BP Data Over Many Years Predicts Arterial Hardening

High blood pressure has been long understood to be an important indicator of heart disease risk. What is known as “mid-blood pressure,” which is calculated as systolic and diastolic readings added and divided by two, is considered an important marker of coronary heart disease risk among younger populations in particular. But until now, single blood pressure measures were the most widely used—long-term blood pressure patterns and their effect on cardiovascular disease risk were poorly characterized. And just how important blood pressure levels over multiple decades are to arterial health may surprise you.

Atherosclerosis, the disease in which plaque builds up inside the arteries, is a complex process that starts when fatty substances, calcium, cholesterol and cellular waste build up in the wall of an artery. It's no surprise that this increases blood pressure; further still, many researchers think that high blood pressure itself could be a cause of arterial-lining damage that may initiate the build-up. The other two widely understood sources of damage to this innermost layer of the artery (the endothelium) are cigarette smoking and elevated blood levels of triglycerides and cholesterol. As plaque hardens over time, not only is blood pressure further elevated but oxygen carried in the blood often reaches organs in limited amounts. If a piece of the plaque breaks off or a blood clot forms on the plaque's surface, a whole artery can become blocked, very possibly resulting in a heart attack or stroke.

A new *JAMA* study reports that long-term patterns in blood pressure beginning in young adulthood are helping to identify patients at risk for developing coronary artery calcium. The researchers studied 3,500 adults from four urban U.S. sites, aged 18 to 30 at baseline, who had multiple blood pressure measurements over the next 25 years. At the end of follow-up, participants had a CT scan to measure their coronary artery calcium score. A score of 100 or greater was considered to be evidence of subclinical atherosclerosis.

The prospective cohort blood pressure data came from examining systolic, diastolic and mid-blood pressure at baseline and years 2, 5, 7, 10, 15, 20 and 25. Compared with patients who had low blood pressure throughout the study, those who had relatively elevated blood pressure throughout the study had 2.5 times the risk for atherosclerosis, and those with high blood pressure throughout the study had a 4-fold increase in risk.

The study notes that blood pressure trajectories throughout young adulthood vary, and “higher
BP trajectories were associated with an increased risk of CAC in middle age. Long-term trajectories in BP may assist in more accurate identification of individuals with subclinical atherosclerosis.

At two-and-a-half times increased risk, the data on people without hypertension is startling. Most participants with “elevated blood pressure” did not meet the definition for actual hypertension, but fell within the range of prehypertension. This underscores the importance of blood pressure monitoring in general and of never ignoring a diagnosis of prehypertension, which is defined as blood pressure between 120/80 mm Hg and 139/89 mm Hg.


**National Heart, Lung, and Blood Institute, NIH, [https://www.nhlbi.nih.gov/health/health-topics/topics/atherosclerosis/](https://www.nhlbi.nih.gov/health/health-topics/topics/atherosclerosis/)**

**AHA, Atherosclerosis, [http://www.heart.org](http://www.heart.org)**

**Examining Acetaminophen's “Safe” Role in Pain Relief**

Acetaminophen (e.g., Excedrin, Tylenol) is found in numerous prescription and o-t-c products designed to treat pain and reduce fever. Acetaminophen is easier on the stomach than aspirin and other NSAIDs, and has been touted as a good option for people who take an anticoagulant (e.g., warfarin, clopidogrel). But because it is so widely used and perceived as safe, people tend to take it without thinking. The FDA has decided to weigh in on the matter, strongly recommending that doctors limit the maximum dose per tablet to 325 mg. Their concerns are not unwarranted: acetaminophen is a leading cause of liver failure in the U.S.

Recall that ibuprofen (e.g., Advil, Motrin) treats fever and pain too but, as an NSAID, also reduces the inflammatory response. Because it thins the blood the same way aspirin does, it's not surprising that the most common side effect of ibuprofen use is GI damage. A study in *Medicine & Science in Sports & Exercise* found that ibuprofen aggravates exercise-induced small intestinal injury and induces gut barrier dysfunction in otherwise healthy athletes. The authors concluded that NSAID consumption by athletes “is not harmless and should be discouraged.”

If you have some form of cardiovascular disease, it might make sense to occasionally take acetaminophen rather than an NSAID for a fever, headache or pulled muscle. Many runners use NSAIDs more than they need to or should. While NSAIDs do reduce pain and muscle soreness, there is evidence that they also prevent “good inflammation” and can be hard on the system with prolonged use.
**Blood pressure is not unaffected**

A small Swiss trial reported on not long ago in this publication warned that acetaminophen—though primarily an analgesic and lacking in anti-inflammatory properties—can nevertheless still behave very much like NSAIDs, somehow affecting the cardiovascular system. In the study, 33 men and women with cardiovascular disease (typical candidates for the drug over an NSAID) took a standard daily dose of 1,000 mg of acetaminophen or an identical placebo for two weeks. After a two-week break, each volunteer took the other treatment.

Average systolic blood pressure increased from 122.4 to 125.3 mmHg when patients were on the acetaminophen regimen, and average diastolic pressure increased from 73.2 to 75.4 mmHg. Blood pressure stayed steady when participants took the placebo. Though these increases aren’t enormous, they indicate that acetaminophen raises blood pressure too.

**FDA confronts liver damage potential**

The FDA is now worried enough about the over-prescription of acetaminophen to officially recommend discontinuing prescriptions of greater than 325 mg per tablet or capsule. They are particularly concerned about prescription combination drug products, which have acetaminophen paired with other ingredients, most often an opioid. These products are thought to more easily lead to accidental overdose, and therefore liver injury in patients.

