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A QUESTIONNAIRE DESIGNED TO MEASURE TRIDOSHA VALUES IN ADOLESCENTS: CHANGES IN SCORE PRE-POST AN IAYT YOGA MODULE

Devika Kaur[1], Alex Hankey[2]* and HR Nagendra[3]

[1]S-VYASA, Prashanthi Kutiram Campus, Manchenahalli, Kalluballu Post, Jigani, Anekal Taluk, Bengaluru District, Karnataka 560105.
[2]Distinguished Professor of Yoga and Physical Science S-VYASA, Prashanthi Kutiram Campus, Manchenahalli, Kalluballu Post, Jigani, Anekal Taluk, Bengaluru District, Karnataka 560105.
[3]Chancellor, S-VYASA, Prashanthi Kutiram Campus, Manchenahalli, Kalluballu Post, Jigani, Anekal Taluk, Bengaluru District, Karnataka 560105.

***Corresponding Author: Alex Hankey**
Distinguished Professor of Yoga and Physical Science S-VYASA, Prashanthi Kutiram Campus, Manchenahalli, Kalluballu Post, Jigani, Anekal Taluk, Bengaluru District, Karnataka 560105.

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ABSTRACT

Background: Ayurveda emphases the *prakriti* concept as fundamental to assessing patients' physiologies. Recent decades have proposed new ways to evaluate it. Previous papers describe formulation and testing of new inventories to evaluate physiological and psychological aspects of *prakriti* in children and adolescents. Here, we report changes in adolescents pre-post a Yoga intervention. **Methodology**: The study was conducted at a high school and PU-college level on 82 adolescents, aged 15.29±1.65 years. The Yoga module was given thrice per week for four weeks. It included Yoga breathing/stretching practices, postures, Mind Sound Resonance Technique, mantra recitation and relaxation techniques. The Inventory was administered pre-and-post the intervention. Statistical analysis used SPSS-21.0 Wilcoxon Signed-Ranks-Test. **Results**: Vata decreased, $p<0.05$; Pitta and Kapha increased, $p<0.05$. **Discussion**: Participant's initial states were Vata dominant. Results indicate that their tridosha became more balanced; psychologies calmer, personalities steadier, causing fewer problems. Changes are attributable to alteration of underlying Tridoshas; epigenetics may provide an explanation.

KEYWORDS: Prakriti, Psychology, Vata, Pitta, Kapha, Yoga.

INTRODUCTION

India's ancient science of life, Ayurveda[1,2] lays great emphasis on the concept of *Prakriti*[3], because that concept provides a preliminary assessment of patients' physiological tendencies when faced by stressors[4], continuing exposure to which will inevitably lead to pathogenesis.[5] In the historical system, many Vaidyas were trained to use *Nadi Vigyan*.[6,7] Ayurveda's system of pulse diagnosis, in addition to *Dashavidha Pariksha*, for the all-important evaluation of *Prakriti* and *Vikriti* in those who came to consult them.[8]

The drift away from traditional systems of healthcare under British influence[9,10], led to neglect of Ayurveda and its systems of diagnosis and treatment. Medical training colleges did not cover them, though Vaidyas trained by traditional Guru-Shishya principles continued to learn them. More recently, this been remedied with present Ayurveda training institutions teaching them as part of their curriculum.[1]* The present need is to develop equivalent ways to obtain the same patient information. A previous paper[11] described the development and testing of a questionnaire for children. We ourselves have developed a separate questionnaire, the Kashyapa Prakriti Inventory (KPI), aiming to evaluate *Prakriti* in adolescents. This paper describes its administration to adolescents before and after training in a 90-minute Yoga module, designed in accordance with the principles of the Integrated Approach to Yoga Therapy[12] (IAYT).

Historically, Yoga originated in India as the ancient Vedic civilization's system of personal development for the children of *Rishis*, Kings and other leaders of society.[13] The discipline is informally described in the first Upanishads[14], and slowly acquired a formal status as the path to union (Yuj) with the Divine[15], and consequent release from the cycle of birth and death.[16]

Yoga focuses on gaining mastery over body and mind[17] and consequent acceleration to gaining life's true goal of self-realization and enlightenment.[18] It integrates body, mind and spirit using a comprehensive, holistic approach in practices emphasizing breathing and stretching, postures and pranayama, chanting and meditation, as detailed below. Yoga practices for the individual may

also include consideration of bodily compositions. The texts hold that nature and body are directly related to each other as described in the phrase '*Avinabhaava Sambandha*'[19], inseparable connection.

