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New IOC Paper Weighs in on Training During Pregnancy

The International Olympic Committee has issued a detailed statement on the effects of training—both intensely and moderately—on specific aspects of fetal development and natal outcomes. The evidence statement was based on systematic research of the existing literature on pregnancy and exercise.. The group was able to draw conclusions on the effects of exercise on fetal heart rate, the risk of miscarriage, fetal growth and risk of preterm birth, among other outcomes.

For each section of the statement, available databases were searched for terms in various combinations, including *pregnancy, exercise, leisure, recreational activity, postpartum, miscarriage, cesarean section*, etc. The researchers looked for studies on PubMed, Embase, Cochrane, PEDro, Web of Science and SPORTDiscus.

Fetal heart rate (FHR)
Maternal exercise, regardless of intensity, triggers an increase in FHR; they report that on average this increase is by about 10 to 15 bpm. Prolonged high-intensity exercise, they note, could "compromise fetal well-being," though this seems to be largely theoretical for now because in all of the studies they looked at, FHR returned to normal once the exercise ceased. They also found that HR decelerations were sometimes reported during exercise, these were "transitory" and only "rare and sporadic." No newborn abnormalities related to these FHR changes were reported.

Miscarriage
Incidents of miscarriage (with "early miscarriage" usually defined as occurring before week 22 of pregnancy), is greater than 10% in the general population, so not uncommon. Early miscarriages account for about 80% of miscarriages. Prevalence is tied to maternal age, with just 5 to 7% of women under age 35 and 22% of women over 40 experiencing miscarriage at any time during pregnancy.

While fertility treatment raises risk, the major cause of miscarriage is thought to be chromosomal abnormalities of the fetus. Female athletes may sustain a miscarriage, then, just as any woman. But does strenuous exercise increase the risk?

In a cohort of over 92,000 women, of whom 3,187 had experienced a miscarriage, 2,551 were interviewed about their exercise habits. The data were obtained either during pregnancy or after an early miscarriage. The risk of early miscarriage increased as the amount of exercise increased, in particular for women in their first trimester who exercised more than 7 hours per week compared to non-exercisers. High-impact exercise such as jogging and racquet sports

was also associated with an increased risk of early miscarriage. However, there was no association between exercise and the risk of miscarriage after week 18.

High-impact or highly strenuous physical activity may then be associated with a higher risk of miscarriage during the “fetal implantation phase,” during which the blastocyst can still be flushed out of the uterus. This phase usually ends by day 24. Repetitive heavy lifting during the first trimester also might increase the risk for miscarriage. Accordingly, the IOC says elite athletes "may consider" limiting such activity.

A systematic review concluded that light to moderate intensity physical activity does not increase the risk of miscarriage and may perhaps decrease it.

Baby weight
Mothers who exercise during pregnancy are less likely to have large babies, i.e., greater than 8.8 lbs, and they are not at increased risk for having small babies (under 5.5 lbs).

Clinical trials examining the effect of exercise on newborn birth weight have prescribed exercise regimens of at least two or three 30-minute sessions per week, with the result being usually a minor reduction in birth weight. There are no published trials evaluating newborn birth weight in elite athletes, and the researchers caution extrapolating outcomes for elite-level training from the far more modest regimens prescribed in the clinical trials; elite athletes obviously exercise at a much higher frequency and intensity. In any case, reducing birth weight to below 8.8 lbs reduces the risk of obstructed labor, caesarean section and childhood obesity. Additionally, the IOC statement reports that physical activity during pregnancy either decreases the duration of labor or has no effect on it.

Preterm birth
Preterm birth is defined as birth of a live-born infant prior to the completion of the 37-week gestation period. Exercise during pregnancy does not appear to increase the risk for premature birth or induced labor.

In 2010, a Cochrane review of 14 randomized clinical trials compared women who performed aerobic exercise with those who did not, but the pooled estimate from the relatively small trials was not statistically significant to establish results on preterm birth. Since then, at least six randomized trials have been published, with sample sizes ranging from 3,554 to 32,055 pregnant women.

In five of these more recent studies, 55 to 60 structured aerobic exercise classes were offered from early to late pregnancy. Women in the intervention groups were compared to a usual care control group, with no differences in preterm birth rates between the groups in any study. In another study, sedentary women assigned to water aerobics had a similar risk of preterm birth to sedentary controls.

There is moderately good evidence, then, that there are few effects of exercise on preterm birth rate in the general population. There have been no studies of elite athletes.

***British Journal of Sports Medicine**, 2016, Vol.50, pp. 1297-1305, http://bjsm.bmj.com/content/50/21/1297*

Can We Fight the Rise of the Superbug?

As cold and flu season again rears its ugly head, it bears repeating that antibiotics do not fight infections caused by viruses like colds, flu, bronchitis and many sinus and ear infections. Instead, symptom relief is generally the best or only course of action for viral infections.

In fact, it is extremely important that we curb our overuse of antibiotics to decelerate the evolution of antibiotic-resistant bacterial strains. But it is not sufficient. Antibiotic resistance, even in the most prudent use scenarios, is still fast becoming a critical public health issue. We do not appear to have the mechanisms in place to keep pace with the rapid evolution of bacteria, in large measure due to a lack of public policy legislation combined with little free market incentive to develop the next generation of antibiotics.

