



## Research Article

### THE NOOTROPIC EFFECT OF SWARNAYOG IN PRESCHOOL CHILDREN

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#### ABSTRACT

In the world of competition, every child stood in the race for first position. This may exposing the young brains for educational and competitive stress, eventually result in an inability to concentrate and affect memory and the level of cognition. To overcome the situations nootropics are use as brain boosters or memory enhancer. In Ayurveda many *Yogas* are recommended to use as *Medhya* (brain booster) in children, *Swarnayog* is one of them. This study was design to evaluate the nootropic effect of *Swarnayog* in school children.

Normal children without having any physical or mental illness of age group 7-9 yrs was selected. Further they were evaluated for IQ and school performance report. The IQ was not less than 70 and the school performance report was not less than 40% was considered for the study. Total of 60 children were enrolled and randomly divided in two groups A & B. A was treatment and B was control group. The group A was received *Swarnayog* in the dose of 5 drops per day in morning hours and the group B was received Honey as placebo in the dose of 5 drops per day in morning hours for the period of 30 days. The day 31 children are assessed for general health condition and further on the day 60 children were assessed for academic performance and IQ level.

The effect of *Swarnayog* on group A for academic performance was statistically significant compared with group B, the p value < 0.05= the level of significance. The effect of *Swarnayog* on group A for IQ was statistically significant compared with group B, the p value < 0.05= the level of significance.

The study was found that group A showed significant effect compared to group B, it showed the positive changes in academic performance & IQ score. Thus the *Swarnayog* was a good nootropic drug, further study will require for their pharmacodynamic and pharmacokinetic actions.

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### INTRODUCTION

Today's modern life becomes ever more complex than before thus it drag the more & more technologies, these technological up-gradation can feel like brain downgrades. Young people are more exposed to educational and competitive stress; Which eventually result in an inability to concentrate and affect memory and the level of cognition<sup>[1]</sup>. Cognition refers to a capacity for information processing, applying knowledge, and changing preferences<sup>[2]</sup>. It involves memory,

attention, executive functions, perception, language, and psychomotor functions<sup>[3]</sup>.

Dr. Alfred Binet, the inventor of the first IQ test was opposed to the notion that IQ is fixed. He was a passionate supporter of the concept that IQ is a variable and that by being a variable, IQ could be influenced – both for better and for worse. Thinking creatively is humanity's built-in capacity for unlimited improvement. The limit of human development can never be found. Less than a half of

what our children's intelligences are made up of can be attributed to parental genes. Developing this born-with intelligence to its fullest potential is very much up to each one of us. It is a many dimensioned process that starts before conception and lasts until adulthood<sup>[4]</sup>.

Perhaps the most universally accessible brain toners are the most ancient – medication and meditation. Growing evidence suggests that proper drug doses and training in mindfulness meditation improves not just psychological well-being but also produces measurable improvements in a range of cognitive areas, including attention and memory.

Nootropics (NOOS= mind and TROPEIN = toward) are referred to as brain tonics, memory enhancers, and cognitive enhancers. A cognitive enhancer is a substance that enhances concentration and memory<sup>[5]</sup>. Nootropics are thought to work by altering the availability of the brain's supply of neurochemicals (neurotransmitters, enzymes, and hormones), by improving the brain's oxygen supply, or by stimulating nerve growth<sup>[6]</sup>. Memory herbs increase the level of neurotransmitters, particularly acetylcholine and improve blood flow to the brain, by increasing its oxygen and nutrient supply, which will aid brain function and memory<sup>[7]</sup>. However, the efficacy of nootropic substances, in most cases, has not been conclusively determined. This is complicated by the difficulty of defining and quantifying cognition and intelligence<sup>[6]</sup>.