Today, many top Yoga research institutions like NIMHANS and Kaivalyadhama[20,21], and other academic organizations like Harvard University[22] and Patanjali Yoga Peeth[23], have worked with great dedication to observe benefits of Yoga practices and validate them. Studies have been done on all age groups: children[24]; adolescents[25]; adults[26] and the elderly.[27] In adolescents (the concern of this study), effects of yoga have been seen in such fields as: increased academic motivation and persistence[28]; social behavior[25]; coping with stress[29], dealing with anxiety[30], and similarly yoga as a complementary treatment for the quality of life of adolescents suffering from IBS[31], etc. However, there seems to be no study of possible effects of yoga on *Prakriti* in adolescents; hence the present study.

Allied to yoga is the ancient Vedic system of medicine, Ayurveda.[1-3] According to *Ayurveda*, the human body is organized by three fundamental physiological principles called *Doshas* that govern all bodily functions[32], *Vata dosha*, *Pitta dosha* & *Kapha dosha*.[33] Strictly speaking, the word '*Dosha*' means impurity, because Doshas may express imbalances in the composition of important aspects of the physiology.[34] However, the *Ashtanga Sangraha* by Vaghbata, related to the third of *Ayurveda's* main three texts[1-3], states that when functioning in balance, *Doshas* are '*Dhatus*', i.e. they nourish & support the system.[35] A fundamental idea in Ayurveda is that each well-functioning *Dosha* possesses an intrinsic strength, *Bala*[36], that may vary from person to person, e.g. the strength of a person's digestion is proportional to the strength of their *Jataragni*, an aspect of their *Pitta Dosha*. If *Jataragni* and hence *Pitta Bala* is strong, then digestion is good[37], but if it is low, then weak digestion may give rise to toxicity, known as *Ama*[38], and so to disease.

The relative strengths of the three doshas are summarized in Ayurveda's theory of *Prakriti*, or 'physiological types'.[39] The dominant Dosha is used to name the corresponding *Prakriti*: a *Vata Prakriti* type has *Vata Dosha* dominant in their system; a *Pitta Prakriti* type has *Pitta Dosha* dominant, while a *Kapha Prakriti* type possesses dominant *Kapha Dosha*. If a person has the strongest two *Dosha Balas* close to each other, then they belong to a combination of types, *Vata-Pitta*, *Pitta-Kapha* or *Kapha-Vata*.[40]

When such matters are considered in further depth, imbalances between a person's *Doshas* are recognized to increase susceptibility to disease. *Dosha* imbalances are thus seen as precursors to all diseases, both physical and mental.[41] Disease in Ayurveda is seen as driven by both general and specific considerations. *Dosha* imbalances tell the general class of pathology, while more detailed considerations tell the specific disease. If one subcomponent of *Vata* is driven out of balance by another subcomponent of *Vata*, the result is a *Vata-vyadi*, a neurological disorder.[42] For example, *Pranavruta-samana vatavyadhi*[43], where the *Vata subdosha*, *prana*, drives another *Vata subdosha*, *samana*, out of balance corresponds to Alzheimers disease. Charaka Samhita[1] also mentions several related *Vata-vyadhis* which correspond to other neurological disorders, such as MS, Parkinson's disease, Hemiplegia and Paraplegia.[42]

Common understanding of Ayurveda propagates the view that an individual's *Prakriti* is fixed from birth – or rather from the time of conception and zygote formation. In reality, the process of *Prakriti* selection is more complex. Sushruta Samhita states[44]: the seven prakriti types have contributions from conception & birth, family, place, time, age, *balas* and factors acquired by the individual. However, Gangadhar Tika's celebrated commentary[45] on Charaka Samhita interprets the concept of *Prakriti* as a state of 'equilibrium of doshas', so that other types with dominance of single, or pairs of, *Doshas*, are states of *Arogya*, i.e. pathophysiology – *Vikriti*.