A political morass

Funding for antibiotic research, as lifesaving as it obviously is, is not politically sexy, given that scientific progress is at best incremental and always uncertain, and so definitive legislative action eludes us.

The government is not only always fighting the perception that it has already over-committed public money (“read my lips”), but it is also too short-sighted to swiftly usher in policy changes that do not result in rapid and visible—and so politically attractive—change. The word "research" sounds just as nebulous and expensive as it actually is.

And from the perspective of Big Pharma, antibiotic sales—not to mention antibiotic research and development—are simply a losing gambit: Why spend millions of dollars on a product that a person might take once every ten years for no more than ten days, when drugs to lower cholesterol, fight erectile dysfunction or stave off depression are made to be taken daily by millions of people for the rest of their lives?

And yet, our current crop of antibiotic medications is fast becoming obsolete. The insidious, almost sci-fi fact about bacteria is that these bugs can *swap genes across species* rather than following the ordinary course of slow, generational adaptation by which other organisms are constrained.

The result is that it isn't just the next generation of a single lineage that becomes drug-resistant, but rather that the discovery of resistance is optimized to happen much quicker—and across vast bacterial populations.

This makes for a very hard target, and we are therefore likely to see a lot more MRSA (methicillin-resistant Staph infection)-type superbugs before this problem is dealt with competently. At the same time, inadequate understanding of when and how antibiotics work has led to abuses of drug intake, such as to incorrectly fight rhinoviruses. Overprescription is also not unheard of. Meanwhile, new household cleaning products and antibacterial soaps flood the market every day to further exacerbate the problem. All of this does not even address the deluge of antibiotics being pumped into our food supply.

MRSA created by medications

When these bugs evolve, producing changes in their genome that leave them no longer vulnerable to antibiotic X (whether that's methicillin, amoxicillin, penicillin, oxacillin or something else), at some point some portion of the bacterial population is resistant in the presence of the drug. If we then keep bombarding people with antibiotic X, we are in effect selecting for the bacteria that aren't sensitive to antibiotic X, thereby speeding up the very process of superbug natural selection. We are accelerating the creation of the one bug left standing that nothing can kill.

A bit of welcome news

So it comes as a slight silver lining that a new study published in the *British Medical Journal* looking into whether the incidence of pneumonia, meningitis, Lemierre's syndrome and other infections is higher in doctor's offices that prescribe fewer antibiotics for respiratory tract infections has found only an insignificant increase in cases.

Researchers examined data from over 600 U.K. general practices from 2005 through 2014. Practices in the lowest fourth of antibiotic prescriptions for respiratory tract infections (RTIs) had a "slightly higher" incidence of pneumonia and peritonsillar abscess than those in the highest fourth.

The researchers calculated that if an average-sized practice reduced its antibiotic prescriptions by 10%, it would distribute about 2,000 fewer antibiotic prescriptions for RTIs over 10 years. This would result in just 11 more cases of pneumonia and 1 more case of peritonsillar abscess during the same period.

What's more, antibiotic prescribing rate was not associated at all with mastoiditis, empyema, meningitis, intracranial abscess or Lemierre syndrome.

The authors conclude: "Even a large reduction in antibiotic prescribing was predicted to be associated with only a small increase in numbers of cases [of pneumonia and peritonsillar abscess] ... and this would be expected to reduce the risks of antibiotic resistance, the side effects of antibiotics, and the medicalization of largely self limiting illnesses."

Still, greater public educational efforts, incentivized R&D and courageous legislative action must all win the day if we are to meet the growing challenge of antibiotic resistance we see today.

***BMJ**, 2016, Vol. 354,i3410, http://www.bmj.com/content/354/bmj.i3410*

Kids Cardio Health Falls Short

The American Heart Association (AHA) lists seven criteria for ideal cardiovascular health in U.S. children, and the vast majority don't meet them.

The number one impediment was poor diet. Not surprisingly, the second main factor on the way to cardio compromise was physical activity behavior, or lack thereof.

The position statement resulted from an analysis of youth and adult data from the 2007-2008 National Health and Nutrition Examination Survey (NHANES). NHANES data are collected biannually and have proven to be reliable assessments of the health and nutritional status of the broader U.S. population.

Still, since only 4,000 to 5,000 children and adolescents are recruited for each examination, additional population-based sources were used to gain additional estimates of cardiovascular health prevalence.

The NHANES and other data allowed the researchers to examine "baseline prevalence" of various cardiovascular health components (not just high blood glucose levels, obesity, hypertension and the like but also behavioral components such as eating and exercise habits).

Ideal childhood cardiovascular health encorporates the following habits and metrics:

Healthy diet. An astonishing 91% of children had poor diets. The authors recommend the Cardiovascular Health Integrated Lifestyle Diet (CHILD 1).

The CHILD-1 diet was designed for kids who have high cholesterol, are overweight, have high blood pressure or other health problems, but the diet is a good idea for all children since it promotes healthy eating and a healthy weight, and with 91% of the children in the study falling short nutritionally anyway, it's safe to say that recommending the diet is sound practice.