The physiology of *Tridosha* (functional units of body) shows that *Vata*, *Pitta* and *Kapha* plays a major role in constituting *Medha*(memory). The *Kapha Vata Shamaka* (inhibiting)effect of drugs may help in breaking the *Srotorodha* (obstruction pathology)and digestion of *Ama* (undigested material) that leads to the proper functioning of systems of the body and brain. *Kapha Shamaka* drugs have properties opposite to that of *Tama Dosh*a, which may help in dispelling the *Avarana* (overlapping pathologies) and normalizing *Tama Dohsa*, thereby maintaining the equilibrium of *Triguna* (functional units of mind) and the proper functioning of *Mana*, *Chitta* and *Buddhi* (properties of mind). The *Tridosha Shamaka* effect of drugs brings about homeostasis in *Tridosha* and *Triguna* as *Vata* and *Mana* interrelated with each other because *Vata* is responsible for vitiation of *Sharirika* as well *Manasika Dosh*a and produce disturbances. Thus such drugs regularize the functioning of *Mana*, *Sharira*, and *Manasika bhavas*, *Dhi*, *Dhriti*, and *Smriti* that are prime functioning parameters of knowledge. Many *Ayurvedic* drugs are act for

improving mental efficiency by single or composite form of action.

*Aacharya Kashyapa* stated that the wellbeing of child depend upon the *Lehana* they would get in their early childhood. *Swarnaprashan* is one of the currently in trend *Lehana Karma* practiced on the basis of Ayurveda classics, which is followed from the ancient golden era<sup>[8]</sup>. *Aacharya vagbhat* gave strong emphasis on the use of *Vachadi ghee* as *Bala* (immunity), *Varna* (general health), *Budhi* (intelligence) enhancer in adult & children<sup>[9]</sup>.

Research drug *Swarnayog* was a herbomineral formulation contains *Vachadi ghee*, honey and *Swarnabhasma*, All the Ayurvedic drugs works according to their *Rasa*, *Guna*, *Veerya*, *Vipaka* and *Prabhava* (pharmacokinetic units of drug). This present research was designed to study the nootropic effect of *Swarnayog* by observing the level of enhancement in mental function (*Medha*) of children having normal physical & mental health.

## MATERIAL & METHODS

Present study was a randomized clinical control trail performed on healthy normal children for the parameters of the academic performance and IQ score. Written and informed consent of the parents and guardians was taken before registrations who were matched the inclusion criteria.

Healthy school going children of age group 7-9 years were scrutinized. For academic performance participants school report card were checked and those who secured more than 45% marks or B grade were selected, for IQ score psychological test "Good Enough Draw –A- Man Test" was conducted and the obtained score was recorded those who secure the score above than 70 were finally selected for this study.

60 Selected children were randomly divided into two groups respectively A & B, Group A was treatment group and B was control group. Each group was having 30 children with having various academic grades & socioeconomic states. The study parameter academic performance was further divided into four categories as per last performing exam i.e., 1. Poor category – were secured (45-60% marks) or B grade. 2. Fair category – were secured (61-75% marks) or B+ grade. 3. Good category – were secured (76-90% marks) or A grade. 4. Very Good category – were secured (91 & above % marks) or A+ grade.

The next study parameter Intelligent Quotient was further divided into three categories as per obtained score from psychological test ie 1. Average category – IQ score 70-85. 2. Good category

- IQ score 86-100. 3. Excellent category - IQ score 100 and above.

All 60 children were followed the study protocol and no one was left or discontinued during the course of study.

For this study purpose, research drug *Swarnayog* consists of *Swarnabhasma*, *Vachadi* ghee and honey was contemporarily mixed and bottled in 15ml pack separately. It was in drop form, administered by oral route, ingredient i.e. *Swanabhasma*, *Vachadi* ghee and honey was procured from reputed Ayurvedic pharmaceutical company. Each ml of *Swarnayog* consists of 7.5 mg *Swarnabhasma*, 352 mg *Vachadi* ghee and 640.5 mg honey.

Treatment Group A received *Swarnayog* as research drug & control group B received sugary syrup with same colour and flavour as placebo.

Group A was received five drops of *Swarnayog* early in morning hours for one month duration. Group B was received five drops of sugary syrup as placebo drug in early morning hours for one month duration. Follow up was taken on 30<sup>th</sup> day of study for general health and compliance of the drug. Second follow up was assessed on 60<sup>th</sup> day of study for general health, academic performance and IQ. All the observations were documented properly. The Mann Whitney test was used for the statistical significance for Academic performance And Intelligent quotient.

