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Athletic performance enhancement with Ayurvedic supplements

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Introduction

Physical activity and exercise is one of the main foundations of health and well-being. Exercise is an essential way which can stimulate our vitality, strength, and natural healing mechanisms of body. Our culture seems to have love-hate relationship with exercise and sports. On one hand, spending on sporting events and sporting products are at its highest level; on the other hand, rates of obesity and metabolic diseases has been steadily increasing for decades.

When it comes to professional competition, even at college level, we love our athletes to be of elite quality. Young athletes in games like football and basketball are major source of revenue stream for colleges and businesses alike. In 2010, NCAA football grossed total profits of $1.1billion;[1] March Madness 2013 grossed a total of 1.15billion in ad revenue alone.[2] These athletes are encouraged and supported in every possible way – as long as they perform.

On the other hand, children in USA are the least active children on the planet. The physical activity report card of 2014,[3] by National Physical Activity Plan found the following trends among children and adolescents (Table 1).

Table 1 National Physical Activity Plan among children and adolescents

Grades (A-F)	Measure
D -	Physical activity: About 42% of 6-11 year olds and only 8% of 12-17 year olds get 60 minutes of physical activity 5 days per week
D	Sedentary behavior: Most children in the US have a 2+ hours in front of television or computer for every 1 instance of play/activity.
F	Active transportation: less than 13% of children walk or bike to school.

These trends indicate that our culture is more interested in student athletes for their talents rather than health-care and encouragement. This cultural message seems to give the wrong impression to our youth - who either excel in sports OR may quit physical activity altogether. Stress of performance is that high that many professional athlete use banned performance enhancing drugs. Problem is that deep seated that many name brand athletes have confessed using banned performance enhancing drugs. Besides being illegal these performance enhancing drugs comes with slew of severe side effects. In recent years, there have been dozens of professional athletes (baseball players, Olympians, elite cyclists, etc.) have been embroiled in scandals involving performance enhancing substances (PES). These professionals are a result of unhealthy cultural pressures on athletes.

These wrong messaging can also occur in the local or family environment of the athlete as well. A recent study indicates that familial and social pressures for performance may encourage our young athletes to start using performance enhancing substance (PES).[4] These students may take on such behavior for improving self-esteem and social standing. Another survey study found that as many as 5-17% of student's athletes in USA use PES's on a state-by-state basis.[5]

Among college athletes, use of PES's is more prevalent among male athletes, who participate in more competitive and aggressive sports.[6] These students were also found to be at a higher risk of cigarette smoking, illicit drug use, drinking and driving, and alcohol abuse disorders.[7]

The risks of performance enhancing substances

The United States Anti-doping Agency outlines a long list of side-effects of using a variety performance enhancing substance (PES). Some are listed below[8] (Table 2).

These side-effects represent a short list of all possible adverse effects of long-term use of PES's. The unhealthy social and cultural demands that drive student-athletes combined with adverse effect listed above put the youth at a high risk. This makes the need for natural alternatives which are safe and without any side effects, more urgent.

Benefits of exercise

Exercising regularly is the most important for developing exercise tolerance, as well as improving stamina and endurance. Benefits of exercise are well-documented and provide tremendous protection for health in the long-term.

Regular physical activity has the direct effect of promoting adaptability of the heart, the vascular system, and the nervous system. Physical activity also promotes harmonious relationship between respiratory system, cardiovascular system, nervous system, and endocrine (hormonal) system. These stimulating and harmonizing effects confer disease prevention. Researchers have demonstrated positive effect of exercise on cardiovascular and inflammatory disease.

. Regular exercise resulted in reduction of various inflammatory signaling molecules; these include TNF-alpha, IL-6, INF-y.[9] The anti-inflammatory effect was specific to protecting the cardiovascular system; this was demonstrated by reduction inflammatory markers CRP and Homocysteine.[9,10] Adhesion factors that promote adhesion of cholesterol to blood vessels to create plaque, vascular cell adhesion molecule-1 (VCAM-1) and intercellular adhesion molecule-1 (ICAM-1) were reduced; thus indicating protection from plaque formation in blood vessels.[9] Doing up to 40-45minutes of daily exercise is most beneficial. Also, interval exercise that alternates between high intensity and low intensity activity are more beneficial to burn calories and improve endurance.