The agency reports that nearly half of acetaminophen-related liver failure cases in the U.S. are caused by accidental overdose from prescription combination drugs. Severe liver injury has occurred mostly in three common scenarios:

- in patients who took more than the prescribed dose in a 24-hour period;
- patients who took more than one acetaminophen-containing product at the same time; and
- patients who drank alcohol while taking acetaminophen products.

The FDA’s recommendation in actuality goes back to 2011, with compliance by January 14, 2014, but some products are still on the market. In the near future the FDA intends to institute proceedings to withdraw approval of prescription combination drug products containing more than 325 mg of acetaminophen per dosage unit.

Acetaminophen is also widely used as an o-t-c pain and fever medication, and is often combined with myriad other ingredients, such as cough and cold remedies. When hidden among a wide list of such ingredients, accidental overdose again becomes a concern.

The FDA also recommends that when a pharmacist receives a prescription for a combination product with more than 325 mg of acetaminophen per dosage unit that they contact the prescriber to discuss a product with a lower dose of acetaminophen.
Skin reaction over-reaction?

In August 2013, the FDA also issued warnings about acetaminophen and skin reactions. They will now require a warning about the skin conditions to be added to the labels of prescription drugs containing acetaminophen, and will ask manufacturers of acetaminophen products to add warnings to their o-t-c medications. But despite the dire-sounding warning, the FDA has identified only 107 cases of serious skin reactions from acetaminophen in 43 years; the problems are very rare.

So what to make of acetaminophen?

Read labels and stick to guidelines to prevent this widely used pain and fever remedy from harming your liver. Cold, cough, and flu season is a good time to revisit the risks of acetaminophen—Harvard Health Publications estimates that more than 600 products on the market contain acetaminophen, and “inadvertently combining them can nudge you into the red zone.”

The drug is an important one for controlling chronic pain, particularly in older adults. But acetaminophen also has a narrower window of safety compared with ibuprofen and naproxen. NSAIDs can make you sick, too, but it takes a larger amount to reach a dangerous overdose. The body breaks down most acetaminophen in a normal dose and eliminates it in the urine, yet some of the drug is converted into a byproduct that is toxic to the liver. If you take too much—all at once or over a period of days—more toxin can build up than the body can handle.

For the average healthy adult, the generally recommended maximum daily dose is no more than 4,000 milligrams (mg) from all sources. But in some people, doses close to the 4,000 mg daily limit for adults could still be toxic to the liver. It's safest to take only what you need, and to not exceed 3,000 mg a day whenever possible.

As always, analgesics and anti-inflammatory drugs are cold comfort in the long haul. For joint pain and similar skeletal or tendon-related problems, runners need to look at underlying instabilities that one ought not simply be swallowing pills to manage. Is it time to get serious about strength training? How consistent and thorough is your post-exercise stretching routine? Is it time for new shoes? Are you overtraining?

**FDA MedWatch, Jan. 14, 2014, Acetaminophen Statement,**

**Cleveland Clinic, HealthHub, Jan. 27, 2014, “FDA Mandates New Acetaminophen Warning,”**
The Latest on Drug Safety Labeling: Naproxen & Saxagliptin

In the wake of the recent concerns about acetaminophen overdose and liver damage, patients seeking pain relief cannot quite turn with ease to NSAIDs like ibuprofen and celecoxib without worrying slightly over CV risk. Now, the FDA has insisted naproxen back down from claims made last year that it is safer than the rest—until stronger evidence appears. Advisers to the FDA concluded recently through a meta-analysis that recent data from a retrospective analysis linking the NSAID naproxen to lower risk of cardiovascular events than other NSAIDs are not reliable. Naproxen was held to be the safer of COX-2 inhibitor choices last year due to its association with lower cardiovascular risk, but now FDA advisers are voting against a new label based on those data.

The original meta-analysis was published in the Lancet in 2013 and found that coxibs or diclofenae conferred increased risk for major vascular events, and ibuprofen showed increased risk for coronary events, relative to placebo. Meanwhile, no such risk increases were seen with naproxen. But now FDA advisers recommend that naproxen's prescribing information stay as is until data is made available from a large, ongoing studio known as the Precision trial. That randomized trial is comparing naproxen with celecoxib or ibuprofen in patients with osteoarthritis or rheumatoid arthritis.

The current available evidence does not prove that the painkiller naproxen, sold under the brand names Aleve and Naprosyn, carries a lower cardiac risk than rival products. In 2005 the FDA determined that all NSAIDs should carry a warning about cardiovascular risk but said there was no evidence that the drugs carried different levels of risk. While the panel agreed that more information has come to light since then, they are looking to Precision to answer the question once and for all.

The FDA's final decision could have wide implications for the way in which these drugs are prescribed and used in the future, and it will have implications for whether the Precision trial is able to continue. One of the key questions in front of the panel was whether to modify the Precision trial, which has been going on for seven years at the request of the FDA. The FDA is not bound to follow the advice of its advisory panels, but typically does so.
Precision is an academically directed trial whose scientific governance resides with an unpaid independent executive committee, Nissen said, and represents the best opportunity to date to answer long-standing questions about the safety of NSAIDs that the FDA has been wrestling with since the withdrawal of Merck & Co.’s Vioxx a decade ago after it was linked to an increased risk of heart attack.

The FDA is also investigating a possible increased risk for heart failure associated with the diabetes drug saxagliptin. The investigation stems from findings from the SAVOR-TIMI 53 trial, in which over 16,000 patients with type 2 diabetes were randomized to saxagliptin or placebo. The trial found no significant difference between the groups in the composite endpoint of cardiovascular death, myocardial infarction, or ischemic stroke. However, there was a significant excess in hospitalizations for heart failure with saxagliptin (3.5% vs. 2.8%).