## OBSERVATIONS & RESULT

The total of 60 children were included for the study, the study was conducted in two group respectively treatment and control. From the total children 26.66% were of the age 7 years, 55% of the age 8 years, and 18.33% of the age 9 years. And 73.33% were males and 26.66% were females,

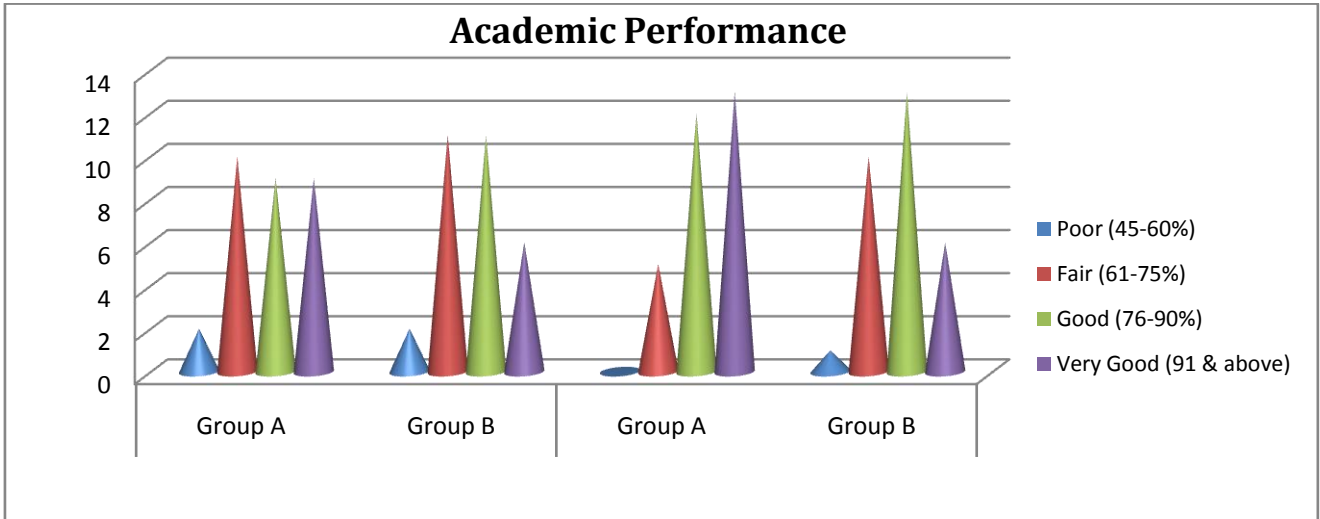
having the birth history like 66.66% born by FTND, 21.66% were from FTLSCS and 11.66% were born from instrumental delivery. The immunization status of the children 91.66% were properly immunized and 8.33% were poorly. Health wise 78.33% was in perfectly fit and 21.66% fall ill for short illnesses. 55% children belong to joint family and 45% was from nuclear family. 56.66% children were vegetarians and 43.33% were having mix food. In the assessment of *Agni* (digestive power) 5% were of *Mandagni*, 73.33% *Madhyama Agni*, 15% *Tikshana Agni*, and 6.66% were of *Vishama Agni*. Whereas in assessment of *Koshtha* (nature of bowel movement/ evacuation) 40% were *Mrudu Koshthi*, 33.33% were *Madhyam Koshthi* and 21.66% were of *Krura Koshthi* in nature. 63.33% children were very active in nature, 21.66% were averagely active and 15% were slowly active in nature. As per *Sharirik* (physical) & *Mansik prakruti* (psychological nature) 43.33% were belongs to *Kapha-Pittaj*, 20% were *Vata- Kaphaj* and 36.66% were of *Vata- Pittaj Sharirik Prakruti*. 28.33% were *Rajasik*, 28.33% were *Tamasik* and 60% children were belongs to *Satvik Manas Prakruti*. As per *Dhatu- Sarata* (immunity/health of body constituents) 28.33% were *Avar* (less compatible), 50% were *Madhyam* (average) and 21.66% were *Praver* (highly compatible). As per *Samhanan* (strength of body constituents) 21.66% were *Avar*, 63.33% were *Madhyam* and 15% were of *Praver Samhanan*. *Satmya* (adjustive capacity of the body towards specific diet & environment); *Satva* (emotional quotients)

The main focused points of this study were school performance and the IQ of the children, which was assessed before and after treatment, was given in the following tables.