The CHILD-1 diet, which children should transition to at age 2, works to:

- limit or avoid sugar-sweetened drinks
- encourage kids to drink water
- avoid trans fat

- encourage high-fiber foods
- limit sodium
- encourage kids to drink fat-free, unflavored milk
- teach kids about appropriate portion sizes based on caloric need for age, gender and activity level encourage a diet rich in fruits, vegetables, whole grains, fish and beans

At least an hour of physical activity per day. Among adolescents aged 16 to 19 years, only 10% of boys and 5% of girls got the recommended amount. The activity should be moderate or vigorous.

Healthy BMI. Roughly 10% of 2-to-5-year-olds are obese. In adolescents, that number becomes somewhere between one-fifth and over a quarter of that age group nationally, 19% to 27%.

Additional guideposts:

Total cholesterol under 170 mg/dL.

Blood pressure under the 90th percentile. Ideal blood pressure changes with gender, age and height. For guidance, you can view the NIH's blood pressure tables for children and adolescents here.

Fasting blood glucose under 100 mg/dL.

Tobacco avoidance.

The American Academy of Pediatrics has also recently issued guidelines on decreasing obesity risk, this time specifically in adolescents. Three recommendations for parents (and clinicians) that stand out are:

Focus on a healthy lifestyle. Rather than making it all about weight, simply demonstrating and discussing the positive aspects of a good diet and regular recreational play and physical activity will go further to embed agreeable habits into your child's routine.

Reinforce a positive body image. If a child is taking steps to manage or reduce overweight, or better still ignoring weight but attempting to combat their previously sedentary habits, the best practice is to make them feel good about their bodies. As in yoga, accepting where you currently are while acknowledging that every day is a new opportunity to improve will go a long way to establishing a sustainable routine. As the old adage goes, if you're facing in the right direction, all you have to do (quite literally in this case) is *keep on walking*.

Establish frequent family meals. Not only does this practice bring eating out of the shadows while promoting regularity in diet, it provides a great opportunity to lead by example by discussing individual gratifications achieved by recent individual physical activity—e.g., "I went

on a great walk today." The dinner table is also a perfect time and place for plotting family outings.

***Circulation**, 2016, Vol. 134, e236-e255, http://circ.ahajournals.org/content/134/12/e236*

***American Academy Pediatrics**, Aug. 22, 2016, AAP Clinical Report: Steps to Prevent Teen Obesity and Eating Disorders, http://tinyurl.com/jjf3mlo*

Breast Cancer Early Detection vs. Overdiagnosis

The *NEJM* has found, after a long-term analysis, that mammography for women who have no signs of breast cancer ("screening mammography") leads to more overdiagnosis than it does early breast cancer detection.

U.S. investigators analyzed population-based cancer registry data in women aged 40 and older. Data from 1975 to 1979, an era prior to widespread screening, were compared to data from 2000 to 2002, the most recent period for which 10-year follow-up data were available.

When widespread breast cancer screening began, incidence of small in situ tumors—meaning groups of abnormal cells that are not yet spreading—increased by 162 cases per 100,000 women, from 38% to 68%, or a 30% increase. Incidence of larger tumors decreased by 30 cases per 100,000, from 64% to 32%, a 32% decrease.

The logic in favor of early screening has always been to detect small malignant tumors before they grow large enough to cause symptoms. Effective screening should therefore lead to the detection of a greater number of small tumors, followed by fewer large tumors over time. "Small tumors" are defined here as less than 2 cm in diameter.

But a careful look at the data suggests that the downward trend of large-tumor detection was guided by an increase in detection of small tumors, not by a significant decrease in large-tumor incidence. In other words, after screening mammography became widely practiced, many more cases of cancer were detected on screening than would have ever led to clinical symptoms of cancer. The rate of large-tumor detection fell not because we got better at spotting cancer early, but because the percentage of large-tumor incidence in relation to overall cancer detections went way down—the result of there now being too many cancer detections, or false positives.

Based on the decline in the tumor size-specific case fatality rate, the study estimates that screening was responsible for no more than a third of the reduction in breast cancer mortality, the other 66% accounted for by improved treatment. And the risk of overdiagnosis appears to outweigh the benefit of modestly reduced mortality due to screening mammography.

The authors write, “Assuming that the underlying disease burden was stable, only 30 of the 162 additional small tumors per 100,000 women that were diagnosed were expected to progress to become large,” which implied 132 cases of overdiagnosis per 100,000 women. Overdiagnosis, then, is a significant and still under-recognized concern. Average-risk patients should ask their doctors to follow U.S. Preventive Services Task Force guidelines: screenings every two years starting at age 50.

Using probability to determine true risk

In the larger picture, this important study also illustrates how we as a culture, clinicians not excepted, too often struggle to understand statistics and probability, a topic broached in “Understand Probability To Make Smarter Health Choices,” in the Nov/Dec 2014 issue of *Running & FitNews*®.

We ought to dive a little deeper in the context of breast cancer screening to see how math plays tricks on us that can have real-world implications, such as in the form of alarming rates of overdiagnosis and false positive-reporting to patients.

In 2014 we looked at studies in Germany and the U.S. in which researchers asked physicians to estimate the probability that an asymptomatic woman aged 40 to 50 who has a cancer-positive mammogram actually has breast cancer if 7% of mammograms show cancer when there is none. While the correct answer was that a cancer-positive mammogram was due to cancer in only about 9% of the cases, 95% of American physicians estimated the probability to be approximately 75%.

