

# EFFECT OF ASHWAGANDHA (WITHANIA SOMNIFERA) ROOT POWDER SUPPLEMENTATION ON THE CORE MUSCLE STRENGTH AND STABILITY IN HOCKEY PLAYERS

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## ABSTRACT

*Withania Somnifera (WS) is having significant effects on anti-inflammatory, nervine tonic, nerve soothing, antioxidant, immunomodulator, free radical scavenger, adaptogen, antiarthritic, antispasmodic, anti-stress and anti-cancer. But ergogenic value of WS as nutritional supplement is yet to be established. Objectives: Present study was designed to investigate the effect of supplementation of WS on the Core Muscle Strength and Stability in Hockey Players. Method: Thirty two male hockey players, with a mean age of  $17.3 \pm 1.8$  years and BMI  $20.7 \pm 2.8$  kg/m<sup>2</sup> volunteered for the study. Subjects were randomly assigned into two groups Group I (n= 24): Withania somnifera group (experimental group) and Group II (n=24): Placebo (control) group. The experimental group received 500 mg capsules of aqueous roots of Ashwagandha twice daily for eight weeks, whereas the placebo group received starch capsules. Core Muscle Strength & Stability was assessed with Mackenzie B. (2002) Core Muscle Strength and Stability Test in both experimental and control groups before and after the administration of Withania somnifera and placebo respectively. Results: A significant improvement in the Core Muscle Strength & Stability after 4 weeks ( $t = 2.99, p < 0.021$ , on tail rest) and 8 weeks ( $t = 9.05, p < 0.02$ , one tail test) in experimental group was found. Whereas, no significant improvement in the control group for Core Muscle Strength & Stability after 8 weeks of placebo supplementation was found. Conclusion: Supplementation of Withania Somnifera improves Core Muscle Strength and Stability in young hockey players.*

*Key Words: Withania Somnifera, Core Muscle Strength, Core Muscle Stability and Placebo.*

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## INTRODUCTION:

The plant *Withania Somnifera* commonly known as “Ashwagandha” is well known for its therapeutic use in the ayurvedic system of traditional medicine. It has been used as an antibacterial, antioxidant, adaptogen, aphrodisiac, liver tonic, anti-inflammatory agent (Puri HS , 2003). It is a reputed health food and herbal tonic and used for cardiovascular diseases in ethnomedicine. It is available for human use either as a single herb or an ingredient of polyherbal or herbomineral formulations. *Withania somnifera*, also known as Indian ginseng, widely used in

the Ayurvedic medicine, belongs to the family of Solanaceae. Leaves, fruits, seeds, shoots and roots of this plant have all been used traditionally as well. The roots of *Withania Somnifera* contained 35 chemical constituents. Withaferin A and withanolides, the active ingredients contribute to the most of the biological actions of *Withania*. Furthermore, the roots of this plant are reputed to promote health and longevity by augmenting defense against some diseases, arresting the aging process, revitalizing the body in debilitated condition, increasing the capability of individual to resist adverse environment factors and by creating a sense of mental well being (Mishra LC; 2003).

Aphale et al. (1998) reported in a study conducted on rats, intake of ginseng and ashwagandha for 90 days, researchers found significant increase in body weight, food consumption and liver weight, and improved hematopoiesis. They did not reveal any toxicity of brain, heart, lung, liver, spleen, kidneys, stomach, testis and ovaries. Further the side effects of WS were not significantly different from those experienced by placebo-treated individuals Cooley et al. (2009) and Chopra et al.(2004). The human doses of Ashwagandha are generally in the range of 4-6 g/day and expected to be safe and non-toxic. *Withania* contains active ingredients like steroidal alkaloids and lactones known as “withanolides”. Withaferin A and withanolide D are the two main withanolides that contribute to most of the biological actions of *Withania* (Matsuda et al. 2001; Sharma V et al. 2011). Stress, as a major cardiovascular risk factor leads activation of sympathoadrenal and hypothalamic pituitary adrenal (HPA) axis and causes oxidative stress. *Withania* possesses a potent anti-stressor effect and is reported to alleviate stress induced changes and provides cardio protection in ischemic rats similar to the properties ascribed to adaptogens like *Panax ginseng*. It also increases heart weight and glycogen in myocardium and liver indicating intensification of the anabolic process and enhances the duration of contractility as well as coagulation time (Dhuley 2000). So, this study was planned to assess the effect of Ashwagandha on hypertensive subjects.