Table 2 Side-effects of using a variety performance enhancing substance (PES)

Growth factors, peptide hormones (EPO, HCG, ACTH, etc.)	Anabolic Agents (like Testosterone)	Pharmaceuticals like beta-agonists, diuretics, etc.
High blood pressure (EPO, HCG)	Liver Damage	Irregular heart beat (palpitation)
Blood cancer/leukemia (EPO, HCG)	Pre-mature stop of bone growth	Headaches
Anemia (EPO)	Stunted growth/disruption of puberty	Nausea
Stroke (EPO)	Vascular plaque that can cause heart attack or stroke	Muscle Cramps
Heart attacks	Aggression "Roid rage"	Nervousness
Feminization (HCG)	Withdrawal may be associated with depression and even suicide (in few cases)	Dizziness or fainting
Thyroid problems (HCG)	Infertility	Loss of co-ordination and balance

Table 3 Total performance in the experimental group was 24% better than total performance by control group

Tests	Control (% improved)	Experimental (% improve)	The difference
Upper body	2%	73.22%	71.22%
Core	0.83%	17.22%	16.39%
Lower body	6.63%	17.66%	11.03%
Total performance	5%	29%	24%

Herbs that enhances athletic performance

Withania somnifera, Ashwagandha is a popular herb in many natural health traditions. It is well known for its capacity as an adrenal tonic - which helps cope with stress and anxiety-like problems. Clinical studies have demonstrated that Ashwagandha can help to cut down the stress hormone (cortisol) by 30% and reduce anxiety by nearly 50% within 60days of use.[11] By cutting down the demand for cortisol hormone, Ashwagandha helps to shift the production of hormones towards more anabolic hormones like DHEA and Testosterone. Researchers have also confirmed this testosterone building effect of Ashwagandha in animal and human studies.[12,13] Testosterone is important anabolic hormone: it helps to build muscle tissue, strength, promotes regeneration of tissues, while enhancing mental vigor and vitality.

In Ayurveda, Ashwagandha's actions are described as Balya (that which gives inner strength and vitality) and Breehana (that which improved muscle bulk). Clinical studies have been done validate this classical knowledge. Among healthy volunteers, Ashwagandha given for 30days in escalating dose helped to improve total muscle strength.[14] The herb also significantly lowered total cholesterol and LDL cholesterols in these volunteers. In a study with children, 111 young volunteers were given Ashwagandha-infused Ghee (clarified butter) preparation or Ashwagandha granules.[15] Over the course of 60days, children receiving Ashwagandha infused ghee had improvement of 38.88% and those receiving granules had improvement of 50% in muscle strength – both significantly better than placebo effect.

Studies have also shown benefits among professional athletes. In a study on teenage hockey players, Ashwagandha was given to 16 players and placebo for other 16 players.[16] After taking 500mg Ashwagandha capsules twice a day for 8weeks, players in the experimental group had better hemoglobin and improved VO_{2max} (capacity to carry oxygen) in blood compared to players in placebo group, demonstrating that Ashwagandha improves energy supply to muscles during exercise. In another experiment, 500mg Ashwagandha capsules were given to elite cyclists, 20years old on average.[17] Eight weeks supplementation with Ashwagandha improved VO_{2max} by 13%; time of exhaustion was also improved significantly. This study demonstrated that Ashwagandha helped to improve energy efficiency and endurance of the cyclists.

Terminalia arjuna, is commonly known by the name Arjuna. This herb is a powerful heart tonic that is commonly used in various cardiovascular conditions by traditional Ayurvedic physicians. A review of studies on the cardiac effect of the herb outlines that: Arjuna helps to prevent fibrosis and oxidative damage to the heart; it promotes activity of anti-oxidant enzymes when heart is under stress; additionally, anti-inflammatory activity of Arjuna prevents excessive injury.[18] These actions have a tonic effect on the heart tissue, thus promoting healthy function of the heart muscle.

Among patients with chest pain related deficient blood flow to the heart muscles (a condition called Angina), Arjuna has proven to be very effective. In one study, 58 patients of heart failure with NYHA stage II & III heart disease were given 500mg of Arjuna, three times a day.[19] The herb improved exercise tolerance and reduced clinical symptoms among these patients as effectively as conventional drug isosorbate mononitrate (40mg/day). In patients with NYHA stage IV heart failure, Arjuna was given in addition to conventional drug.[20] Patients receiving the herb demonstrated improvement in cardiac efficiency.

Among healthy young adults, Arjuna is often used as preventive herb that has relaxing effect on the cardiovascular system. Healthy young adults receiving a combination of Arjuna and Ashwangandha show great benefit from the combination. In a clinical study, 500mg of each herb was given to health young adults to test effect on physical performance and cardio-respiratory endurance.[21] After taking the herbs for 8weeks following results were seen.