In studies of human psychophysiology, it is natural to connect strengths of various organ systems to properties of the personality. A strong digestion, high *Pitta Dosha*, may be connected to a 'fiery personality', showing anger more easily (Choleric)[46]; a person with dominant *Vata Dosha* may be more subject to attacks of anxiety, and neurotic disorders.[47] People with dominant *Kapha Dosha* may be more relaxed, happier and easy-going than their peers, but will be more susceptible to overweight, and thus to the metabolic syndrome spectrum of disorders.[48]

In this way, ancient Indian Psychology associates *Doshas* with different facades of the human personality. The Ayurveda classics propose seven types of *Prakriti*: *Vataja*, *Pittaja*, *Kaphaja*, *Vata-Pittaja*, *Vata-Kaphaja*, *Pitta-Kaphaja* and *Sama*, with each of which a different style of personality may be associated.[49]

In addition to these seven physiological types, the Ayurveda texts introduce sixteen mental types, categorized according to three different basic dimensions, known as *Gunas* or qualities. The first, *Sattvoguna*, has seven types associated with it; the second, *Rajoguna*, has six related types, and the third, *Tamoguna* has three associated types.[50] Thus, besides its personality types connected to the physiology, Ayurveda texts also utilize these three, more spiritually-oriented, personality concepts. *Sattva* – luminous with wisdom and self-knowledge; *Rajas* – more focused on enjoyment and pleasures in the external world, and driven by impulsiveness, aggression etc.; and *Tamas* – dragged down with inertia from failure to adhere to high moral precepts, past disasters in life etc.[51]

These last three qualities (*Gunas*) of personality, *Triguna*, are often associated with Yoga, due to their use to assess an individual's personal capacity for spiritual growth: a soul is thought to evolve from *Tamas* dominance to *Rajas* dominance, and on to *Sattva* dominance, which is transcended in the final stages of spiritual liberation. Such a process may take many lifetimes.[52]

Many studies of these concepts from Yoga and Ayurveda have been carried out. Those on adolescents are clearly more relevant to the study reported here. For example, in a study in a public school, Yoga practice was seen to improve adolescent's mood and affect.[53] An uncontrolled pilot study of a module based on Patanjali's ashtanga Yoga for children and adolescents has observed benefits for weight management and psychological well-being.[54] A paper offering guidance to clinicians on prescription of Yoga as a complementary therapy for children and adolescents has proved very beneficial.[55] In these various fields, studies of adolescents have broadened scientific understanding gained from studies on adults.

Previous papers on young people include the development and assessment of a self-rating scale to measure *Tridoṣhas* in children aged 6 to 12 years.[56] One study assessed changes in Triguna in children observed in a 10-day Personality Development Camp.[57] Another found that yoga / meditation training improved abilities to learn self-control and self-care in adolescent sex offenders.[58] A further study observed that exercise, Yoga and meditation improved adolescents' depressive and anxiety disorders.[59] Management through yoga of academic anxiety was also considered, while effects of a youth empowerment seminar on adolescents' impulsive behavior has been reported.[25] A feasibility study has validated a Yoga module for emotional and behavioral disorders in adolescents and younger children.[60]

Medically, a study has measured effects of yoga practice on stress, depression, and health-related quality of life in a non-clinical sample of adolescents, finding it very useful.[61] Similarly yoga as a complementary treatment for the quality of life of adolescents suffering from IBS, hemophilia, cancer, and emotional and behavioral disorders was found highly beneficial, as was a study of the subjective experience of yoga as a management strategy for stress and depression in pregnant, urban, African-American adolescents.[62] Finally, a literature review has evaluated the effects of yoga practice on pulmonary function in healthy adolescents, including perspectives on barriers to, and facilitators of, physical activity.[63]

AIMS AND OBJECTIVES

The aim of this study was to evaluate the use of the new KPI for adolescents. The objective was to administer the inventory pre and post a Yoga program and assess any changes. To this end, the study assessed the effects on adolescents of an IAYT Yoga module designed for that purpose. The research hypotheses were that the module would have significant observable changes on each variable being assessed. The null hypotheses were either that such changes would not occur, or that they would not attain $p < 0.05$ significance.

