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REPORT

**Ready Get Set GO**

Get the best out of exercise while avoiding the hazards

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Many people have turned exercise into an intensive daily routine, as there are enormous benefits associated with a non-sedentary lifestyle. While exercise can improve our lives, health, outlook and functional life span, there are potential negative consequences if one fails to protect against the known side-effects of excess physical exertion.

Despite the mountains of data documenting the benefits of safe exercise, the public is largely ignorant of the molecular effects that over-exertion places on the body in the short and long-term. This review article will enlighten the physically active enthusiast about how to enhance the effects of exercise, protect against its negative effects, and increase energy levels so that longer workout periods are possible.

The many up-sides of exercise

Where do we even start to explain the total benefits of exercise? Several studies have shown that regular exercise can extend life span by an average of two years. Much more important perhaps, exercise greatly increases functional life span. Getting older does not have to be the downward spiral of lost functionality in everyday life, and any older person who has incorporated exercise into their schedule throughout their life can attest to that.

Exercise throughout life is optimal, but studies have shown people in their nineties can improve strength and increase muscle mass after only two weight training sessions per week for six weeks. Clearly, it is never too late to start.

Along with a good diet and supplement regimen, regular exercise can prevent bone loss, muscle loss, and slow down the negative cognitive changes that often accompany aging. Many studies have shown exercise improves mental acuity in the old and the young.

For decades, it has been considered scientific fact that the brains of adult mammals had a fixed number of cells. This idea has recently been challenged by several studies that showed exercise nearly doubled the number of cells in the area of the brain involved with learning and memory, known as the hippocampus. This study was done on mice, but regeneration of the hippocampus has now been shown in adult birds and monkeys. One of the researchers speculated "intense exercise in a natural environment may be associated with a need for increased navigation skills." The hippocampus is thought to be the control center for the learning processes involved with navigating and understanding our surroundings. Exercise is not just essential for our bodies but also our minds!

Moderate exercise has been shown to improve immunity, reduce body fat, and improve mood states. Regular exercise can greatly improve glucose metabolism and insulin sensitivity, reduce cholesterol levels, and help to prevent so many diseases it would take an entire book to even list them all! What else do we need to say?

The downside

"You mean there could be a downside to exercise?" the reader may be asking him or herself. Like all things in life, there is always a downside to any upside, and exercise is no exception. Though the benefits clearly outweigh the risks, we must acknowledge the potential downsides and look for ways to minimize them. Though moderate exercise has been shown to improve immunity, extreme and prolonged exercise has been shown to suppress the immune system. This is commonly called "over training syndrome," or OTS, and is common with athletes who train too long and too hard. One study found that a group of runners who trained for a marathon but did not compete were much less likely to get upper respiratory infections than the runners who

completed the race, showing how much such endeavors can take out of a person. The old saying, "too much of a good thing..." rings true with exercise also. Long term repetitive and impactful exercise is also associated with cartilage degeneration, and that's the last thing people, especially older people, need.

One well known effect of exercise is it raises oxidative stress and increases free radical production. Though exercise has been shown to improve antioxidant mechanisms, these defenses can be overwhelmed over time and the risks of increased free radical production are well known, such as damage to DNA and a host of pathologies best avoided. The issue of free radical production and oxidative stress is made more important when we factor in our various lifestyles and environment. For example, it has been shown that ozone greatly increased oxidative stress and is made even worse when we exercise in areas with high ozone levels. Most major cities, and many rural areas surrounding major cities, have highly elevated ozone levels at certain times of the year and people are told not to exercise at peak ozone times. Poor diet, smoking, certain drugs, and other lifestyle factors greatly increase oxidative stress. Therefore, exercise combined with poor lifestyle habits could do more harm than good, though most studies don't show that effect as much as one would expect. Translated, of all the terrible things a person can do to themselves on a daily basis, exercise still appears to be a positive rather than a negative in improving overall health.

Regardless, the trick to making exercise work for you, that is, have the highest benefit with the lowest risk, is to incorporate the proper nutrients into your daily life specific to the issues of exercise.