Long term strenuous exercises release of free radicals that causes oxidative damages of varied amount on different systems of human body. Stress can cause increased peroxidation of lipids, while decreasing levels of the antioxidant enzymes catalase and glutathione peroxidase. When Ashwagandha extract was administered by re-searchers one hour before a daily stress-inducing

procedure, all of the aforementioned parameters of free radical damage normalized in a dose-dependent manner Bhattacharya et al. (2001). Thus, ashwagandha probably is safe without serious side effects. There are only few scientific clinical studies showing effect of WS on selective parameter of exercise performance after regular administration when given as supplements. The present study was therefore designed and performed to assess the effects of *Withania somnifera* (Ashwagandha) on the Core Muscle Strength & Stability which is the key for all form of sports/games.

#### METHODOLOGY:

The present randomized controlled, parallel group, single blinded study was conducted on thirty two male hockey players, with a mean age of  $17.4 \pm 1.7$  (aged between 16 to 19 years) years and BMI  $20.9 \pm 2.9$  kg/m<sup>2</sup> from Shri Guru Hari Singh Hockey Academy, Shri Jiven Nager, Sirsa, Haryana, who volunteered for the study. Subjects were randomly assigned into two groups using the chit in a box method, Group I (n=16): *Withania somnifera* group and Group II (n=16): Placebo (control) group. *Withania somnifera* was used in the form of a standardized aqueous root extract was obtained from Central Council for Research in Ayurveda and Siddha (CCRAS), Delhi, India. Prior to the start of data collection, participants were explained about the drugs and previous research supporting the effectiveness on physical performance and possible side effects due to overdose. Only then the subjects who volunteered to participate in the study were recruited. A written informed consent was taken from each participant and their parent prior to recruitment.

Quality and dose of drug was decided after consultation with the Ayurvedic Medical Officer of civil hospital, Sirsa. 500mg of roots of WS and 500mg of sugar power was filled in gelatin capsules and stored in air tight containers and in room temperature below 30°C throughout the experiment. Drug and sugar capsules were given to their respective groups (Experimental and Controlled) in the dose of 1 capsule/day orally with milk after meals at night for 8 weeks under the personal supervision of researcher. Subjects were unaware of which group they were in and which drug they were to receive. It was thus a single blinded study, where all the subjects were completely unaware of drugs which they were going to consume. Core Muscle Strength &

Stability was assessed with Mackenzie B. (2002) Core Muscle Strength and Stability Test of both experimental and control groups were measured before and after the administration of *Withania somnifera*. The data was analyzed by student 't' test(one tail) with Statistical Package for Social Sciences (SPSS - 20) software.

## RESULTS:

Results of the table- 1 indicates that the mean Pre Test and Mid Test (After 4 Weeks) Core Muscle Strength & Stability of placebo group (control group) before the supplementation of placebo (Pre Test) is 49.34 and after 4 weeks supplementation of placebo (Mid Test) it is 51.02. The mean difference is 1.68, which is in favor of mid test. The t value is 1.25, which is less than the table value of 1.68 at 0.10 levels (one tail test) of significance for 40 degrees of freedoms.