Here is a slightly easier exercise that illustrates how to correctly use probabilistic thinking. Note that the following is a mathematical word problem—**not actual cancer data.**

Let’s say the facts are these: **100 out of 10,000** women at age 40 who participate in routine screening have breast cancer. **80 of every 100** women with breast cancer will get a positive mammography. **950 out of 9,900** women without breast cancer will also get a positive mammography. If 10,000 women in this age group undergo a routine screening, about what fraction of these women with positive mammographies will actually have breast cancer?

The answer is just 7.8%.

To arrive at that correct answer, begin by understanding that in this case, we want to know what percentage of the women with positive mammographies actually have breast cancer. So **how many positive mammographies** are there? That number becomes the **denominator** in a simple division problem.

Since 950 of the 9,900 women that do not have breast cancer will have a positive mammography, and 80 out of the 100 women who do have breast cancer will get a positive test result, 1,030 women will have a positive test result.

How many of those 1,030 women with a positive test result actually have breast cancer? Our hypothetical data tell us that 80 of the 100 women with breast cancer will get a positive test result, so 80 becomes the **numerator** of the division problem.

In this example, the fraction of women with positive test results who actually have breast cancer is 80/1,030, or .0777, or 7.8% probability.

Needless to say, conveying this information to a 40-year-old patient who just tested positive after a routine mammography is a lot less stressful than assessing her cancer risk at 10 times that. And that in itself is good for your health.

***NEJM**, 2016, Vol. 375, pp. 1438-1447,*
http://www.nejm.org/doi/full/10.1056/NEJMoa1600249?query=pfw&jwd=000013591515&jspc=

***CSA**, December 18, 2010, "An Intuitive Explanation of Eliezer Yudkowsky's Intuitive Explanation of Bayes' Theorem," by Luke Muehlhauser, http://commonsenseatheism.com/?p=13156*

Harnessing Your Kid's Defiance "For Their Own Good"

Among the more common and conspicuous behavioral changes beginning in adolescence and staying on to young adulthood is the emergence or intensifying of a defiant streak. And modern parenting trends suggest that we have begun to figure out that butting heads directly with this natural sense of rebellion, or worse, attempting to dictate it into submission with draconian disciplines, is largely a fool's errand.

Now researchers reporting in the Proceedings of the National Academy of Sciences have potentially game-changing insights to offer regarding how we may interact with, and in some cases harness, defiance in adolescents and young adults.

The study found that teenagers make wiser choices when they perceive healthy behavior as an act of defiance. Educators are learning that young people seem to often be more sensitive than adults to notions of social justice, autonomy and a sense of mission, at the same time that researchers are testing the effectiveness of framing good habits as acts of defiance. The results are promising.

Cultivating rebellion
The researchers randomly assigned just under 500 eighth graders to either read an ordinary health-class article—about the way the body processes food and with recommendations to consume a low fat and sugar diet, with colorful pictures of vegetables—or to read an exposé on the cynical manufacturing and marketing practices of some food companies. Specifically, the reading material pointed out how food manufacturers purposely reformulate ingredients not for health but for addictiveness, as well as how they deploy deceitful labeling strategies to make their foods appear healthy by skirting around labeling laws and regulatory practices.

Notably, the second group heard how food marketing executives successfully deceived adult authority figures. They were encouraged to view avoidance of junk food as a way to rebel against the food industry's control.

The next day, the students were allowed to pick snacks in an unrelated class as part of a long-planned celebration; teenagers who had read the exposé article were 11% less likely to choose at least one unhealthy snack (such as cookies, chips or cheese puffs) in favor of fruit, baby carrots or trail mix, and 7% more likely to choose water over cola or sugary punch.

These percentages may not seem dramatic, but in the estimation of the study authors, if the students sustained such subtle changes it would translate to the loss of about a pound of body fat every six to eight weeks.

Is, as *The New York Times* asks in their reportage of this study, teenage rebellion a potential asset to be cultivated rather than a threat to be quashed?

A 2009 study published in the American Journal of Preventive Medicine offers additional evidence. In it, researchers looked at an anti-smoking campaign known as "truth." One memorable spot from the early aughts featured a group of young people that piled up 1,200 body bags outside the headquarters of a tobacco company, the number derived from deaths attributed to smoking each day in America. A youth shouts into a megaphone up at a tobacco executive peering down nervously from his office window. Smoking is thus framed as an act of corporate submission rather than rebelliousness. The study estimated that the broader campaign prevented 450,000 young people from starting to smoke from 2000 to 2004.

Teens also seem to possess abundant focus and self-discipline when properly motivated. In another study, students who had been asked to reflect on the larger purpose of their learning were more likely to stick with solving tough math problems and resist watching online content or playing video games. Their self-control increased when they connected math to a larger cause.

Needless to say, admonishments from generations past such as "it's for your own good" go nowhere and only backfire. It appears to be time to stop criticizing and start tapping into teen defiance. Envision a world, as the leading proponents of this line of thinking do, in which each soda commercial provides a "booster shot of indignation rather than temptation." The junk food industry would be in effect paying to undermine their own unhealthful products.

No conspiracy theories needed

Recent evidence makes clear that it won't be hard to prove to teenagers that there is indeed a cynical and deceitful side to the food industry. The cache of historical documents released in September showing that the sugar industry paid scientists in the 1960s to downplay the link between sugar and heart disease is the latest example.

