

characteristic traits comprising of about 8 traits in each category, were categorically compared with Vātaja, pittaja, and kaphaja Prakṛti lakṣaṇas.

#### 2.7 Discussion:

Each and every characteristic trait of the four humoral types of modern psychology were easily related to the lakṣaṇas described in brhatrayi and laghutrayi texts of Āyurveda classics.

#### 2.8 Conclusion:

The attempt to compare the concept of Prakṛti with modern personality concepts was fairly done, and the tridoṣa types were compared to the personality traits. And types.

### **3. REVIEW OF SCIENTIFIC LITERATURE:**

#### **3.1 REVIEW PREVIOUS QUESTIONNAIRES TO DETERMINE PRAKRTI**

##### 3.1.1 Studies on Scales

1. Uma K. et al (1971) have constructed a scale to measure the Trigūṇas. The strength of this study is it helps in measuring the Trigūṇas. Also, the limitation in this scale is it's not worked on reliability and validity.
2. Mohan V, & Sandhu S (1986) has developed a scale to measure trigūṇas sattva, rajas and tamas. The scale's strength is, it has established good reliability and has high correlations amongst each other scales. The limitation has not been established.
3. Das R C (1991) Standardized the 'Gita Inventory' and it has attempted to standardize the scale inorder to measure trigūṇas and this becomes the strength. The limitation being the scale is neither associated with good reliability or validity.
4. Marutham P et al (1998) has developed SRT inventory. The strength of this study is, it is one of the earliest scales which measures trigūṇas and the scale is not associated with good reliability and validity.
5. Wolf DB (1999) and Stempel HS et al (2006) Developed and standardized Vedic Personality Inventory. The scale was developed based on the comprehensive aspects of

the Indian classical texts which also rigorously established good reliability and validated it by using factor analysis. No norms for the limitations quoted.

6. Joshi RR (2005) has developed a self-reporting questionnaire in order to quantify the tridoṣas along with a check list for the physicians. The strength of the study being it's the first attempt to measure the tridoṣa, but has not established cronbach's alpha, split-half reliability and validity. Limitations in the study too was not done.
7. Shilpa S and C. V. Murthy (2011) has developed a personality scale to assess tridoṣas from psychological perspective in humans and validated it using psychometric procedures. The scale has a satisfactory reliability and validity. Norms are set in the scale.
8. Shilpa S. Murthy CV (2011) this paper is a theoretical framework importing the Āyurveda and other ancient Indian scriptures knowledge in delineating the functioning of human behavior and mind. This work has been validated.
9. S. Shilpa, C.G. Murthy (2012) has developed a standalone scale to assess triguṇas again from psychology perspective using psychometric procedures. The developed scale has reliability and validity indices and the norms are given too.
13. S. P. Suchitra, H. R. Nagendra (2013) the study was about development and standardization of an inventory in order to measure tridoṣas in children aged 6-12yrs. The inventory has a very good reliability and a validity.
10. S. Shilpa, C.G. Murthy (2014) this is an addition in conjunction with the earlier study Mysore Trigṇa Scale and is not a standalone scale. It just describes the standardization procedures and results that were obtained during the development of the scale and it has satisfactory reliability and validity.
11. S. Shilpa, C.V. Murthy (2014) in this paper authors have attempted to integrate tridoṣas and triguṇas to assess the traits and types of personality. Also, 16 types of classical personality types are identified and validated it.
12. Ramakrishna BR (2014) has developed a questionnaire and a checklist to assess Prakṛti in individuals based on the concept of tridoṣas. The inventory has a consistent good reliability and validity.
14. Suchitra SP (2014) has developed a questionnaire to assess Prakṛti in children and compared the scale with child personality questionnaire, it has a good reliability and validity.



Table 1: Scales studies

Author and Year	Samples	Psychometric Properties
Uma K. et al (1971)	Adults various age category	Reliability and validity, not established
Mohan V, & Sandhu S (1986)	Adults different age category	Validity and Reliability not achieved
Das R C (1991)	Adults various age category	Triguṇas (Sattva, Rajas and Tamas) have negative correlation between them, did not establish reliability and validity
Marutham P et al (1998)	Adults different age category	Did not have good reliability and validity, there was negative correlation between sattva, rajas and tamas.
Wolf DB (1999) and Stempel HS et al (2006)	619 adults, Various age group	Rigorously established reliability and validity, with good cronbach's alpha and good total item correlation
Joshi RR (2005)	280 adults, 18-70yrs	The model of regression showed good scores but there's no trace of reliability and validity
Shilpa S and Murthy C.V (2011)	1548 adults, general adult category	A well-established reliability and validity seen.
S.P Suchitra, Nagendra H.R (2013)	200 children, 6-12yrs	Is associated with good reliability and validity
Ramakrishna BR (2014)	300 adults, 19-24yrs	Extremely good cronbach alpha values and validity is established