The FDA said that it has requested trial data from the manufacturer and that it considers current information from the trial to be preliminary. The agency advised that patients should not stop taking the drug but should discuss concerns with their healthcare professionals. The investigation of saxagliptin is part of a broader investigation into the cardiovascular risk of all drugs for type 2 diabetes.


Study Finds No Advantage to Annual Mammography

When researchers in Canada compared breast cancer incidence and mortality up to 25 years in women aged 40-59 who did or did not undergo mammography screening, the results surprised nearly everybody. The ubiquitous, widely-promoted annual breast cancer screening procedure was found to be ineffective at reducing mortality outcomes in women under age 60 and led to overdiagnosis an astonishing 22% of the time.

The study was a follow-up of the Canadian National Breast Screening Study, a randomized trial analyzing 15 cancer screening centers, the study’s central office data and information from cancer registries and vital statistics databases. As reported in BMJ, between 1980 and 1985, just under 90,000 women aged 40 to 59 were randomized to five years of annual mammography or no mammography. Women aged 40-49 in the mammography arm and all women aged 50-59 in both arms received annual physical breast examinations. Women aged 40-49 in the control arm received a single examination followed by usual care in the community. The main outcome
measured was deaths from breast cancer.

After up to 25 years' follow-up, there was no discernible difference between groups in breast cancer mortality. Of the screen-detected tumors, 22% were overdiagnoses—one for every 424 women in the mammography arm.

Andrew Kaunitz, an OB/GYN with NEJM Journal Watch, wrote: "This important Canadian report documents the failure of screening mammography to impact mortality from breast cancer, as well as breast cancer overdiagnosis. Based on these and other recently published data, clinicians and women should move away from starting screens among women in their 40s and from screening annually. While we reevaluate the practice of screening mammography, adopting the U.S. Preventive Services Task Force 2009 recommendations (beginning screening in average-risk women at age 50 and screening biennially) would appear prudent."

Not all organizations agree on mammogram guidelines. For instance, the U.S. Preventive Services Task Force mammogram guidelines recommend women begin screening at age 50 and repeat the test every two years. The American Cancer Society and other organizations recommend screening begin at 40 and continue annually.

Mammogram screening isn't perfect. Studies have concluded, for example, that despite more women being diagnosed with early breast cancer due to mammogram screening, the number of women diagnosed with advanced breast cancer hasn't decreased. And now the BMJ-published findings reveal significant overdiagnosis. In between are findings that some women with early breast cancer were diagnosed with cancer that may never have affected their health.

Unfortunately doctors can't distinguish dangerous breast cancers from those that are non-life-threatening. But concerns about mammogram screening for breast cancer include a significant false-positive result risk, and exposure to low levels of radiation. The unavoidable fact is that annual mammography in women aged 40-59 does not reduce mortality from breast cancer beyond that of physical examination or usual care when additional assistive therapy for breast cancer is freely available. Overall, 106 out of 484 of screen-detected invasive breast cancers were overdiagnosed, representing one overdiagnosed breast cancer for every 424 women who received mammography screening in the trial.

BMJ, 2014, Vol. 348, g366, http://www.bmj.com/content/348/bmj.g366


Children Receive Well Over RDA for Most Vitamins

The NIH Office of Dietary Supplements, working in concert with the National Library of Medicine, recently created the Dietary Supplement Label Database (DSLD) to allow researchers to access and analyze supplement label information to, among other research goals, ensure that the information on supplement labels is truthful and accurate.

Now the first published analysis using the database to look specifically at supplemental vitamins for infants and children one to four years old has found that children's supplements almost universally contain more than the recommended daily allowance for vitamins. The findings were published in January in *JAMA Pediatrics*.

Some 172 labels of vitamin supplements geared toward infants and children up to age four were compared with the Institute of Medicine (IOM) recommendations for vitamin intake. On average, supplements contained more than the recommended daily allowance of every vitamin except D and choline. The amount of biotin in supplements exceeded the recommended daily allowance or adequate intake level by five to 10 times, with the highest incidence discovered at an astonishing 936% of adequate intake level.

Based on this analysis, it's clear that much of pediatric vitamin supplementation is not based on IOM recommendations and represents an unsettling tendency toward oversupplementation. More testing and careful monitoring of supplemental vitamin dosage levels for two of our most vulnerable demographics—babies and very young children—needs to be mandated and is likely to follow.

**Vitamin D can be a challenge, however.** Interestingly, vitamin D was only one of two vitamins that did not exceed the recommended daily allowance/adequate intake level set forth by the IOM. Indeed, the National Center for Health Data, which compiles and dispenses statistics on the nation’s health, reported a few years ago that nearly one in three Americans has vitamin D blood levels below the threshold that the IOM says is needed for good bone health.

Vitamin D is a tricky nutrient to obtain through diet alone—few foods contain it naturally. Many doctors recommend taking 800 IU of vitamin D3 a day. But it’s also produced by the body in a complex process that starts when rays of ultraviolet B (UVB) are absorbed by the skin. The liver and kidneys are then involved in making available the form of vitamin D that the body can use. Now, a Swedish medical journal reports other factors that influence vitamin D level. Given that so many people are low in vitamin D, it’s worth looking closely at these factors.

**Northern exposure.** At higher latitudes, the amount of UVB light reaching the earth’s surface goes down in winter. This is because of the low angle of the sun. Short days combined with cold-weather clothing covering legs and arms make UVB exposure limited at best from November through February, which in turn results in low vitamin D levels.

**Air quality.** Burning fossil fuels and wood scatters UVB rays, as well as absorbs them, by
producing carbon. This reduces the amount of vitamin D you manufacture. Interestingly, however, the ozone absorbs UVB, so holes in the ozone layer caused by pollution may enhance your vitamin D levels by letting more UVB through.