Table – 1  
Comparative status of Pre Test and Mid Test Core Muscle Strength & Stability in  
Placebo Group (Control Group)

S.No.	Phase	Mean	S.D	Mean Difference	S.E.D	t – Value	P Value
1.	Pre Test	49.34	4.81	1.68	1.347	1.25	Not Significant
2.	Mid Test	51.02	3.87				

Similarly mean Core Muscle Strength & Stability of placebo group (control group) before the supplementation of placebo (Pre Test) is 49.34 and after 8 weeks supplementation of placebo (Post Test) it is 51.54. The t value is 1.58, which is less than the table value of 1.68 at 0.10 levels (one tail test) of significance for 40 degrees of freedoms.

Table – 2  
Comparative status of Pre Test and Post Test Core Muscle Strength & Stability in Placebo  
Group (Control Group)

S.No.	Phase	Mean	S.D	Mean Difference	S.E.D	t – Value	P Value

1.	Pre Test	49.34	4.81	2.20	1.396	1.58	Not Significant
2.	Post Test	51.54	4.17				

Whereas table - 3 indicates that mean Core Muscle Strength & Stability of Experimental Group before the supplementation of Ashwagandha (Pre Test) is 48.86 and after 4 weeks supplementation of Ashwagandha (Mid Test) it is 52.87. The mean difference is 4.01, which is in favor of mid test. The t value is 2.99, which is more than the table value of 2.42 at 0.02 levels (one tail test) of significance for 40 degrees of freedoms. It means that there is a significant improvement in the Withania Somnifera group (Experimental Group) for Core Muscle Strength & Stability after 4 weeks of Ashwagandha (Withania Somnifera) supplementation.

Table – 3

Comparative status of Pre Test and Mid Test Core Muscle Strength & Stability in Withania Somnifera Group (Experimental Group)

S.No.	Phase	Mean	S.D	Mean Difference	S.E.D	t – Value	P Value
1.	Pre Test	48.86	3.93	4.01	1.338	2.99	Significant at 0.02 level
2.	Mid Test	52.87	4.71				

Similarly mean Core Muscle Strength & Stability of Withania Somnifera group (Experimental Group) before the supplementation of Ashwagandha (Pre-Test) is 48.86 and after 8 weeks supplementation of Ashwagandha (Post Test) it is 65.72. The mean difference is 16.86, which is in favor of Post Test. The t value is 9.85, which is more than the table value of 2.42 at 0.02 levels (one tail test) of significance for 40 degrees of freedoms. Hence, there is a significant improvement in the Withania Somnifera group (Experimental Group) for Core Muscle Strength & Stability after 8 weeks of Ashwagandha (Withania Somnifera) supplementation.

Table – 4

Comparative status of Pre Test and Post Test Core Muscle Strength & Stability in Withania Somnifera Group (Experimental Group)

S.No.	Phase	Mean	S.D	Mean Difference	S.E.D	t – Value	P Value
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1.	Pre Test	48.86	3.93	16.86	1.710	9.85	Significant at 0.02 level
2.	Post Test	65.72	6.78				

#### DISCUSSION OF RESULTS:

According to table 1 and 2 the t value is 1.25 and 1.58, which are not significant. It means that there is no significant improvement in the Pre Test, Mid Test and Post Test in Core Muscle Strength & Stability after 4 and 8 weeks of placebo supplementation. Whereas table 3 and 4 reveals as t value is 2.99 and 9.85, which are significant also, indicates that there is a significant improvement in the Withania Somnifera group (Experimental Group) for Core Muscle Strength & Stability (CMSS) after 4 and 8 weeks of Ashwagandha (Withania Somnifera) supplementation.

The growth-promoting effect of WS was studied for 60 days in a double-blind study of 60 healthy children, age 8-12 years, experienced a slight increase in hemoglobin, packed cell volume, mean corpuscular volume, serum iron, body weight, and hand grip, and significant increases in mean corpuscular hemoglobin and total proteins ( $p < 0.01$ ) at the end of 60 days when compared to the initial level and the placebo group Venkataraghavan et al.(1980). WS may induce the synthesis of inducible nitric oxide expression likely by acting at transcriptional level Iuvone et al.(2003). Shenoy S et al. (2012) found that eight weeks of Ashwagandha supplementation increased endurance, respiration capacity and metabolic efficiency among cycling athletes.