Nutrients for athletes or weekend warriors

Whether you are a casual exercise buff or a serious athlete of any age, there are nutrients you can take to prevent the problems mentioned above, improve the effects of exercise, and improve performance. For example, though it's prudent to avoid exercise at high ozone times of the day in places known to have ozone problems, even small amounts of ozone are known to affect lung function and oxidative stress. As just about everyone knows by now, antioxidants are the treatment of choice for combating free radicals and oxidative stress.

Several studies have confirmed the damaging effects of ozone on lung function and yet more studies have found adding antioxidants reduces the power of ozone to damage lung tissue. Even the simple addition of vitamins C and E to the diet of trained cyclists was shown to improve lung function. Dutch researchers gave 500 mg of vitamin C and 500 mg of vitamin E to well-trained cyclists, while another group took a placebo (neither the researchers nor the athletes knew who was getting the antioxidant vitamins, using a classic double blind placebo protocol). The researchers found that even small amounts of ozone affected the athletes' lung function and the addition of the antioxidants greatly reduced the negative effect of ozone on lung function of the athletes. It's well known that the lungs are particularly sensitive to oxidative stress, and the researchers theorized that the vitamins may protect the lungs against some of the effects of ozone by reducing the lung's inflammatory response to air pollution.

If the simple addition of vitamins C and E can have this effect, imagine what other antioxidants, or antioxidant supporting nutrients, such as NAC, whey protein, bioflavonoids, etc., can do? Clearly, a good all-around antioxidant rich multivitamin formula is a must for people engaged in exercise, and the additional intake of vitamins C, E, selenium, NAC and whey protein are highly recommended both pre- and post-workout.

Of course antioxidants have many functions in addition to combating ozone damage, such as improving immunity, a concern to athletes who may suffer from OTS. Whey protein has been shown to improve the specific areas of the immune system depleted by intense exercise. In particular, several studies have shown whey protein increases glutathione, the body's most important water soluble antioxidant that is essential to immunity. One pilot study purposely caused OTS in several athletes to study the effects on the immune system. The doctors were able to reverse the immune suppression caused by over training syndrome by adding 40 grams of whey isolate to the athletes' diets per day. Antioxidants, and antioxidant-increasing nutrients such as whey, are what athletes and active people can count on.

Some studies have shown exercise increases the use and excretion of minerals. Mineral status is particularly important to older individuals, and a good mineral supplement containing highly bioavailable forms of calcium, magnesium, potassium, and boron combined with a good diet is recommended. Of course, healthy joints are needed to exercise, or to be functional throughout life for that matter. Nutrients known to improve joint health/function such as glucosamine and chondroitin, SAMe, hydrolyzed gelatin, omega-3 fatty acids, GLA and antioxidants can be added into the diet of people who exercise and are concerned about joint health. These nutrients are particularly helpful to active people who already have joint problems they wish to address.

The above list is not complete but meant to give people a general idea of the many compounds out there that can be added to the diet of athletes and active people to combat the specific issues exercise may bring up. Most of the nutrients in this article have been covered at length in the pages of Life Extension magazine, so people should look through back issues if they need more details on each nutrient.

Performance

The subject of enhancing athletic performance could very well be the most confusing and controversial section of this article. There is an extensive, virtually endless list of nutrients claimed to improve athletic performance. Covering them all, much less confirming or debunking their effectiveness, is beyond the scope of this article. But we'll do our best.

Many of the supplements on the market reported to increase performance do improve overall health, but have not been substantiated to improve athletic scores. For example, although lipoic acid, L-Carnitine and CoQ10 have been pushed as performance enhancers by some companies, neither has a stitch of convincing research to show either has any effects on performance. The importance of coenzyme Q10, lipoic acid and carnitine, however, lie in their ability to prevent age-related mitochondrial exhaustion. Intense exercise generates lots of free radicals that are especially damaging to the mitochondria. This means that athletes and active people should supplement with at least 100 mg a day of coenzyme Q10, 1000 mg a day of L-carnitine or acetyl-L-carnitine, and 300 mg a day of alpha lipoic acid.

Some research suggests that antioxidants can improve performance while others show no benefits. Yet as previously stated, many supplements that are lacking in data showing they improve performance are clearly good for you and should be looked at in that light. However, taking them in the hopes you will run faster or lift more weights may prove disappointing.