**Sunscreen? Not really.** Though it prevents UVB from penetrating your skin, studies of sunscreen’s effects in practice have shown that its adverse influence on vitamin D are minimal. Most people do not apply enough sunscreen to block all UVB, or they simply use it in an irregular way that allows some UVB exposure. An often-cited Australian study showed no difference in vitamin D between adults randomly assigned to use sunscreen and those given a placebo cream.

**Skin tone.** Melanin is the substance in skin that makes it dark. It “competes” for UVB with the substance in the skin that kick starts the body’s vitamin D production. As a result, dark-skinned people tend to require more UVB exposure than light-skinned people to generate the same amount of vitamin D.

**Skin temperature.** Warm skin is a more efficient producer of vitamin D than cool skin. This doubles down on summer’s effect on vitamin D production, since the sun’s rays are already more powerful and longer lasting during summer’s long days. The added heat facilitates the production of more vitamin D than temperatures on a cool day.

**Body fat.** One frequently overlooked factor is that fat tissue soaks up and stores vitamin D, making it a kind of rainy-day fund for the substance. But other research has shown that being obese is correlated with low vitamin D levels, and that being overweight may affect the bioavailability of vitamin D. It’s unclear how these factors ultimately play out in the balance of vitamin D production, but, much like sun block’s protection from melanoma, it goes without saying that there are myriad reasons beyond effect on vitamin D that merit keeping a healthy body weight.

**Age.** Older people have lower levels of the skin’s conversion substance for making vitamin D than do those under 40. There’s also experimental evidence that older people are less efficient vitamin D producers than younger people. Still, the National Center for Health Statistics data on vitamin D levels does little to buttress the conventional wisdom that older folks are any more vitamin D deficient than younger people. There just isn’t a statistical drop-off after 50 in the way you’d expect if there were a significant inadequacy by age.

**Liver health.** Some types of liver disease can reduce absorption of vitamin D because the ailing liver isn’t producing normal amounts of bile. With other types, steps essential to vitamin D metabolism occur incompletely or not at all. Kidney health matters too. Levels of the bioactive form of vitamin D tend to track with the health of the kidneys, so in someone with kidney disease, bioactive vitamin D levels decrease as the disease gets worse, and in end-stage kidney disease, the level is undetectable.

Consumption of fortified dairy products like milk, which has vitamin D added to it in part because of D’s role in calcium absorption, falls off after childhood. Given how chronically
undernourished we are in vitamin D, a conversation with your doctor about whether supplementing vitamin D is appropriate is certainly one worth having.


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**Keep Achilles Pain from Nipping at Your Heels**

Outrunning Achilles tendon discomfort or injury is a challenge many runners face. Long distance runners sometimes shirk post-warm-up stretching, figuring they'll just “work it out” on the first couple of miles. But one of the best ways to prevent Achilles tendinitis is by building limber lower legs apart from the distance run itself. An underlying lack of flexibility, especially in the calf muscles, can lead to Achilles injuries.

Calf muscles are primarily used to extend the ankle. The stretches and exercises here all target the lower leg and will keep the muscles in your calves (both gastrocnemius and soleus muscles) strong. Both the larger of the two (the gastrocnemius) and the smaller muscle (the soleus) attach to the calcaneus (heel bone) by way of the Achilles tendon. The larger muscle takes a greater workload when the knee is straight, and the soleus when the knee is bent. Stretching both is an important part of protecting the Achilles tendon.

If you suffer pain in the back of the heel, the tendon just above it, or as high as where the calf muscles form a V on the back of the leg, you might have an Achilles tendon injury. The highest Achilles injury is more commonly called a calf strain—these tend to heal quickly. Just below it are injuries that involve the junction of muscle and tendon, a spot about halfway down the lower leg. Neither of these are as serious as injury to the tendon itself.

When the Achilles tendon is inflamed (tendinitis) or chronically inflamed with fluid buildup (tendinosis), dynamic rest is called for. This means swimming and biking usually work well, but not if you are still feeling pain. In any case, running is contraindicated. Ice, stretching and eventually strengthening are the reliable components to the road back. But these training components should not only be deployed after injury; protecting the Achilles from injury in the first place involves the same exercises as getting you back up to speed after it. Apart from the
well-known **straight- and bent-legged calf stretches**, here are some stretches and strengthening exercises to consider incorporating into your routine.

**Split Jump**

With or without dumbbells, stand in a staggered stance with right foot in front of left. Lower your body as far as you can. Quickly switch directions, jumping with enough force to propel both feet off the floor. Scissor kick in the air to land with opposite leg forward. Repeat, alternating.

**Dumbbell Calf Raise**

Standing with a dumbbell in your right hand on a step, block or even a 25-lb weight plate, cross your left foot behind your right ankle and balance on the ball of your right foot. Your right heel should be hanging off the step. Your left hand should be placed on something stable—a wall or weight rack. Lift your right heel as high as you can; pause, lower, repeat to desired number of reps. Switch dumbbell hands and repeat with the left leg.

**Bent Knee Calf Raise**

Follow the same directions as the above dumbbell calf raise, but this time bend your knee and hold it that way as you perform the exercise.

**Calf Roll**

With a thick foam roller under your right ankle, cross your left leg over your right (both legs should remain straight). Support yourself with your hands on the floor and roll your body forward until the roller reaches the back of your right knee. Roll back and forth to the number of reps you desire, then repeat with your left calf touching the roller.

**Walk on Toes**

With a pair of heavy dumbbells in your hands, raise your heels off the floor and walk forward or in a circle for one minute. Stand tall and stick your chest out, and use the heaviest dumbbells you can without breaking form for the full 60 seconds.