MATERIALS AND METHODS

Study Protocol (see Figure 1): The study was conducted in Vivekananda Education Centre, Jayanagar and MES Pre-University college, Maleshwaram, Bengaluru. It was a Pre-Post design on 82 randomly selected adolescents aged 13-18 years. For the mean ages for each gender and both together, see Table 1.

Table 1: Age Distribution by Gender.

AGE	13 YRS	14 YRS	15 YRS	16 YRS	17 YRS	18 YRS	TOTAL	Mean±SD
BOYS	8	9	8	9	7	6	47	15.34±1.66
GIRLS	7	6	7	6	5	4	35	15.23±1.66
TOTAL	15	15	15	15	12	10	82	15.29±1.65

Caption: Table 1 shows numbers of students in each year of age according to gender and in total.

Inclusion Criteria: Physically and Mentally Healthy, Either Gender, Aged 13 to 18 years.

Exclusion Criteria: Attention Deficit Hyperactive Disorder, Psychosis, Autism / Mentally Challenged.

Intervention: 90-minute Integrated Yoga Module (see Table 2) with seven different sections- Breathing Exercises, Dynamic Exercises including Suryanamaskara, Asanas, Pranayamas, Chanting, Yogic Games, and Relaxation Techniques; given 3 times per week for four weeks. Also, participants were instructed to practice at home daily for the other days of each week, and given a printed sheet of the module to use to direct their practices.

Table 2: Integrated Yoga Module.		
SECTION	**PRACTICE**	**TIME (mins)**
1. Breathing Exercises	Hands In & Out Breathing	2min
	Vertical Hand Stretch	1min
	Ankle Stretch	1min
	Tiger Breathing	1min
	Dog Breathing	1min
	Rabbit Breathing	1min
	Sectional Breathing	2min
2. Dynamic Exercise	Hand Swing	2min
	Twisting	1min
	Alternate Side Bending	1min
	Forward & Backward Bending	1min
	Jogging	3min
	Pavanamuktasana Kriya	4min
Suryanamaskara	Suryanamaskara	5 min
3. Asana	Ardhakati chakrasana	1min
	Padahastasana	2min
	Ardhachakrasana	1min
	Ushtrasana	2min
	Paschimottanasana	2min
	Suptavajrasana	1min
	Makarasana	1min
4. Pranayama	Nadishuddhi	3min
	Kapalabhati (a Yoga Kriya)	2min
	Bhramari	1min
	Sheetali	1min
5. Chanting	Vedic Chanting (Choice of 10 Sections)	6min
Different on Different Days	Bhagavad Gita	8min
	Nadanusandhana / Omkara Meditation	4min/5min
6. Yogic Games: Choice of -	Find Ram-Shyam	5min
Different on Different Days	Accepting Criticism	2min
	Find-a-Leader	1min
	Search Engine	5min
7. Relaxation Technique	IRT, QRT & DRT (from SMET Program)	1min,3min,7min

Assessment: The KPI was administered before and after the four-week intervention.

Statistical Analysis: Employed SPSS version 21.0. First, the Kolmogorov-Smirnov test was used to check whether the data were normally distributed; since it was not, the Wilcoxon Signed Ranks Test was applied to assess the significance of within-group changes in the data.

RESULTS

Results are displayed in Table 3 below, which shows that *Dosha Prakriti* measured according to the KPI changed highly significantly for each *Dosha*. Changes generally indicate improved health, since, once imbalances have set in, excess *Vata Dosha* tends to drive other *doshas* further out of balance. The decreases in *Vata Dosha* seen over the course of the four-week period indicate more steadiness of mind suggesting reductions in a. *Chitta-Vritti* activity[64], and b. generally unnerving speed of thought, which lead to speedier actions on a physical level. This result also suggests slowing of the breath and / or breathing. In contrast, the other two *Doshas*, *Pitta Dosha* and *Kapha Dosha* were both strikingly much stronger than *Vata Dosha* at the end of the month.