Colorado State University researchers found that Ashwagandha and other Ayurvedic herbs help protect the heart from oxidative damage Reuland DJ et al.(2012). The effect of Ashwagandha on glycosaminoglycan synthesis in the granulation tissue of carrageenin-induced air pouch granuloma was studied. Ashwagandha is shown to exert significant inhibitory effect on incorporation of ribosome -35S into the granulation tissue. The uncoupling effect on oxidative phosphorylation (ADP/O ratio reduction) was also observed in the mitochondria of granulation tissue. Further, Mg<sup>2+</sup> dependent ATPase activity was found to be influenced by Ashwagandha. Ashwagandha also reduced the succinate dehydrogenase enzyme activity in the mitochondria of granulation tissue (Begum & Sadique, 1987). Biswal BM et al.(2012) from Malaysia's University Sains found that Ashwagandha reduced fatigue and increased general well-being



among patients who were undergoing chemotherapy. Raut AA et al.(2012) from the ICMR Advanced Centre for Reverse Pharmacology in Traditional Medicine found in a 30-day clinical trial among 18 healthy volunteers that 750-1250 milligrams of Ashwagandha per day reduced cholesterol, improved sleep and increased muscle strength. Research from Germany's University of Tuebingen discovered that Ashwagandha reduces oxidative stress and alters gene expression to help cells with energy production Sabir F et al. (2012).

Analytical reports on Ashwagandha suggest that this herb has a rich array of a diverse spectrum of bioactive compounds Chaurasiya ND et al. (2008). The abundance of phytochemicals with antioxidant properties, such as phenolic, flavonoids, and carotenoids may be held responsible for the rejuvenating activity of this medicinal herb. This explains the inclusion of this herb in the Indian system of Ayurvedic lists in promoting longevity and other pharmacological effects Widodo N et al. (2008). In spite of the many properties attributed to Ashwagandha, there is a shortage of clinical scientific evidence for its use in athletes. Present study provides a scientific basis for the use of Ashwagandha supplementation by athletes.

Though there are many factors that could contribute to the increase in the Core Muscle Strength & Stability, we believe that an increase in the CMSS is due the ability of Ashwagandha to provide healthy long-lasting energy for enhanced performance, improving recovery from workout-derived stress and fatigue, and increasing anabolic metabolism to promote lean muscle development. An added benefit of this stress reduction is that many people feel an enhanced mood when taking Ashwagandha. In addition, most athletes know that maintaining a healthy weight helps enhance performance. Further studies on Core Muscle Strength & Stability would provide conclusive evidence regarding the mechanism of the ergogenic effect of Ashwagandha. Thus, the above findings clearly indicate that the traditional use of Ashwagandha has a logical and scientific basis. Large scale clinical studies are needed to prove the clinical efficacy of this herb, specially in sports performance. Conclusion:

*Withania somnifera* may therefore be useful for to improve Core Muscle Strength & Stability after 8 weeks of Ashwagandha (*Withania Somnifera*) supplementation. Drug appears to be safe for young adults when given for mentioned dosage and duration. The forthcoming researches should focus on dose finding, longer treatment duration as well as gender specific effects of WS.

Further studies are also required to measure whether the drugs can improve other parameters of physical fitness so that in future *Withania somnifera* can be used as ergogenic elements.