**Running Tips**

Pronation can contribute to Achilles injury so do try to watch your foot mechanics. Consider arch supports or motion-control shoes to help correct excessive inward foot roll. Another variable you have some control over is the pounding your feet take: less load per footstrike can help stave off Achilles injury. A shorter running stride combined with increased cadence often leads to better stride mechanics because each footfall carries less load (to not only feet and ankles but shins and knees too) than at wider/less frequent stride/cadence combinations. A common comfortable yet rapid cadence for many runners shooting for shorter strides is 85 to 90 right-footfalls per minute.
10 Lesser Known Training Principles

Base training, gradual adaptation, hard-easy, specificity of training, periodization: these are among the many tried and true principles behind healthy, adaptive training for runners, swimmers, cyclists, rowers and athletes of just about every ilk. Beyond the better known concepts that form the basis of our training, we can gain insight from what might be termed secondary or even tertiary principles. Equally important, but perhaps not as widely publicized or as well understood, are 10 such ideas worth keeping in mind as you pursue continuously improving athletic performance.

1. **Use it or Lose it.** This principal applies specifically to flexibility and strength, which are lost every year we age. Not losing sight of this fact helps to see regular stretching and strengthening not just as optional for performance gains, but optimal to keep pace. In this way, one secret to winning is to age slower, and one way to do that is with a daily stretching routine and a weight training program that works your muscles every other day. And of course the stimulation our muscles, vessels, heart and lungs receive from our regular chosen activity contributes further (even primarily) to our longevity; remember though that this happens not just from the main effect of exercise, but often indirectly too through better dietary choices, improved rest and avoidance of destructive habits like smoking.

2. **Reversibility.** Once speed, strength or aerobic capacity is developed, they can be lost easily if neglected. This principal goes beyond Use it or Lose it by calling attention to holes in your training. You may feel fit, but if you ignore one area of your training for too long, specific adaptations may be lost.

This means that if strength built up in the base training period is neglected in the sharpening period, it will be lost. Many people omit speedwork in the base period—one reason it takes a long time to get it back. The best performance is achieved with a long buildup. Include some speed in the base period, not for speed's sake but to maintain a significant amount accrued in the sharpening phase. It's important for muscles and the neurophysical system to “remember” speed to achieve that fast turnover later. Keep fast strides during warmup, as well as fartlek and short and medium hills at a fast pace.

3. **Maintenance.** Once a training effect has been reached, it can usually be maintained at less volume, but intensity must remain the same. After, say, a 12-week sharpening phase that readies you for peak racing season, you may have major competitions a month or more away. Therefore, it's safest to reduce volume and track sessions but keep intensity; the reason is this extra sharpening period is prime time for injury.
4. **Supercompensation.** This is a phenomenon in training where performances increases above the original level of increase. It typically occurs after the athlete is optimally stressed and then rested. The following graphic represents supercompensation in an interval training session:

--- Training too easy; start of next rep is at end of supercompensation

--- Training at optimum; start of next rep is at peak of supercompensation

--- Training too hard; recovery too short

5. **Intuition (Training Flexibility).** Many renowned coaches and athletes (Percy Cerutty, Herb Elliot, Arthur Newton and George Sheehan among them) grant a high level of importance to a training principle that can be summed up as “Listen to your body.” This works best in conjunction with a deep understanding of the other training principles, of course. Still, there is something ephemeral yet important that athletes describe as being able to feel what their body is lacking or getting too much of in training. Iron-clad goals can work against you, leading to injury or sub-optimal gains. Extreme weather also introduces the need for flexibility—remind yourself
that this is okay. Learn that a very sore muscle is a warning; it's usually better to reduce your scheduled workout or rest. Disregard your body's signals at your peril: six months on the DL is the least optimal result you could ever ask for.

6. **Continuity/Consistency.** “Nothing new on race day” means don't wear a brand new running shirt that hasn't been tested repeatedly for chafing or overheating during training runs, but the principal of continuity/consistency extends to the days leading up to a big event as well. Do not deviate from your routine (other than tapering training of course). Keep food, drink, supplements, sleep and warmup consistent. If you're not used to massage before a race, pass on the free offer at the race expo. On marathon day run in the same shoes you ran your long runs in. Sometimes ill-advised deviations in your routine can creep in subtly: sitting for hours in the stands watching other events before your race begins, or walking excessively seeing the sights of an unfamiliar city. Save shopping and tourism for after the race.

7. **Paradoxically, the Weak Mind Can be Strong.** This principal is simple but often neglected. You can do more than you think you can. The mind is certainly the master, but it isn't always strong in the sense of being *confident*; the body is often stronger than the mind thinks. The key is to remember this, which is itself a mind trick. One good illustration of the idea that the mind can trigger fatigue before the body is actually ready to succumb to it is this: imagine rounding a corner during a race and suddenly you are faced with an unexpected, steep hill. Your brain, surprised and discouraged, can actually send the initial message that it's time to throw in the towel. It can incorrectly fool the body into believing the outcome is dismal. Fight these tricks of the mind with the mental prep work known as visualization: Imagine an obstacle during a race like a hill or fatigue or another runner suddenly passing you, and then imagine yourself overcoming it.

8. **Relaxation.** This principle is the key to racing fast because it promotes running economy. Any tension in the body can interfere with muscle fluidity. The result is sapped energy. Remembering to relax results in minimum energy expenditure as well as increased confidence, and so faster race times.

9. **Least Effort.** In distance races, an even pace with few surges (the finish line surge excepting) will give you the least energy expenditure and this, as with the principle above, is a good way to go faster. Believe that you are running with minimal effort and this too will help make it so. You'll feel better, move looser, and avoid the “push harder” mental and physical traps that compromise the effortless effort feeling required to be your best.