The internal sugar industry documents were discovered by a researcher at the University of California, San Francisco, and published in *JAMA Internal Medicine*. They strongly suggest that five decades of research on sugar, saturated fat and heart disease may have been largely shaped by the sugar industry.

It's important to avoid unintended consequences here, however. Since the sugar industry actively looked to scapegoat saturated fat as the heart disease culprit, we must be careful not to accidentally steer young people toward saturated fat excess as an act of rebellion.

In addition to the scandal surrounding the cynically named and now defunct Global Energy Balance Network (see *Running & FitNews* July/Aug 2015, "A Coke Fueled Controversy"), in October it was revealed that Coca-Cola and Pepsi gave millions of dollars to, and then lobbied against, attempts to improve the American diet. Specifically, the beverage giants gave generously to almost 100 prominent health groups while simultaneously spending millions to defeat public health legislation that would reduce soda intake.

The findings were published in the *American Journal of Preventive Medicine*, and document the beverage industry's prolonged financial outreach to the health community to actually silence criticism of their products' impact on public health and gain allies in the fight against soda regulations.

The silver lining here is that reshaping attitudes toward doing the right thing has been made easier in an information age in which deceitful practices have a way of coming to light, allowing teens to readily perceive a clear moral choice that was made obvious in spite of, rather than because of, the powers that be.

***The New York Times**, Sep. 12, 2016, "Can Teenage Defiance Be Manipulated for Good?" by Amanda Ripley, http://www.nytimes.com/2016/09/13/upshot/can-teenage-defiance-be-manipulated-for-good.html*

***JAMA Internal Medicine**, Sep. 12, 2016, Special Communication, Sugar Industry and Coronary Heart Disease Research: A Historical Analysis of Internal Industry Documents, http://jamanetwork.com/journals/jamainternalmedicine/article-abstract/2548255*

***American Journal of Preventive Medicine**,Oct. 2016, Sponsorship of National Health Organizations by Two Major Soda Companies, http://www.ajpmonline.org/article/S0749-3797(16)30331-2/fulltext*

Inflammation: It's Complicated

The body's complicated relationship to inflammation continues to intrigue us. While inflammation is a necessary part of the healing process, it can also lead to heart disease, stroke, arthritis and, recent evidence suggests, even Alzheimer's.

Inflammation is not all bad. It is a necessary part of the immune system and promotes bodily health. But just as a fire can provide good (warmth, light, etc.), the inflammation that helps heal us, when left unchecked, becomes analogous to a devastating wildfire, ravaging tissues, joints and blood vessels in its path and causing significant damage.

Acute inflammation is the necessary fire that surrounds and protects cuts, bruises and fractures as the body sends white blood cells rushing in to protect the area and red blood cells begin to repair the damage. This type of inflammation also occurs when you have the flu or pneumonia, offering protection from infection by battling invaders that may otherwise cause it, as well as contributing to the general healing process. Acute inflammation is characterized by the familiar sensation of heat, along with redness and swelling.

Chronic inflammation is the unchecked wildfire that can occur when the body's immune response consistently overreacts. "Autoimmune disease" is the catchall term for a state of immune-system overreactivity. ("Immune deficiency disease," by contrast, refers to an underperforming immune system. All are "immune system disorders.")

Autoimmune diseases are thought to have a variety of causes, but in many cases the cause is poorly understood. Environmental toxins have at times been implicated; inheritance of certain genes is also a factor. In the next issue we'll explore an alternate theory of autoimmune disease causation that is gaining acceptance among a growing body of scientists.

In any case, chronic inflammation is the result of autoimmune disease, but the latter is not always the cause of chronic inflammation. This is clear simply from the fact that chronic inflammation does not always produce autoimmune disease-type symptoms. Examples of problems unrelated to autoimmune disease that chronic inflammation can cause include Alzheimer's, stroke, cancer and heart disease.

Common autoimmune diseases include: rheumatoid arthritis, lupus, ulcerative colitis and Crohn's disease, multiple sclerosis, type 1 diabetes, Guillain-Barre syndrome (attacks on the nerve cells), psoriasis, Graves' disease (causing hyperthyroidism), and vasculitis (attacks on the blood vessels).

Cytokines and chronic inflammation

It is with regard to chronic inflammation that the complex role of cytokines enters the picture. Cytokines are small secreted proteins released by cells have a specific effect on the interactions and communications between cells. The term "cytokine" is a general one—there are many different types.

Specific inflammatory responses vary. It is common for different cell types to secrete the same cytokine or for a single cytokine to act on several different cell types. Sometimes problematically, cytokines are redundant in their activity—similar functions can be stimulated by different cytokines.

Additionally, they are often produced in a cascade, as one cytokine stimulates its target cells to make even more cytokines. For example, white blood cells (specifically, macrophages) are among the first types of cells on the scene, and they (among other functions) produce cytokines, which in turn (among other functions) regulate the behavior of yet more white blood cells (specifically, lymphocytes).

When white blood cells are directed to flood into, and then overstay their welcome in, an area of the body, they can begin to attack nearby healthy tissues and organs. Certain pro-inflammatory cytokines in spinal cord, dorsal root ganglion, injured nerve or skin are known to be associated with pain behaviors. They are also thought to generate abnormal spontaneous activity from injured nerve fibers or compressed or inflamed dorsal root ganglion neurons. These pro-inflammatory cytokines are among the type produced by the above mentioned macrophages that initiate the cascade of white blood cell-cytokine production. Cytokines therefore play a key role in the development and persistence of many pathological pain states.