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Arjuna improves cardiac efficiency [20]
a. Increased strength of contraction
b. Improved ejection fraction
c. Reduced heart rate

Improved VO2max – 4.9% improvement in efficient energy consumption

The combined effect of Arjuna and Ashwagandha[21]
a. Improved VO2max – 4.9% improvement in efficient energy consumption
b. Improved bulk muscle strength - 3.6% improvement "average absolute power" of lower limbs muscles
c. Improved velocity
d.Lowered blood pressure

These studies and more confirm the traditional knowledge of Ayurvedic physicians and affirm the effectiveness of these herbs as alternatives to otherwise dangerous performance enhancing drugs. The gracious Mother Nature provides us with a safer and effective alternative for our children.

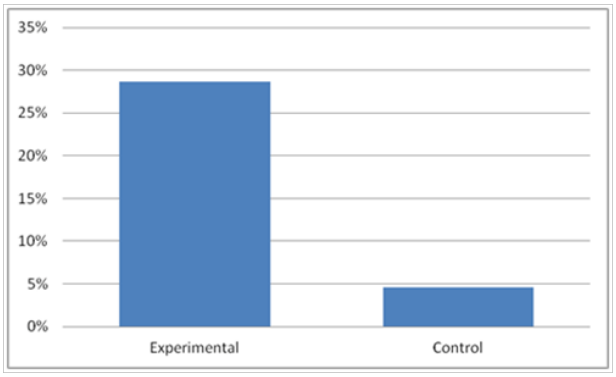

Figure 1 Comparative Difference Experimental Vs. Control.

Story of high school students and experiment with arjuna and ashwagandha

In January of this year (2015) three students from the Tesla STEM high school approached me for advice. They wanted to do a clinical experiment for the upcoming science fair. After some deliberation, we decided on doing a study on the herbs Ashwagandha and Arjuna for their effect on exercise capacity. The visionary students: Sindhooja Mullapudi, Prerana Annapantula, and Elysia Midorikawa - worked with me to design the experiment.

Experiment design

A. 18 students were recruited - divided into two groups - Experimental and control

B. Both groups underwent exercise performance tests before the experiment:

   a. Upper body - Push-ups

   b. Core - Sit ups

   c. Lower body - jump rope, running, squats

C. Students in the Experimental group received:

   a. 1 capsule (500mg) Ashwagandha, three times a day

   b. 1 capsule Arjuna Heart™, three times a day

   c. Dosage for both supplements was doubled in the second week to 2 capsules, three times a day.

D. At the end of the experiment (2weeks later), exercise performance tests were repeated.

All supplements were donated by the Ayush Herbs Inc., an Ayurvedic Herbal supplement supplier. We chose the supplements for their quality and purity. This experiment would not be possible without this generous donation from the company. So, I want to thank Ayush Herbs for supporting the children in their quest for knowledge.

I. Arjuna Heart - a cardiovascular tonic formula

II. Ashwagandha - a 500mg extract of Ashwagandha root powder

Results

The exercise performance of both groups was tested at the end of the two week trial. Performance at the end was compared with the initial performance to measure difference. Students in the experimental group demonstrated significant improvement compared to control group in each category. Improvement in upper body capacity was the highest, averaging 71% better than control group. Core and lower body strength also improved significantly, 16% and 11% respectively. Total performance in the experimental group was 24% better than total performance by control group (Table 3).

This small and amateur study by these gifted students showed that within 2weeks, the supplementation with these herbs may improve exercise performance to 124% compared to baseline (Figure 1).

Through the means of this experiment, Sindhooja, Prerana, and Elysia educated themselves, their classmates and their community about these great alternatives for enhancing physical performance and endurance without using performance enhancing drugs.

For their next presentation, they will be presenting their data at the Washington State Science Fair and Future Business Leaders of America.

(They won first prize) needs to write about this too.

Conclusion

Performance enhancing drugs uses is very common in young as well as professional athletes. I remember when my son Gunny Sodhi was in high school, he was keen to use performance enhancing steroids for bulking and building muscles. I remember we had a very interesting talk and it took lot of persuasion to avoid use of anabolic steroids. To my surprise all the anabolic steroids were available in Bellevue, Washington. Some time we may want to fall to trap for short term gain, but long terms side effects can be permanent, one of them being infertility along with many others. Herbal medicine can provide safe and natural alternatives and this small experiment by the students proves it. Congratulations to girls for taking such a keen interest in proving the power of natural medicine.

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Conflicts of interest

Author declares there are no conflicts of interest.

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