10. **Regularity.** Success comes from years of regular training at an intense level. And having a long-term plan is a terrific way to keep running regular. Training logs are an important way to keep sight of this bigger picture. Additionally, we all also hate to see lots of blank spaces in those training logs; to some extent they keep us going. Finally, to keep your activity regular, whenever possible approach your training as its own reward—an end, not just a means. A great way to do
this is simply to strive for a positive attitude, as in, “Hey, I get to run again today!”


**To Curb Appetite, Study its Very Origins**

In an age when the disconnect between overeating and knowledge of its negative consequences is arguably at an all-time high, welcome new NIH-funded research out of Beth Israel Deaconess Medical Center (BIDMC), a research affiliate of Harvard Medical School, has discovered the involvement of a new cluster of neurons in the regulation of hunger. The research moves us closer to a complete picture of appetite regulation, and some would say not a moment too soon.

Hunger is a hard-wired state that motivates specific action for survival: eating. Neuroscience is continually trying to better understand its roots and inner workings, one wants to believe as much as in the interest of public health as in pure scientific discovery or of profit. The ultimate goal is to untangle the complicated jumble of neurocircuits in the brain that underlie hunger to create a kind of “wiring diagram” to explain its origins and control its darker urges.

The new findings add an important extension to our understanding of what drives appetite. We previously have understood that an amino-acid compound called Agouti-related peptide (AgRP) gets expressed in a cluster of neurons at the base of the hypothalamus that are crucial to the control of hunger. They are activated by caloric deficiency and, when naturally or artificially stimulated, they induce intense hunger. Similarly, chemogenetic inhibition of these AgRP neurons decreases feeding.

Excitatory input to AgRP neurons is important in their activation. Despite the important role of this input, its source has been unknown. But now, using cell-specific neuron-mapping techniques with mice, the BIDMC group discovered a strong excitement-producing drive that emanates from an area of the hypothalamus not previously thought to be involved in the hunger response—to the contrary, the brain region in question has long been associated with causing *feelings of fullness*. Furthermore, in sated mice stimulation of a newly recognized subset of neurons expressing a hormone known as TRH (for thyrotropin-releasing hormone) induced intense feeding. Inhibition of these neurons, which also activate pituitary adenylate cyclase, decreased feeding in *calorically deficient* mice. The discovery further advises against referring to this latter group of mice as *hungry*, as caloric-deficiency and hunger are really quite different.

“Afferent” neurons refer to those that carry nerve impulses toward, as opposed to away from, the central nervous system. Hunger is an intensely motivational state and the complicated picture of how it is regulated has been made more finely detailed again with the exciting discovery of these specific afferent neurons that are so directly involved with triggering it.
As the BIDMC team writes, “While the function of eating is to nourish the body, this is not what actually compels us to seek out food. Instead, it is hunger, with its stomach-growling sensations and gnawing pangs that propels us to the refrigerator – or the deli or the vending machine. Although hunger is essential for survival, abnormal hunger can lead to obesity and eating disorders, widespread problems now reaching near-epidemic proportions around the world.” When hunger and caloric deficiency can be completely separated, we will potentially have a very real solution to many of the health problems associated with overweight and obesity that now so devastate the more affluent nations among us.

_Nature, published online Feb. 2, 2014,_
[http://www.nature.com/nature/journal/vaop/ncurrent/full/nature12956.html](http://www.nature.com/nature/journal/vaop/ncurrent/full/nature12956.html)

The Clinic:

Avoid Running with a Foot Drop

I am a 46-year-old male, 5' 11" and 170 lbs. I have been running 23 years and run one or two marathons a year for a lifetime total of 26 marathons. The most recent was two months ago. In the last month, I have developed “right foot drop” after running only two miles. As I run, I develop fatigue and soreness in the lower front leg and the have difficulty with pulling the toes toward the front of the leg. I can walk normally minutes after I complete the run.

Since the marathon, I have soreness on the top of the foot around the first two toes and on the side of the ankle. This occurs when I first get out of bed, but it dissipates after walking a few minutes. Are there any conservative strategies I can try at home prior to seeing a professional for the foot drop?

Bill Weimer
Torrington, CT

You may be developing a foot drop caused by an abnormality in your lower back. The region of your soreness is with the "L5" disk. I would seek out a physiatrist that deals with runners and a physical therapist or chiropractor as needed. Do not run with a foot drop, as you could fall and injure other things.

Amol Saxena, DPM
Palo Alto, CA

I would strongly recommend you not try to manage drop foot yourself. Drop foot can be caused by peroneal nerve injury and/or nerve root compression originating in the lumbar level of the back. It is a condition that needs to be addressed by a physician before permanent nerve damage occurs. Please see a physician at your earliest convenience.

Paul Langer, DPM
Minneapolis, MN
Knee Pain from Nowhere

I'm 6' 2", 200 lbs. I had been running 10 to 15 miles a week when one day I felt a sharp pain under the lower front part of my knee. It's now been eight months, and I still have a little pain in my knee when I walk. I can actually hear a kind of slipping and popping in the knee socket when my left heel touches the ground. If I walk a lot and then sit, the knee gets stiff and sore. What can I do to get through this and back to running?

Ed Kopchik
Hollywood, FL

Instability of the fibular head is possible, but is usually caused by significant trauma, for example, a car accident; and there are usually other ligament injuries as well. A simple exam by an orthopedic surgeon can determine whether the head is subluxing (slipping). One treatment for this consists of fusing the head of the fibula to the adjacent tibia. This is a relatively short and predictable operation and should allow you to return to running. That said, I don't quite have a good explanation for why this has occurred in the first place, so upon examination you may find yourself with an altogether different diagnosis.

Klaud Miller, MD
Evanston, IL
Cramping and Nausea During Ironman Events

I'm a 33-year-old female weighing about 118 pounds. My recent Ironman competition went well for the first two legs, but by mile six of the run my stomach began cramping and that continued for the next hour and a half. I vomited during miles 19 through 24.