### 3.1.2 Studies on Tridośa and Trigūṇa

1. Hankey. A (2004) has given an elaborate understanding on the phase transitions in the functioning of the tridośas and its subsets of 15types in the body going through the different specific stages of evolution, input and output, storage and the control mechanisms.
2. Hankey. A (2005) this paper gives an independent scientific evidence for the identification of the dośas and the system analysis on which it is based.
3. Hankey. A (2010) this paper is concerned with showing tridośas being present and functioning in every living cellular organism where Vāta is denoted by input and output homeostasis, pitta with turnover and kapha with storage capacity that is at inheritable structure.
4. Dube K. C, A. Kumar, Dube. S (1983) this study mentions the similarity between the Āyurveda mental concepts and Lewin's field of theories (Gestalt). It has also mentioned and described the sixteen personality types with sixteen types of mental disorders.
5. Patwardhan B, Bodekar.G (2008) have shown a correlation study between the Prakṛti types, and HLA alleles thus establishing a preliminary experimental support and a rationale for the association between HLA alleles and tridośa theory of individual Prakṛti types in Āyurveda.
6. Prasher B, Negi S and et.al (2008) have made an attempt to see the different constitutions described in Āyurveda has any molecular correlates. Thus, unravelling the traditional system of medicine clinical phenotype principles to modern biology. Integration of Āyurveda with genomics is quite promising for a future predictive medicine.

Table 2: Studies on tridośa and trigūṇa

Authors, Year of Publication	Observations
Alex Hankey (2004)	The functioning of tridośaand its subset 15types, which goes through specific changes at cellular level which points specifically to V- input/output, P-turn over and K- storage capacity.
K.C. Dube and et.al (1983)	Brought in the similarities between Āyurveda mental concepts and constitutions with Lewin's field of theories, and

	mentioned the 16 personality types with 16 mental types.
Bhushan Patwardhan and et.al (2005&2008)	Studied a remarkable gene study showing the significant relation between Prakṛti types and phenotype to genotype.
Prasher B, Negi S and et.al (2008) Misra L (2001)	Attempted a profound study to see the different constitutions described in Āyurveda has any molecular correlates and thus unravelling the traditional system of medicine clinical phenotype principles to modern biology.

### 3.1.3. Research thesis, dissertation by s-vyasa

Scales:

1. Suchitra SP (2007) developed a scale to measure tridośa symptoms of unmāda by using the concepts of Āyurveda. The 67-item unmāda specific symptom scale was developed on the basis of translation of Sanskrit verses describing vātaja (V), pittaja (P), and kaphaja (K) unmāda (specific symptoms of psychosis due to the imbalances of metabolic components) and by taking the opinions of experts (15 Āyurveda experts, 5 psychiatrists, and 5 psychologists). The tridośas in psychotic disorders can be measured reliably by this instrument. The scores on each of these dośas help in differentiating three types of psychosis (according to Āyurveda) that have good correspondence with prevailing classification. That's the strength of the scale and the limitation of the scale is, it has to be measured on a large number of subjects.
2. Devika HS (2007) developed a report on the development and initial standardization of a scale to measure the unmāda (psychosis) symptoms in patients with non-affective psychosis. Āyurveda unmāda scale consisting of 68 items was developed based on the translation and the meaning of the verses in Sanskrit describing unmāda and with the opinion from the experts viz., fifteen Āyurveda Scholars and five each of Psychologists and Psychiatrists. The scale was administered for 44 consecutive patients with non-affective psychotic disorders. Āyurveda unmāda scale is associated with excellent Internal consistency. The strength is the symptoms of unmāda can be measured reliably by this scale in patients with non-affective psychosis. Limitation being scale has to be administered on a larger group of patients and to assess each vibhrama and developing a module for it.
3. Mangala S (2007) has developed Dhanwantary personality inventory to assess the Prakṛti based on physical factors. The scale was developed based on description of classical texts and opinion of the experts. Strength of the study is it was the first attempt to develop a scale and included physical factors comprehensively. But the limitation was that the scale is not associated with good reliability and validity and the scale did not consider psychological factors.
4. Vaidya Vasudeva (2007) and Ramakrishna B.R. has developed a Dhanwantary personality inventory to assess Prakṛti based on ahara, vichara and vihara. The scale was developed based on description of classical texts and opinion of the experts. Strength of the study is

it was the first attempt to develop a scale and it includes psychological factors comprehensively. The limitation was that the scale is not associated with good reliability and validity and the scale did not consider physical factors.