Table 3a: Pre and Post Dosha Values of Present Study.					
VATA		**PITTA**		**KAPHA**	
Pre	Post	Pre	Post	Pre	Post
11.28±3.12	**8.09±2.60**	**12.91±3.24**	**15.86±3.32**	**16.37±3.34**	**19.59±3.25**
Table 3b: Pre and Post Dosha Values of Patil Study.					
10.74±3.42	**7.98±2.11†**	**12.80±3.57**	**13.96±1.85†**	**11.80±4.42**	**13.72±2.04**
Caption: Tables 3as & 3b display Pre and Post Values of Dosha Prakritis for Adolescents (3a) & Children (3b)					

DISCUSSION

The last statement requires comment: high *Kapha* levels can precipitate *Kapha Rogas*, of which obesity and related disorders like metabolic syndrome are all too common among today's population. However, the participants' ages must be taken into consideration: ages 5 to 13 are dominated by anabolism related to physical growth and thus naturally exhibit high levels of *Kapha Dosha*; similarly, ages 13 to 18 are dominated by *Pitta Dosha*, as the physicality of youth comes into play. Observing higher levels of *Pitta* and *Kapha Doshas*, when assessing youth in the age range addressed in this study is quite acceptable. The final *Dosha Prakriti* scores therefore reflect processes taking place all during the 4-week module practice. They can be interpreted as indicating restoration of *Dosha Prakriti* values towards their usual ranges for this age group.

Comparison with Patil's study[11] is instructive. Pre-post percentage changes obtained in Patil's study and this study are as follows: (Vata: -25.6, -28.2) (Pitta: +8.90, +22.8) and (Kapha: +16.2, +19.7). The two studies therefore show similar changes in Dosha scores after a one month Yoga module intervention; the only major difference being in percent change in Pitta score, with adolescents, in a naturally Pitta stage of life, showing greater increase. This observed difference was almost to be expected.

Generally, in recent times, because of modern *Ahara-Vihara* habits common in this stage of life, we see *Dosha Balas* opposite to those said to characterize the age group in question. The data therefore indicate that inculcating the module's Yoga practices at an early age will help restore desired *Dosha* balances, and, as *Vata Dosha* reduces and *Pitta Dosha* increases, the memory, intelligence and basic learning skills characteristic of youth.

Practising dynamic exercises like those in the module will tend to induce or increase sweating, *sweda*. According to Ayurveda classics, *swedana* is a treatment that reduces *Vata Dosha*, and that will benefit the three gunas by reducing *Rajas* and *Tamas*.

Strengths: The strengths of the study are: a. it is the first to assess the effect of Yoga on *Tridosha* in adolescents; b. being a pre-post design, the first to observe significant changes in state in all three *Doshas*, *Vata*, *Pitta* and *Kapha*; c. the intervention can bring changes in *Tridosha* large enough to significantly alter adolescents' physical and psychophysiological states – and possibly reshape their personalities.

Limitations: No control group was included in the study.

Future Research: Any future study should include a control group along with the Yoga group. A randomized controlled trial would then be the best study design, but with the following *caveat*: here, the same Yoga module was used for all the participants, despite their having different *Dosha Prakritis*; future studies should use several Yoga modules, each adapted to a particular *Dosha Prakriti*. Then we may anticipate improved progress towards *Sama Prakriti* being achieved in all cases.

CONCLUSIONS

The study suggests that the four-week IAYT Yoga module employed in the intervention brings significant balancing benefits for *Tridoshas* in adolescents. It may also benefit levels of the three *Gunas*. Practiced regularly over a sufficient period of time, breathing techniques like sectional breathing, *Nadi Shuddhi*, and *Sitali*, named in the yoga module help to reduce *Vata* at the physical level, and simultaneously overcome *Tamas*. Adopting dynamic practices like *Suryanamaskara*, *Asanas* & *Kapalabhati*, *Pitta* increases so that the individual him/herself transforms inertia (*Tamas*) into *Rajas*, thus bringing lightness and flexibility to the body and dynamism to brain activity (*Rajas*). In yogic lore, this is considered an advance on the path to transcending the influence of *Gunas*. Along with these practices, addition of meditation, *Japa*, breath retention in *Pranayama* and increasing time of maintaining each *Asana* helps to increase stability of body and mind (*Sattva*).[57]

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