I've been running for almost 20 years, but when participating in endurance events, I often have trouble with my stomach. At about the three-hour mark during a marathon, I am no longer able to ingest a gel or other food without feeling nauseated. What can I do to alleviate this problem?

Karen Oldsweld
Bayport, NY

The fact that these symptoms occur well into these extended events suggests that dehydration or electrolyte imbalance is affecting peristalsis. When peristalsis, the muscle contractions that propel food along the digestive tract, is interrupted, nausea and vomiting can result. There is a normal reduction of blood flow to the digestive tract during exercise, but this occurs early and remains so throughout the exercise, so it would not be the cause of a problem this late in the event.

You should prehydrate with sports drink containing sodium, and continue to hydrate throughout the exercise period. Peristalsis is very sensitive to salt and water imbalance in the intestinal tract. Many runners restrict their nutrient intake late in the race to fluid-only. Be sure to experiment on long training runs with various foods—your intestinal tract needs to be trained for an endurance event in the same way your other muscles and organs do.

Dennis D. Daly, MD
Camillus, NY
Spike in Sugar Level Only After Intense Workouts

I'm diabetic, 62 years old, 4' 10", and weigh 95 lbs. For three years without medication I’ve been able to consistently keep my morning blood sugar readings below 110. I've noticed after high-intensity tennis or running, though, that my blood sugar count is often in the 200 range. An hour or so later, the level is back down to around 120.

My tennis games are very competitive, and I play four or five times a week. Am I harming my body? In addition to tennis, I try to speedwalk or jog 20 miles a week, and I've noticed my blood sugar level does not spike on days when I just speedwalk. By comparison, my last run was a 5K at 9:15 mile pace, and my blood sugar level was 240 ten minutes after the race. My diet consists mainly of vegetables, oil and protein.

Ellen Lamontagne
Philadelphia, PA

Exercise typically lowers blood sugar level in type 2 diabetics during the event and for one to two days following, which is one reason why exercise is recommended for diabetics. Therefore, I suspect you are not as well controlled as you think you are. Check your glycohemoglobin with your doctor. This is a measure of long-term blood glucose control. It is reflective of the last three months of blood sugar levels, and more meaningful than individual blood sugars. I think you may need some type of once-a-day medicine that will make you more sensitive to the insulin your body makes. Another consideration is how much glucose loading you are doing in the meals before (and during) exercise. On a side note, I recommend having a stress test or heart scan, since diabetes is a major risk factor for coronary artery disease, which is often asymptomatic.

Peter Mendel, MD
Woodbridge, VA

I have type 1 diabetes and have managed it with an insulin pump for 14 years. I've completed seven marathons since being diagnosed in 1991. I emphatically urge you to continue your exercise regimen—the benefits, both physical and psychological, are just too great to give up. That said, please know that it is very common for diabetics to progress over time from managing their disease with diet and exercise, then to taking one or more oral medications, and finally to insulin.

It's good that you test regularly. I would keep your doctor informed about your blood glucose response to the vigorous workouts, as he/she may one day feel the need to prescribe medication to help you manage; this is not a bad thing. You should continue your workouts. Your body's response to them is not unusual, and may be related to catecholamine release. This is a stress hormone that causes the liver to produce glucose. You seem to follow a low-
carb diet. Your age at diagnosis suggests that you may have overt type 2 diabetes, which is well controlled with diet and exercise. Remember, however, that diabetes can be a progressive disease and so medications may become necessary down the line.

Kevin Foley, MS

Dayton, OH

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The Back Page

Winter Track: Finding a facility “Indoors”

It was not too many years ago that I jumped into a grassroots fight in our large school system to save “indoor track” from extinction. I live in one of the largest county school systems in the country and one with a large budget. One budget cycle was fraught with disaster from on high. The deficit would doom the schools and money had to be found. The “Rodney Dangerfield” of running competition is indoor track. Even though the participation numbers continue to climb in high schools nationwide, the lack of funding support is the wall that all of us need to scale to keep the sport thriving or basically competing. Now that we staved off elimination in that budget fight, many communities outside ours (Fairfax County VA) have the same obstacle: lack of indoor facilities for track and field.

Look at Birmingham Alabama. The city was suffering from urban decay and the flight of tourists and business development. What did the Mayor and city government do? They chose to build a world-class indoor track and swimming facility right smack dab in the middle of a decaying inner city core. The track is banked and operates on a hydraulic system. The banked curves rise up from the floor and have the track ready for action in less than 15-30 minutes. On days that the track is not needed, the surface can be covered for other events or sports. The
The international standard for indoor tracks is a 200m oval that is banked. Many of the banked indoor track facilities in the U.S. are fixed in place. They can be disassembled and stored outside the Indoor Track season, yet they do not operate on a hydraulic lift system.

The lack of facilities around the country is more due to a lack of need and understanding of how a properly designed indoor facility can accommodate multiple events when the competition season has concluded. A secondary floor could be rolled on top of the existing track if it had the hydraulic lift system in place in Birmingham. Summer months could focus on indoor Volleyball or Gymnastics. The track could remain in-place if it had the fixed banking design. Many cities and communities have the need for space for senior living communities to exercise.

This current indoor season showed many high school coaches and school leaders that the missing piece in the sport of indoor track is the physical plant or facility. The barren city parking lots and closed warehouses are ripe for opportunities like a destination track facility. One indoor track and field complex that serves communities not in its charter is the Prince Georges Sports & Learning Complex in Maryland, just outside the District of Columbia. Due to growth in the sport and a lack of a competition venue, high schools in Virginia and Delaware had to book space on weekdays to complete their high school seasons. Normally, high school track teams compete on the weekends. That was not the case in the 2014 winter.