#### 3.1.4. Summary of published research on effect of yoga

1. Uma K et al (1989) did a study on Integrative Yoga module being beneficial in mentally disabled children. In this study about 90 children with mental retardation of mild, moderate and severe degree were selected from four special schools in Bangalore, India. Forty-five children underwent yogic training for one academic year (5 h in each week) with an integrated set of yogic practices, including breathing exercises and pranayama, sithili karanavyayama (loosening exercises), suryanamaskara, yogasana and meditation. They were compared before and after yogic training with a control group of 45 mentally retarded children matched for chronological age, sex, IQ, socio-economic status and socio environmental background who were not exposed to yoga training but continued their usual school routine during that period. There was a highly significant improvement in the IQ and social adaptation parameters in the yoga group as compared to the control group.
2. Platania – Solazzo A (1992) have studied the effect of relaxation techniques on Anxiety. The present study analyzed the immediate effects of relaxation therapy (RT) which were assessed on 40 hospitalized children and adolescents with diagnoses of adjustment disorder and depression. These effects were assessed using a with-in subjects pre-test / post-test designs and by comparison with a control group of 20 depressed and adjustment disorder patients who watched a 1hour relaxing videotape. Self-reported anxiety and in- anxious behavior and fidgeting were decreased as well as the positive affect was increased in yoga group compared to the one in video group.
3. Zaba R (2003) studied the effects of yoga on respiratory parameters. In this study 70 children with mild idiopathi - scoliosis I, degree by the method of Cobb, participating in two or several rehabilitation camps, and in the control group of 22 healthy children were designed. Intensive movement rehabilitation with breathing exercises and relaxation with Yoga was used in children. The mean values of spirometry parameters were correlated between the examined groups and statistically significant increased values of parameters MMEF% pred., MVV (Maximal Voluntary Ventilation) were defined in the group of children with scoliosis.



4. Hadi N (2007) has tested the effect of Hatha yoga on well-being in healthy adults. This study was designed with that purpose using the SF-36 questionnaire in 107 volunteers [44 males and 63 females, mean age 34 (standard deviation) 07 years] who attended yoga classes for 6 months. There was significant improvement in scores for all health items. The differences according to age, sex and education level were not significant. The conclusion of this study was that yoga can improve physical and mental health and promotes well-being.
5. Rangan R et al (2009) has shown that Yoga educational system is better than modern education system. In this study, 49 boys of ages ranging from 11-13 years were selected from each of two residential schools, one MES (Modern Education System) and the other GES (Gurukula Education System), providing similar ambiance and daily routines. The boys were matched for age and socio- economic status. The GES educational program is based around integrated yoga modules while the MES provides a conventional modern education program. Memory was assessed by means of standard spatial and verbal memory tests. The results suggested that GES boys showed significant enhancement in both verbal and visual memory scores than MES boys.
6. Carei TR(2009) have studied the effect of yoga on eating disorders. In this study, 50 girls and 4 boys aged 11-21 years were randomized to an 8-week trial of standard care vs individualized yoga plus standard care. Of these, 27 were randomized to standard care and 26 to yoga plus standard care. Outcomes evaluated at baseline, end of trial, and 1-month follow-up included Eating Disorder Examination (EDE), Body Mass Index (BMI), Beck Depression Inventory, State-Trait Anxiety Inventory, and Food Preoccupation questionnaire. Conclusion of the study was that: Individualized yoga treatment decreased EDE scores at 12 weeks, and significantly reduced food pre-occupation immediately after yoga sessions. Yoga treatment did not have a negative effect on BMI. Results suggested that individualized yoga therapy holds promise as an adjunctive therapy to standard care.
7. Deshpande S et al (2009,2010) studied the effect of integrative yoga module on Triguna and self-esteem. The study was carried out on 226 subjects aged between 18-71 years, of both sexes, who satisfied the inclusion and exclusion criteria, and whose consent to participate in the study were randomly allocated into two groups. The Yoga (Y) group practiced an integrated yoga module that included asanas, pranayama, meditation, notional correction, and devotional sessions. While the other group practised mild to moderate

physical exercise (PE). Both the groups were supervised for 01hour session daily for six days a week, for about eight weeks. Guṇa(personality) was assessed before and after eight weeks using the self-administered "The 'Gita" Inventory of Personality" (GIN) to assess Sattva, Rajas, and Tamas. Self - esteem in terms of competency (COM), global self - esteem (GSE), moral and self - esteem (MSE), social - esteem (SET), family self - esteem (FSE), body and physical appearance (BPA), and the lie scale (LIS) were assessed using the self - esteem questionnaire (SEQ). The results in study showed improvement in Sattva guṇa and decrease in Tamas guṇa which was significant in the Yoga group but not so in the PE group. The effect size for self- esteem in the Yoga group showed greater than the PE group from three out of seven domains.