**Table 1: Academic performance**

Academic performance	Before Treatment				After Treatment			
	Group A	Group B	Total	%	Group A	Group B	Total	%
Poor (45-60%)	2	2	4	6.66	0	1	1	1.66
Fair (61-75%)	10	15	25	41.66	5	14	19	31.66
Good (76-90%)	9	11	20	33.33	12	13	25	41.66
Very Good (91 & above)	9	2	11	18.33	13	2	15	25
Total	30	30	60		30	30	60	

**Graph No. 1. Academic Performance**



The academic performance was assessed through school report forms. Before treatment 6.66% were poor, 41.66 were fair, 33.33% were good and 18.33 were having very good academic performance. After treatment children shows good change in their academic performance. From the total children only 1.66% showed poor result, 31.66 were fair, 41.66 were good and 25% were very good in their academic performance.

**Table 2: Significance for Academic performance**

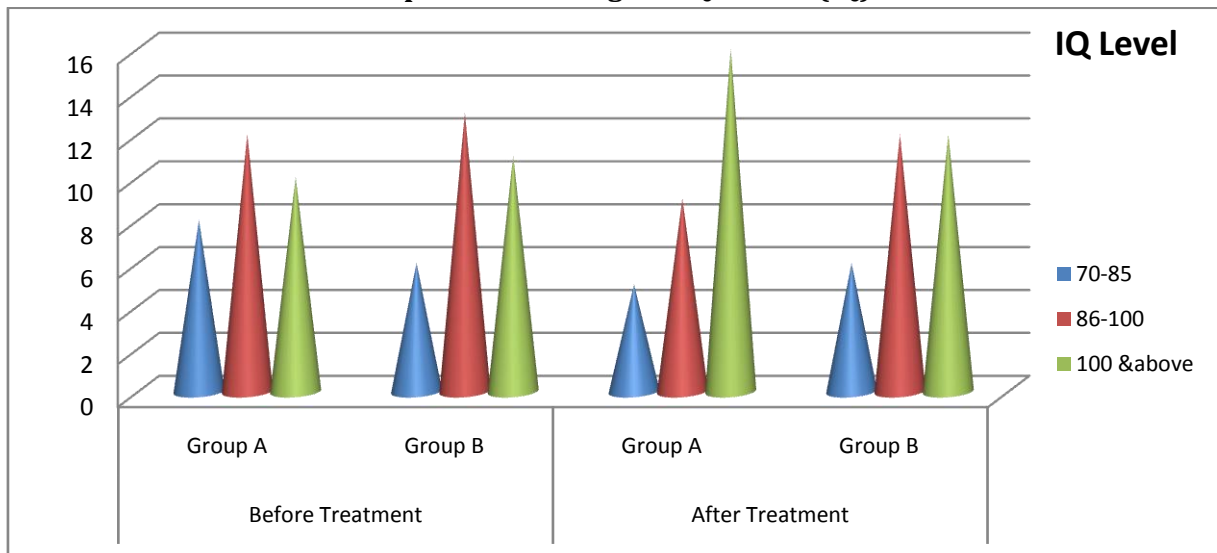
Significance for Academic performance			
Test Applied for Comparison	Test Statistics	P value	Significance
Before Treatment	398.5	0.432	Non significant
After treatment	288	0.012	Significant

The Mann Whitney test was used for the statistical significance for academic performance. The effect of *Swarnayog* on group A for academic performance was statistically significant compared with group B a control group, the p value < 0.05= the level of significance.

**Table 3: Intelligence Quotient(IQ)**

IQ	Before Treatment				After Treatment			
	Group A	Group B	Total	%	Group A	Group B	Total	%
70-85	8	6	14	23.33	5	6	11	18.33
86-100	12	13	25	41.66	9	12	21	35
100 & above	10	11	21	35	16	12	28	46.66
Total	30	30	60		30	30	60	

**Graph No. 2. Intelligence Quotient (IQ)**





*Medha & Smruti* is the Ayurvedic parameters of intellectual capacity of the human being and it was assessed by standard IQ test. Before treatment 23.33% were found between the IQ range (70-85), 41.66% were (85-100) and 35% were of range (100 & above). After treatment children shows good change in IQ assessment 18.33% were of (70-85), 35% were (85-100) and 46.66 % were of 100 and above.