Let’s join together and put teams together throughout the U.S. who sees the economic impact of a national standard indoor track facility. The famous line from the film, “Field of Dreams” is true for indoor track: “Build it and they will come”

AMAA BOSTON 2014 – Our All-Star Lineup

The AMAA 43rd Sports Medicine Symposium at the Boston Marathon® is geared up for potentially one of the largest gatherings in AMAA’s history. Only the 100th Boston may exceed the number of attendees at AMAA’s annual meeting; not to mention the 2nd largest race field in Boston Marathon history. The reason as we know is tied to last year’s awful events on Boylston St mere yards from the finish line. We return this year with resolve and exuberance in both our desire to complete the race and to celebrate our running lifestyle.

The Symposium Speakers slated to present in Boston reads like a Major League Baseball All-Star Lineup! Our two cardiologists have made their marks on opposite coasts. Dr Paul Thompson is the one of the nation’s leading experts in cardiology studies involving runners and athletes. He will discuss the new cholesterol guidelines and how we interpret them in our practices. Dr Jamie Beckerman returns to Boston and AMAA from his practice in Portland OR. He has worked with athletes young and old and has some interesting insights into interpreting ECGs in athletes. World-renowned evolutionary biologist Professor Dan Lieberman returns to energize the hunter-gatherer in all of us. His talks are entertaining and inspiring. Dr Bob Sallis
is like our cleanup hitter. He is leading the charge in the Sports Medicine community on several fronts, most notably “Exercise is Medicine”. Another of our All-Star Sports Medicine pros is Dr Amol Saxena. His talk on 25 years of treating runners and athletes will be fascinating. Some of his biggest fans include Olympians like Shalane Flanagan, our 2012 Olympic Bronze Medalist In the 10,000m. His discovery that Shalane had an extra bone in one foot led to her comeback following surgery and recover to her Olympic success. Our own AMAA Board All-Star is giving a first-ever talk from her own lifetime of experiences, Dr Cathy Fieseler. She will present the experiences of being an ultra-marathoner. Oh and she is our current AMAA Board President. The rest of the AMAA 2014 is outstanding. The AMAA Board and Staff are thrilled. We hope you enjoy this year’s event and weekend like no other.

**Seen and Heard while Running this Winter**

**Is It Time To Put The Squeeze On?**

Compression garments are ubiquitous, squeezing the legs of top flight athletes like Chris Solinsky and Meb Keflezighi as well as the average runner. The idea is that the pressure from the socks, tights and sleeves may improve performance and speed recovery time by increasing circulation and improving lactic acid transport. In addition, manufacturers claim compression garments can dampen muscle vibrations, reduce muscle oscillation, keep muscles warm and flexible and improve proprioception. But do compression garments deliver on their promises?

Studies to date have been small, and there isn’t conclusive evidence that compression garments improve running performance. However, there are indications that wearing compression during and after running can improve recovery.

In one study\(^1\), fourteen runners wearing compression socks experienced a statistically significant reduction in *Delayed Onset Muscle Soreness* (DOMS) twenty-four hours after a 10K road race compared to control runners who didn’t wear compression socks.

In another study\(^2\), competitive trail runners completed a 15.6 km run in two sessions, with compression socks and without. Muscle oxygen uptake and muscle blood flow were significantly increased following the compression sock sessions.

Three versions of Compression socks were worn by ARA staff, SKINS®, CEP® brand socks and a pair of Nike socks. The one difference in the SKINS and CEP socks is that you are asked to provide either a measurement of your calf circumference (CEP) or find your size by using your height and weight in a matrix chart. Nike’s were labeled by the traditional sizes and left it up to you to select the size without measurements. Each pair was *knee-length – they cover the calf and end an inch or two short of the knee*. The socks are light-weight and designed to wick away moisture. The greatest compression is located in the lower part of the sock with decreased compression in the calf area. So far, we find them comfortable, easy to slide on and well-constructed. We’ll provide an update as we put them through some more rigorous wear tests.
One wearer had had a DVT this past summer and compression socks or sleeves were worn while traveling. He noticed that his lower legs felt better after the travel.

Many athletes have been using and trying compression socks for post-exercise or running recovery. Friends have commented that they have less soreness on the days following hard track workouts or a tough long run. More study is needed on the added value of compression socks to the arsenal of apparel for competitive runners and athletes.


**Is the Pasta Party or pre-race Carbo-load fading out?**

More runners and coaches are paying attention these days to what the elite athletes are eating and drinking in the days and weeks preceding a major track race or road race. What do you think we are seeing and hearing? Not so many carbo-load meals by the Kenyans, or some elite Americans. What I am hearing is a focus on such diets as the “40-30-30” plan; that is, 40 percent carbs, 30 percent protein and 30 percent fats. What you do is follow this diet or nutrition plan throughout training. The carbs are not the donuts and bagel variety, nor are they piles of pasta and marinara sauce. It might be scrambled eggs with spinach and goat cheese in the morning. On other days, it could be an omelet with black coffee. Lentil soup and a burger for dinner. I have yet to see some elite Kenyans go to a Pasta Party and pile on the spaghetti or ziti.

My observations are more anecdotal. I also have checked on what my daughter and several of her track & field teammates at Virginia Tech eat during training and competition. I know their coach preaches the 40-30-30 diet. Many athletes may find a nutrition plan that suits their wants but also balances it to what they have learned from experience. Like a training plan to compete, once you find a plan that gets you fit and leads to best times, you stick with it. Same thing goes with nutrition and pre-race or competition foods. As the saying goes, “you are only as good as what you eat”.

*Enjoy the snow-covered trails (some of us) on your run!*

*The Staff and Board of American Running*