>
<td>10 Hand Side Plank Adduction R</td>
<td>10 Stationary Cossack L</td>
<td>10 Single leg RDL L</td>
<td>10 Supine rotational reach</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11 Hand Side Plank Adduction L</td>
<td>11 Supine rotational reach</td>
<td>11 Supine rotational reach</td>
<td>11 Single leg RDL L</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 Supine plank marching alt R</td>
<td>12 Supine rotational reach</td>
<td>12 Supine rotational reach</td>
<td>12 Single leg RDL L</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13 Supine plank marching alt L</td>
<td>13 Supine rotational reach</td>
<td>13 Single leg RDL L</td>
<td>13 Single leg RDL L</td>
</tr>
</tbody>
</table>

# Rest 60-90”

<table>
<thead>
<tr>
<th>Nuptse (Bar and Wall)</th>
<th>Matterhorn</th>
<th>Aconcagua</th>
<th>Foraker (Calisthenics)</th>
<th>Aconcagua</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Bar hang</td>
<td>1 Lat pull down</td>
<td>1 Speed skaters</td>
<td>1 Standing oblique OH</td>
<td>1 Standing oblique OH</td>
</tr>
<tr>
<td>2 Wall sits</td>
<td>2 Hammer curl</td>
<td>2 Skiers with pause</td>
<td>2 Supine toe touches</td>
<td>2 Supine toe touches</td>
</tr>
<tr>
<td>3 Hanging knee ups</td>
<td>3 Hanging knee ups</td>
<td>3 Rocket jumps with pause</td>
<td>3 Standing oblique OH</td>
<td>3 Standing oblique OH</td>
</tr>
<tr>
<td>4 DB or BB upright row</td>
<td>4 DB or BB upright row</td>
<td>3 SL rotational jump R leg to R</td>
<td>4 Supine rotational reach</td>
<td>4 Supine rotational reach</td>
</tr>
<tr>
<td>5 Leg extension</td>
<td>5 Seated to hip hike</td>
<td>5 SL rotational jump L leg to R</td>
<td>5 Seated to hip hike</td>
<td>5 SL rotational jump L leg to R</td>
</tr>
<tr>
<td>6 Weighted back hyper with twist R</td>
<td>6 Stationary Cossack R</td>
<td>6 SL rotational jump L leg to L</td>
<td>6 Stationary Cossack R</td>
<td>6 SL rotational jump L leg to L</td>
</tr>
<tr>
<td>7 Tricep extension</td>
<td>7 SL rotational jump L leg to L</td>
<td>7 DB or BB upright row</td>
<td>7 SL rotational jump L leg to L</td>
<td>7 DB or BB upright row</td>
</tr>
<tr>
<td>8 Windmills</td>
<td>8 Stationary Cossack L</td>
<td>8 Wall sits</td>
<td>8 Stationary Cossack L</td>
<td>8 Wall sits</td>
</tr>
<tr>
<td>9 Single leg RDL R</td>
<td>9 Single leg RDL L</td>
<td>9 Single leg RDL L</td>
<td>9 Single leg RDL L</td>
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<td>10 Single leg RDL L</td>
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</tbody>
</table>

# Rest 60-90”

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<tr>
<th>Ama Dablam (Calisthenics)</th>
<th>Cho Oyu (Core Stability)</th>
<th>Jumps</th>
<th>Multi Throws</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Split squat R (no DB)</td>
<td>1 Side plank leg raise R</td>
<td>1 Shock jumps</td>
<td>1 Speed skaters</td>
</tr>
<tr>
<td>2 Split squat L (no DB)</td>
<td>2 Side plank leg raise L</td>
<td>2 Backward lunge return</td>
<td>2 Skiers with pause</td>
</tr>
<tr>
<td>3 Reverse crunch</td>
<td>3 Side plank with abduction R</td>
<td>3 SL rotational jump R leg to R</td>
<td>3 Rocket jumps with pause</td>
</tr>
<tr>
<td>4 Suitcases</td>
<td>4 Side plank with abduction L</td>
<td>4 SL rotational jump L leg to L</td>
<td>4 Standing to hip hike</td>
</tr>
<tr>
<td>5 SL crab position hip lift R</td>
<td>5 Prone plank alternative knees to elbow</td>
<td>5 Stationary Cossack R</td>
<td>5 SL rotational jump L leg to L</td>
</tr>
<tr>
<td>6 SL crab position hip lift L</td>
<td>6 SL glute bridge with hip rotation R</td>
<td>6 Stationary Cossack L</td>
<td>6 Standing to hip hike</td>
</tr>
<tr>
<td>7 Mountain climbers w/ e</td>
<td>7 SL glute bridge with hip rotation L</td>
<td>7 Supine rotational reach</td>
<td>6 Standing to hip hike</td>
</tr>
<tr>
<td>8 Supers</td>
<td>8 Side plank with abduction R</td>
<td>8 Supers</td>
<td>8 Standing to hip hike</td>
</tr>
<tr>
<td>9 Crab pushup</td>
<td>9 Side plank with abduction L</td>
<td>9 Glute bridge (feet on ball)</td>
<td>9 Single leg RDL</td>
</tr>
<tr>
<td>10 V-ups</td>
<td>10 Prone plank with leg raise R</td>
<td>10 Single leg RDL</td>
<td>10 Supine knee rolls</td>
</tr>
</tbody>
</table>
Sprint drills
- Posture
- Limb stiffness (advanced)
- Vert force development
- Gen strength, balance, coordination

Hurdle mobility
- Posture
- Limb stiffness (advanced)
- Vert force development
- Gen strength, balance, coordination

What is the warmup and cooldown?

Opportunity for light training of key speed/power concepts

Putting it all together

Step 1:
Putting it all together

Step 2:

What is the workout today?

Match the running and strength themes

Short intervals or speed development
NEUROMUSCULAR LIFTING
✓ Multi-jumps
✓ Multi throws
✓ Olympic and/or static lifts

Long intervals or threshold
NEUROMUSCULAR or RECOVERY LIFTING
✓ Multi-jumps
✓ Multi throws
✓ Olympic and/or static lifts
✓ Circuits- Weights, BW, MB, Core

Recovery run
RECOVERY LIFTING
✓ Circuits- BW, MB, Core
✓ Circuits- weight room (BB)
The weight room is too small for my team.

Troubleshoot

Theme matching is most important

- We don’t have access to our weight room
- We have to lift in the mornings
- We have a separate strength coach
- We have to lift on the same days each week

Putting it all together

Step 3:

We don’t have access to our weight room

We have to lift in the mornings

We have a separate strength coach

We have to lift on the same days each week
Review

Skill re-enforcement

Running Economy
Force Production

Recovery/Adaptation

Hormone Response
Glycogen Depletion
References/Suggested Reading:


• Myers, T. *Anatomy Trains*. Churchill Livingstone. 3e


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If you have questions, please contact me at:
carrie@peakenergypt.com
www.peakenergypt.com
carrielane55@gmail.com
@coachcarrielane (FB, Insta, Twit)