**Table 4: Significance for IQ**

Significance for IQ			
Test Applied for Comparison	Test Statistics	P value	Significance
Before Treatment	429	0.756	Non significant
After treatment	436	0.836	Significant

The Mann Whitney test was used for the statistical significance for *Medha* (Intelligent quotient) IQ. The effect of *Swarnayog* on group A for IQ was statistically significant compared with group B a control group, the p value < 0.05= the level of significance.

## DISCUSSION

In present circumstances young people are more exposed to educational and competitive stress; Which eventually result in an inability to concentrate and affect memory. Intelligence is a multidimensional process that starts before conception and last developing up to adulthood. Memory herbs are known for increase the brain functions and memory, *Swarnayog* consists of memory enhancing drugs.

The total 60 physically and mentally healthy children were assessed for the effect of *Swarnayog* for their academic performance and IQ level, used for one month period. It showed statistically significant improvement in school performance and enhancement in IQ level.

The pharmacodynamic property of the above formulation shows that the consisting drugs was mainly having the *Rasa - Madhur, Kashaya, Katu and Tikta; Guna - Snigdha, Laghu, Guru, Mrudu, Tikshna, Ruksha and Pichhil; Veerya - Ushana and Sheet; Vipaka - Madhur and Katu* and with the special property *Prabhava* i.e., *Medhya* and *Rasayan*.

The *Panchabhoutik* composition of *Swarnayog* was *Akashiya, Tejas* and *Aapya Gunatmaka*, this *Dravyas* are having the property of enhancing *Sattva Guna* and hence increases the *Medha*.

The CNS acting drugs are therapeutically invaluable as they can produce specific physiological and psychological effects. From the vast array of materia-medica of the indigenous system, many plants have been reported to have activity against CNS disorders and act as very useful remedies for the alleviation of human suffering<sup>[10]</sup>.

*Swarna Bhasma* is of the group of '*Rasayana*.' Due to the *Madhura Rasa, Madhur*

*Vipaka, Shita Veerya, Snigdha, Laghu Guna* and *Tridosha* in action it is primarily used as *Rasayana*. Gold / *Swarna Bhasma* has the higher affinity to the nerve ganglions. So it helps in the myelination of the nervous system<sup>[11]</sup>. *Madhu* (Honey), It is *Madhur, Kashay Rasa Ruksha, Shita, Laghu* and main *Yogvahi Guna, Sheeta Veerya, Madhur Vipaka*. *Madhu* is a good source of multi-vitamin which is important in production of new cells i.e. vitamin B, C micro-elements like calcium, Iron, magnesium, phosphorus, potassium, sodium and zinc<sup>[12]</sup>. Due to *Yogvahi Guna Madhu* adopts the properties of the other drug like *Swarna Bhasma & Vachadi ghee* without losing their own properties and helps to add effectiveness of the whole yoga. *Ghrita* (Ghee), is having *Madhur Rasa, Madhur Vipaka Shita Veerya. Snigdha, Saumya, Mridu Guna* and the property of memory enhancement.<sup>[13]</sup> *Ghrita* crosses the Blood-brain Barrier thus the lipid soluble substances can easily cross the barrier. Hence *Ghrita, Madhu* are best vehicles for administration of medicines.

*Vachadi ghrita* contains, *Vacha (Acorus calomus)* the versatile medicinal plant is the unique source of various types of compounds having diverse biological activities like Nootropic Activity, Anticonvulsant activity, Anti-anxiety-depressant, Anti-oxidant, Antihepatotoxic activity, Anticellular and immunosuppressive activity, Antimutagenic activity.<sup>[14]</sup> *Apamarg (Achyranthus Aspera)* is having the property of hepatoprotective, analgesic, anti-inflammatory, anti-oxidant, anti-depressant, cardiovascular, immunomodulatory activity<sup>[15]</sup>. Methanol extract of the plant was reported to have neuro-pharmacological (central nervous system depressant) activity<sup>[16]</sup>. Its antidepressant<sup>[17]</sup> and anxiolytic<sup>[18]</sup> activity were reported. The plant was screened in vitro for anti-hypertensive effect<sup>[19]</sup>. *Haritaki (Terminalia Chebula)* is one of the most important medicinal plants having a number of pharmacological properties. It is the source of a variety of biologically active phytoconstituents, which are responsible for antimicrobial, antioxidant, antihyperglycemic, anticancer and protective effects on various vital organs such as