Chronic inflammation due to obesity and overweight

If you are overweight and have more visceral fat cells—the kind of fat that builds up in your abdomen and surrounds your organs—the immune system sees those fat cells as a threat and pumps out more white blood cells. The longer you stay overweight, the longer your body remains in a state of inflammation.

Losing extra pounds, especially around the belly, can lower your risk. Other preventive steps include fighting gum disease (bleeding gums indicate inflammation), treating high cholesterol and quitting smoking. The toxins from smoking have a direct link to inflammation.

Dietary steps

Which foods are considered the best for reducing inflammation? A study published this spring in the *British Journal of Nutrition* found that polyphenols from onions, turmeric, red grapes and green tea lowered a marker for inflammation in the body. All types of berries are also rich in polyphenols, as are cherries and plums. Dark green, leafy vegetables like spinach and kale are also good choices. Olive oil, flaxseed oil, salmon, sardines and mackerel offer healthy doses of omega-3 fatty acids, which have long been shown to reduce inflammation. Note that many of these foods also promote weight loss and healthy weight maintenance.

***Harvard Men's Health Watch**, Sep. 2016, "Playing with the fire of inflammation,"* *delivra&utm_medium=email&utm_campaign=GB20160914-DOH&utm_id=251440&dlv-ga-memberid=10660158&mid=10660158&ml=251440*

***Cleveland Clinic**, Chemocare, The Immune System: Information about Lymphocytes, Dendritic Cells, Macrophages, and White Blood Cells, http://chemocare.com/chemotherapy/what-is-chemotherapy/the-immune-system.aspx*

***University of Rochester Medical Center**, How Wounds Heal, https://www.urmc.rochester.edu/Encyclopedia/Content.aspx?ContentTypeID=134&ContentID=143*

***Int Anesthesiol Clin**, 2007, Vol. 45, No. 2, pp. 27–37, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2785020/*

Tech Report: Combined Training and VR Can Lower Fall Risk

A randomized controlled trial involving five different European countries examined elderly adults with a high risk for falls, based on a history of two or more falls within the last six months prior to the study. The aim was to determine whether forcing subjects to continually adjust their steps on a treadmill by imposing obstacles in a virtual reality (VR) environment would improve the incident rate of falls by the end of training, which consisted of 45 minutes on the treadmill three times per week for six weeks.

The 302 study participants were aged 60 to 90 with varying levels of motor and cognitive deficits, from mild cognitive impairment to Parkinson's disease. They were each randomly assigned to either a treadmill routine or treadmill-plus-VR, which consisted of a motion-capture camera and a computer generated simulation projected onto a large screen. The visuals displayed real-life challenges including obstacles, multiple pathways and distractions that required continual adjustment of steps.

The incident rate of falls during the six months after the end of training was significantly lower in the treadmill-plus-VR group than it had been before training, whereas the incident rate did not decrease significantly in the treadmill-alone group. At six months post-training, the incident rate of falls was also significantly lower in the treadmill-plus-VR group than in the treadmill-alone group. No serious training-related adverse events occurred.

Age-associated motor and cognitive deficits increase the risk of falls, a major cause of morbidity and mortality. Because of the significant ramifications of falls, many interventions have been proposed, but few have aimed to prevent falls via an integrated approach targeting both motor and cognitive function. Older adults often fall due to problems negotiating obstacles, and these falls can involve both cognitive and motor deficits. The study shows that interventions to prevent falls should target both deficits. It also opens the imagination to how virtual and/or augmented reality might contribute to training and health in ways we have only begun to explore.

***The Lancet**, 2016, Vol. 388, No. 10050, p 1170–1182,* http://dx.doi.org/10.1016/S0140-6736(16)31325-3

Are Fitness Trackers Worth it?

A *JAMA* study has found that among young adults attempting to lose weight, adding a wearable device that tracks exercise and energy expenditure offers no benefit over a standard weight-loss intervention. The results are surprising, given the increased popularity of wearable technology and the growing notion that diary-making and accountability are key components to an effective weight-loss regimen.

In the study, 470 overweight or obese young adults were randomized to a standard or enhanced weight-loss intervention. All participants received a behavioral intervention that included calorie reduction, physical activity prescription and group counseling.

Only after six months did participants in the enhanced intervention group also begin wearing a sensor that tracked physical activity and offered feedback on energy expenditure. The standard intervention group simply monitored their diet and activity on a website, also beginning at the six-month mark.

What's interesting about this study is that the researchers attempted to isolate the fitness tracker variable specifically, not the monitoring of diet and activity that is generally thought to be important to weight loss plans.

At 24 months, the enhanced intervention group had lost significantly less weight than the standard intervention group. The fitness trackers lost just under 8 lbs on average, compared to 13 lbs on average for the standard group. Curiously, neither physical activity nor diet differed significantly between the groups during the study.

The study authors write: "Among young adults with a BMI between 25 and less than 40, the addition of a wearable technology device to a standard behavioral intervention resulted in less weight loss over 24 months. Devices that monitor and provide feedback on physical activity may not offer an advantage over standard behavioral weight loss approaches."