#### References

- Aphale AA. Subacute toxicity study of the combination of ginseng (*Panax ginseng*) and ashwagandha (*Withania somnifera*) in rats: a safety assessment. *Indian J Physiol Pharmacol.* 1998 Apr;42(2):299-302.
- Begum V H, Sadique J.(2011). Anti-inflammatory responses of ashwagandha (*Withania somnifera*). *Indian J Exp Biol* 26: 877-882.
- Biswal BM, Sulaiman SA, Ismail HC, Zakaria H, Musa KI. Effect of *Withania somnifera* (Ashwagandha) on the Development of Chemotherapy-Induced Fatigue and Quality of Life in Breast Cancer Patients. *Integr Cancer Ther.* 2012 Nov 9.
- Bhattacharya A, Ghosal S, Bhattacharya SK. Antioxidant effect of *Withania somnifera* glycowithanolides in chronic footshock stress-induced perturbations of oxidative free radical scavenging enzymes and lipid peroxidation in rat frontal cortex and striatum. *J Ethnopharmacol.* 2001 Jan;74(1):1-6.
- Chopra, A.; Lavin, P.; Patwardhan, B.; Chitre, D. A 32-Week Randomized, Placebo-Controlled Clinical Evaluation of RA-11, an Ayurvedic Drug, on Osteoarthritis of the Knees. *JCR: Journal of Clinical Rheumatology* . 2004.10 (5): 236–245.
- Chaurasiya ND, Uniyal GC, Lal P, Misra LN, Sangwan NS, Tuli R, et al. Analysis of withanolides in root and leaf of *Withania somnifera* by HPLC with photodiode array and evaporative light scattering detection phytochem. *Phytochem Anal.* 2008;19:14854.
- Cooley, K.; Szczerko, O.; Perri, D.; Mills, E. J.; Bernhardt, B.; Zhou, Q.; Seely, D. (2009). Gagnier, Joel. ed. "Naturopathic Care for Anxiety: A Randomized Controlled Trial . *PLoS ONE* .(2009). 4 (8): e6628.
- Dhuley JN. Adaptogenic and cardioprotective action of ashwagandha in rats and frogs. *J Ethnopharmacol.* 2000 Apr;70(1):57-63.
- Iuvone T, Esposito G, Capasso F, Izzo AA. Induction of nitric oxide synthase expression by *Withania somnifera* in macrophages. *Life Sci.* 2003 Feb 21;72(14):1617-25.



- Mackenzie B. (2002) Core Muscle Strength and Stability Test [WWW] Available from:  
<http://www.brianmac.co.uk/coretest.htm>
- Mishra LC. Florida: CRC Press; 2003. Scientific basis for Ayurvedic therapies
- Puri HS. RASAYANA: Ayurvedic Herbs of Rejuvenation and Longevity. Taylor & Francis, London. 2003; p. 46-58.
- Reuland DJ, Khademi S, Castle CJ, Irwin DC, McCord JM, Miller BF, Hamilton KL. Upregulation of phase II enzymes through phytochemical activation of Nrf2 protects cardiomyocytes against oxidant stress. *Free Radic Biol Med.* 2012 Nov 30;56C:102-111.
- Sharma R.. Effects of long-term administration of the roots of ashwagandha and shatavari in rats. *Indian Drugs.* 2011. 29: 1339.
- Shenoy S, Chaskar U, Sandhu JS, Paadhi MM. Effects of eight-week supplementation of Ashwagandha on cardiorespiratory endurance in elite Indian cyclists. *J Ayurveda Integr Med.* 2012 Oct;3(4):209-14.
- Raut AA, Rege NN, Tadvi FM, Solanki PV, Kene KR, Shirolkar SG, Pandey SN, Vaidya RA, Vaidya AB. Exploratory study to evaluate tolerability, safety, and activity of Ashwagandha (*Withania somnifera*) in healthy volunteers. *J Ayurveda Integr Med.* 2012 Jul;3(3):111-4.
- Sabir F, Mishra S, Sangwan RS, Jadaun JS, Sangwan NS. Qualitative and quantitative variations in withanolides and expression of some pathway genes during different stages of morphogenesis in *Withania somnifera* Dunal. *Protoplasma.* 2012 Aug 10.
- Widodo N, Takagi Y, Shrestha BG, Ishii T, Kaul SC, Wadhwa R. Selective killing of cancer cells by leaf extract of Ashwagandha: Components, activity and pathway analyses. *Cancer Lett.* 2008;262:37-47.