nerves, heart, kidney and liver<sup>[20]</sup>, acetylcholine inhibition activity, antinociceptive activity, antianaphylaxis activity<sup>[21]</sup>. *Vidanga (Embellia ribs)* is having property of cardio protective, neuro-protective, In cerebral ischemia, improves microcirculation in brain, nerve weakness, nervous debility<sup>[22]</sup>. *Shati (Hedychium Spicatum)* is having property of antimicrobial, cytotoxicity, anti-inflammatory, analgesic<sup>[23,24]</sup>, Essential oil of rhizomes of *H. spicatum* was reported to possess mild tranquilizing action of short duration<sup>[25]</sup>. Terpenoid compositions of rhizome of were found to possess antioxidant activity<sup>[26]</sup>.

*Sunthi (Zingiber officinale)* showing some of the effects like this anti-inflammatory, antinociceptive, antioxidant, antigenotoxic activity<sup>[27]</sup> It is useful in vascular phenomenon of neurological disorder like migraine.<sup>[28]</sup>

*Guduchi (Tinospora cordifolia)* is used traditionally for its anti-stress activity<sup>[29]</sup>. The pure aqueous extract of the root was found to enhance verbal learning and logical memory<sup>[30]</sup>. Retention memory, indicating enhancement of learning and memory<sup>[31]</sup>, is having property of anti-inflammatory, antioxidant, immunomodulatory, cardioprotective<sup>[32]</sup>, nootropic action, involving cholinergic and GABA energetic modulation<sup>[33]</sup>.

*Shankhpushpi (Convolvulus pluricaulis)* is used as nervous debility, loss of memory, syphilis and scrofula, aphrodisiac and a nerve tonic<sup>[34]</sup> for improvement of memory and intellect<sup>[35]</sup>. It is recommended as a brain tonic to promote intellect and memory, eliminate nervous disorders and to treat hypertension<sup>[36]</sup>. Nootropic activity<sup>[37]</sup> and also having anxiolytic, tranquillising, antidepressant, antistress, neurodegenerative, antioxidant, immunomodulatory, and cardiovascular activity<sup>[38]</sup>.

*Swarnaprashana* increases the circulation in the CNS and balance the level in the blood thus it has anti hypoxic effects. *Sthairyakara* (Stabilizing) action gives neuro protection by directly or indirectly modulating activities of ATP ases. *Swarnaprashna* exhibit interaction of GABA energetic modulators. *Sandhankara* (formative) action gives the immune stimulants and increased the synthesis of Acetylcholine.

Depletion of neurotransmitters generally results in reduced mental performance with difficulty in concentrating, slowed reasoning, impairing recall typically, nootropics work by increasing supply of neuro chemical like serotonin, increases hippocampus release of acetylcholine, increase synoptic transmission as well as supply of oxygen and glucose by stimulating nerve growth.

Combined action of the trial drug taken from clinical study prove to be effective for their action on memory, intellect, concentration contributed very well for improvement of mental functions as well as IQ.

## CONCLUSION

*Swarnayog* may be worked by decreasing mental fatigue, increasing cerebral circulation, altering the availability of the brain supply of oxygen and neurochemicals by stimulating the nerve growth and by improvement of discrete cerebral function i.e. memory, anti-inflammatory, anti-ulcer, immunomodulatory and other effects of drugs add to overall health promotion. Specific action of *Medhya* produces target action at CNS by improving *Satva Guna* (mental capability) i.e. sensory perception and neuronal arborisation mediated through neurotransmitters.

*Swarnayog* is proved to be a multipurpose medicinal agent, thus instrumental in curing large number of ailments. Its study paves the way for further attention and research to identify the active compounds responsible for the plants biological activity, to characterize the active compounds and to elucidate the exact mechanism of action by which they exert their effects, also the pharmacodynamic changes and pharmacokinetic action of the formulation.

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