Clearly more research is needed to determine what mechanisms might be at play here. But for now, if you're reluctant to spend the money on a wearable fitness tracker, take solace in the fact that good old fashioned diary keeping appears to be as, or indeed more, effective in keeping you on your game.

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THE CLINIC

Eight Months of Patellar Pain

One day running my usual 10 to 15 miles a week 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? I'm 6' 2", 200 lbs.

Tom Katevatis
Raleigh, NC

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

What Are My Options For Osteochondritis?

I was recently diagnosed with osteochondritis dissecans (OCD) in my right knee. My doctor explained that this is essentially a piece of bone that has separated from the end of the bone. He recommends I have osteochondral allograft transplant surgery (OATS). I have already had meniscus surgery on this knee, about a year and a half ago. I'm wondering what the best course of action is at this point. I've been running for 22 years (I'm 52), and I can still jog slowly on a treadmill.

James Douglas
Round Rock, TX

There are many issues with osteochondritis, and the OATS procedure brings more into play. I assume that if allograft is anticipated there must be large OCD lesions, otherwise autograft tissue might be preferable. I would probably avoid surgery until you do not have other options. Patella-centering braces, NSAIDs, quadriceps strengthening exercises, and crosstraining would

all likely be helpful. I would avoid stairs, hills, and the like and never train to excess. Some patients use injections of viscous material like Synvics.

In the right circumstances OATS is a good procedure. However, if the lesion is small with intact articular cartilage, the bone scan normal, and your symptoms minor, then the real value of the procedure is less evident.

Larry D. Hull, MD
Centralia, WA

In order to make an assessment I'd have to see your MRI as well as an A/P longstanding view of both lower extremities to determine the size of the OCD defect, your weight-bearing alignment, and associated intraarticular knee disease. My experience with allograft osteochondral grafting has been very encouraging. Results, at least in the short term, are excellent.

Rob Meislin, MD
New York, NY

Where the Tendon Meets the Hamstring, Chronic Pain

I have been a runner since 1972 and had never had hamstring issues until I combined yoga and running. I have practiced Ashtanga yoga for over 11 years.

I was injured doing yoga a decade ago, and I have never gotten over the injury. In yoga it is referred to as "sit bone" pain, but I believe it is essentially a high hamstring injury. I am 54 years old, weigh 112 lbs, and am 5 feet 6 inches.

I have rested, crosstrained, etc. I am able to run, but not at the intensity or duration I once did and during yoga I have to be very careful when doing anything involving the hamstrings, which in yoga is almost every asana. For running, it means no hills and no interval training. I have gone from 6:30 mile pace to 8:00 mile pace.

There have been times when even walking was difficult, and sitting at length (especially in a car) was very painful. Also, at the height of the pain, I could not even do 10 lbs on the curl machine.

My new yoga teacher has indicated it may involve the sacroiliac joint and the pelvis being "locked." I'm interested to know your thoughts on this and would really appreciate any suggestions to help me move beyond this injury.

Rita Andersen
Holyoke, MA

While high hamstring tendinopathy is most commonly seen in runners, it can occur with other activities. Runners tend to develop this problem after years of running. Tendinopathy describes chronic injury to the tendon as opposed to an acute strain. As a result, stride length will decrease due to a loss of flexibility. Strength deficits will also be present. Single leg exercises to address the strength and flexibility deficits are essential to recover from this problem; stopping the offending activities may be a necessary component of the recovery process. Running through the problem will result in exactly what you are describing: a significant decrease in speed.

The "sit bones" (otherwise known as the ischial tuberosities) are on the bottom rim of each side of the pelvis. The majority of the hamstring tendons originate here. Sitting on a hard surface or in the bucket seat of a car will put pressure on this site, causing pain.

The pelvic bones attach to the sacrum, creating the sacroiliac (SI) joints. Any abnormality in the lower back and pelvis will impact other structures in the area. Chronically irritated proximal hamstring tendons may cause irritation of the SI joints. Irritation of the sciatic nerve and hip flexors may occur in conjunction with hamstring tendinopathy. It is also possible an alignment issue in your pelvis or back was the cause of the hamstring problem. Each step that you take is the result of a chain of events; a problem with one link affects the entire chain.

You should seek evaluation by a sports medicine specialist to assess alignment, mobility, strength and flexibility. You may discuss treatments in addition to exercises, such as platelet rich plasma (PRP) injections. Recovery will be a slow process, especially since the problem has been present for more than a decade. Hang in there with the therapy and you will likely note improvement in your symptoms.

Cathy Fieseler, MD
Tyler, TX

Without actually examining you I believe this pain could be caused from small tears in your hamstring or connected tendons. Since your hamstring attaches via tendon tissue, it is possible that the tears have occurred at the junction of the tendon and the hamstring muscle. Sometimes during yoga, participants will overstretch the hamstring causing these small tears. This can be the source of your pain.

If the pain is a result of performing yoga exercises on a firm mat, it is possible that the pain is caused by a bruising. In either case, pain while sitting for a prolonged period in a chair or in a car can be bothersome. This injury will also likely bother you when running, especially on an incline.

I would recommend that you perform higher repetition (15 to 20 reps) leg curls with low resistance. The first intent of these exercises is to stretch the hamstrings and glutes and increase blood flow to these working muscles. The second goal is to increase the strength in these muscles.