One clear-cut supplement that has been shown to increase strength and lean body mass is creatine monohydrate. Some studies show clear-cut performance enhancement from creatine while some do not. The general consensus is that creatine is best for activities that require explosive short duration activities, such as weight lifting or sprinting, but some endurance athletes do feel they benefit from using creatine even though the research has been contradictory on that point.

Creatine may also have several cross-over uses into health. Several studies have confirmed it appears to lower cholesterol levels by up to 15% by unknown mechanisms. Just as promising, several studies suggest creatine can be helpful in diseases that attack the neuromuscular system; several researchers are already making recommendations for using creatine with such diseases. Creatine and several creatine derivatives may also be useful in certain pathologies of the heart where energy production of the heart muscles are affected. Creatine may also come in handy for those afflicted with certain diseases that cause muscle wasting, such as AIDS, but more research is needed for any definitive recommendations to be made.

Though creatine has been shown to be an exceptionally safe supplement in all the research studies to date, it may not be appropriate for everyone. People with impaired kidney function might be wise to avoid creatine supplements at this time.

Whey protein has been the protein supplement of choice for athletes and active people, and for good reason. Though performance would probably not be affected by the simple addition of whey to a person's diet, active people, certain athletes and older individuals are known to require additional protein. Considering whey has the highest biological value of any protein yet studied, and offers additional health benefits, it's no wonder it's the number one selling protein supplement on the sports market. Whey is a true "crossover" product. Though it has become a staple for most athletes, its confirmed ability to prevent cancer in animals, increase immunity, raise glutathione levels and possibly retain muscle mass makes it a true health product in its own right. People would be wise to see it that way.

Perhaps one of the more controversial supplements, ephedrine/caffeine (EC) mixtures have been shown to improve performance in many ways. Athletes and active people like to take an EC mixture prior to exercising for increased energy levels. There is also no doubt that it improves fat loss when a person is on a reduced calorie diet, and studies that looked at the combination showed it clearly helps to reduce body fat while preserving muscle mass. Though some studies suggest that the addition of aspirin to the EC combo enhances the thermogenic effect, a head to head comparison has yet to be done. Though the potential side effects of the EC products have been greatly over stated by the "don't confuse us with the facts" media, EC products are not for everyone. Studies to date have shown the side effects to be usually mild, transient and short lived. Since EC products are stimulants, anyone with high blood pressure, people using MAO inhibitors, pregnant women and men with benign prostate enlargement are warned against using the EC products at this time. It is also important to not take more than 16 mg of ephedrine and 40 mg of caffeine in any one dose before exercise. As already mentioned, those with hypertension should not take any EC product before heavy exercise.

The proper use of natural thermogenic compounds such as ephedrine and caffeine can be an energy pick-me-up prior to exercise or used as an adjuvant during a weight loss program, but should be used prudently and are not for everyone, though the research to date has shown them to be quite safe, in fact. It is important to understand that losing weight using EC products is a gradual process that takes about three weeks of moderate dosing in order for the body to start burning significant body fat.

Conclusion

Exercise has its ups and downs, to be sure. The key to making it work for you is to understand the benefits that lifelong exercise can offer, while evaluating the many options available to those looking for a supplement regimen that may help offset the risks involved with such activities.

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Make your workout work harder!

The benefits exercise offers are numerous. But as the body enjoys the results, it also develops certain needs. Weight lifting, sprinting and other intense anaerobic exercise depletes ATP and greatly increases the demand for creatine. Synthesized from the amino acids arginine and glycine, creatine maintains higher levels of ATP during exercise and enhances physical performance while minimizing fatigue. Creatine NGH consists of a unique combination of L-ornithine HCl, ornithine alpha-ketoglutarate, glycine, L-arginine, L-glutamine, L-lysine, niacinamide ascorbate, L-taurine and pyridoxyl 5 phosphate. It provides optimal supplementation for athletes-just one teaspoon yields the equivalent of creatine found in 2.2 lbs (1 kg) of uncooked red meat. And Creatine NGH is also the most economical, stable and most highly assimilable form of creatine.

If your workout regime doesn't include creatine, you're not getting the best out of it

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