Gradually increase the resistance you are using until it is challenging to perform 10 to 15 repetitions in your leg curl exercise. If you experience any pain during either exercise, it is likely that it will be experienced when the muscles are in a stretched position, so pause in a stretched position for two seconds. Let any pain be an indicator that you have stretched sufficiently for that particular repetition. Use your pain to let you know when you have stretched far enough—never try to continue stretching through the pain.

You can place warm, moist heat on your hamstring/buttock area prior to working out to promote blood flow to the areas. Daily contrasting applications of heat before (20 minutes) and ice after (20 to 30 minutes) workouts will help to promote recovery.

When you feel that you are ready to return to running, you should begin on a flat surface and at a comfortable speed. And whenever you perform any exercise or work in a standing or seated position, try to maintain a slight bend at your knees, as this will reduce stress on your hamstrings and connected tendons.

John Comereski, MD
Ithaca, NY

Even Cycling Can Trouble The ITB

As a runner, I've gone over 25 years logging about 15 miles a week without pain or injury. Recently I've started biking several times a week, and I was surprised when I began to develop pain in my right knee. I've always been under the impression that the impact forces due to running were the major culprit of knee pain, and that biking was in fact what a lot of injured runners wind up resorting to permanently after they "retire" from running due to knee pain. The onset of this pain has almost exactly coincided with my new biking habit. It is on the outside of my right knee, and so it feels a lot like iliotibial band syndrome. Can bicycling cause knee injury?

Francls Goodsell
New Lenox, IL

It's important, first off, that you don't go too long guessing at a diagnosis: If your problem hasn't resolved after resting for a week or two, find a sports medicine professional for a thorough evaluation. Iliotibial band syndrome (ITBS) is most common among runners, but it can also occur in cyclists. Cycling might also exacerbate an underlying, mild ITBS condition. Whether or not your problem turns out to be ITBS, the first thing you should do is find a professional bike shop and have your bicycle evaluated for fit. If your frame is too big or too small, or your seat adjustment is incorrect for your body, it can increase the stress and strain on both of your knees, hips and back.

Once you are certain your bike fit is correct, you can minimize strain while riding if you avoid your big ring and stay in your saddle. When climbing hills, try spinning up rather than pushing a bigger gear. You will generate less force and will decrease the compressive load on your ITB at the knee.

As for recovery and future prevention, avoid running on a cambered surface (this doesn't apply if you always run on a treadmill). Make sure you are wearing the right running shoes for your foot and running style, without excessive mileage. It is also very important to keep the ITB stretched from the hip to the knee. Stand with your left side about 12 to 18 inches away from a wall or other support, and cross your left foot in front of your right foot. Lean toward the wall, with your right arm straight up, pushing your right hip away, stretching your arm toward the wall, until you feel a stretch from the hip downward. Hold for 30 seconds and repeat on the other side.

Pain can be minimized with massage (manually or by rolling on your side on a styrofoam roll); icing, stretching and topical anti-inflammatories (ask your pharmacist about these). It can be helpful to strengthen the gluteal muscles, particularly the gluteus medius, which is primarily responsible for abduction (moving the leg laterally away from the body), and is important in controlling pelvic motion. This may, in turn, reduce the tension on the ITB from above. To strengthen hip abduction, while lying on your side with the affected leg up and weight applied to the ankle, slowly lift (abduct) the leg and slowly lower it.

John Cianca, MD
Houston, TX

The Back Page

The RUN A MILE DAYS Youth Campaign: *growing the ARA – AMAA youth fitness project to enable more Mile running programs in schools*

The loss of fundraising at the Boston Marathon has spurred ARA and AMAA to push a grassroots fundraising campaign to raise the funds to keep the NATIONAL RUN A MILE DAYS project moving. We are seeking both donors and fundraisers who believe in our campaign to increase the daily and weekly physical activities of our young kids and youth in elementary and middle schools throughout the country.

It takes just $10 to provide the materials including a MILER T-shirt to any of our youth in schools or community groups . One average classroom is $250 and co-sponsoring an elementary school is anywhere from $1000 to $2500 depending on the size of the school.

To become a fundraiser go to this AMAA Miler Project site – go to CrowdRise.com and search for AMAA or copy this URL https://www.crowdrise.com/runamilefund

You can donate to the Youth Miler Project via Network For Good. Go to:
https://donatenow.networkforgood.org/runamilefund

AMAA's MCM Sports Medicine Conference 2016: Big move across the Potomac
New Partnership with MedStar Sports Medicine brings event to Georgetown U Hospital and Medical School

The 2016 Sports Medicine Meeting during Marine Corps Marathon weekend proved to be a big success. MedStar who owns several hospitals in the Maryland and DC Region formed a partnership with AMAA to bring the longstanding Sports Medicine Conference to one of the MedStar Hospital facilities, Georgetown University Hospital. The meeting was held on Friday October 28th in the Medical School Auditorium and associated classrooms. The meeting kicked off with Grand Rounds led by Natalie Stavas, M.D. who is in a pediatric fellowship at The Children's Hospital of Philadelphia (CHOP). Dr Stavas gave an inspiring talk on the developing brain in children and ties to obesity. Her enthusiasm and energy carried over to all the other top-notch speakers.