8. Krisanaprakornk T et al (2010) have discussed meditation therapies for Attention Deficit Hyperactive Disease. Randomized controlled trials that investigated the efficacy of meditation therapy in children or adults diagnosed with Attention Deficit Hyperactive Disorder, were searched in CENTRAL, MEDLINE, EMBASE, CINAHL, ERIC, PsycINFO, C2-SPECTR, dissertation abstracts, LILACS, Virtual Health Library (VHL) in BIREME, Complementary and Alternative Medicine specific databases, HSTAT, Inform IT, JST, Thai Psychiatric databases and ISI Proceedings, plus grey literature and trial registries. Four studies were done, including 83 participants, were included in this review. Two studies used mantra meditation while the other two used yoga compared with drugs, relaxation training, non-specific exercises and standard treatment control. Only one out of four studies provided data which was appropriate for analysis. For this study there was no statistically significant difference between the meditation therapy group and the drug therapy group on the teacher rating ADHD scale. Authors were unable to draw any conclusions regarding the effectiveness of meditation therapy for ADHD. That was the limitation of the study.
9. Fricchione GL et al (2011) and Radhakrishna S (2010) did a study in which the relaxation techniques help children with Autism. These studies were done to check the effect of relaxation techniques and Integrative Yoga module on children with Autism. In the first study, intervention involving yoga and dance, showed efficacy in treating behavioral and some core features of autism, particularly for latency-age children. The other study indicated that integral yoga module practiced for ten months, may offer more benefits as an effective tool to increase imitation, cognitive skills and social-communicative behavioral skills in children with Autism.

10. Khemka SS et al (2011) has studied the effect of integrative yoga module on triguṇas Sattva, Rajas and Tamas and emotional intelligence. This study was done on 108 subjects, who were selected out of 198 volunteers to form the experimental yoga group. Their ages ranged from 17 to 63 years. The yogasanas (postures), pranayama (breathing exercises), relaxation techniques, meditation, chanting and lectures were the components of yoga intervention. The variables measured were sustained attention, emotional intelligence - EQ, general health - GHQ, Guṇa personality - sattva, rajas and tamas. The results of the study showed that there were significant changes in all variables ( $P < 0.001$ ) except in sattva. It also confirms that EQ and general health variables correlate significantly with each other and negatively with tamas. EQ and tamas form positive and negative predictors of health respectively. Sattva correlates positively with EQ suggesting that a sattvic personality indicates better self-control in individuals.
11. White LS (2012) et al has shown that the mindful yoga reduces stress in school going girls. In this study, Fourth- and fifth-grade girls were recruited from two public schools and randomly assigned to the intervention and wait-list control groups. The intervention group met 1 hour session a week for 8 weeks and completed 10 minutes of daily homework. Self-esteem and self-regulation increased in both groups. Limitation of the study was it was not a blinded randomized study.
12. Noggle JJ et al (2012) discovered that Yoga improves psychological well-being of school going children. In this study, Kripalu-based yoga program of physical postures, breathing exercises, relaxation, and meditation module was administered for 2 - 3 times per week for 10 weeks to adolescents of 11<sup>th</sup> and 12<sup>th</sup> grade. The inventories administered were the profiles of Mood States-Short Form and Positive and Negative Affect Schedule for Children; Additional measures of psycho-social well-being, included Perceived Stress Scale and Inventory of Positive Psychological Attitudes; Secondary measures of self-regulatory skills which included Resilience Scale, State Trait Anger Expression Inventory-2<sup>TM</sup>, and Child Acceptance Mindfulness Measure. The result was total mood disturbance improved in yoga student's group and worsened in control group students. Limitation of the study being uneven sample size.

#### 3.1.5. Thesis of S-vyasa in the field of effect of Yoga

1. Pushpavathi P R et al (2004) has done a study on how yoga improves verbal memory in children.

2. Shraddha S Kamath et al (2004) has shown how yoga practice helps in improving visual memory in children.
3. Dr Mallikarjun et al (2004) published a study on yoga practise showing significant effect on logical memory in children.
4. Sudhansu Mohanty et al (2004) has clearly shown how yoga improves creativity in children.
5. Dr Gautam Hazarika et al (2004) studied how yoga improves attention and concentration in children.
6. Vishwajeet Singh et al (2004) developed a specific model for improvement of intelligence being better than any other model for physical stamina and creativity development in children.
7. Avinash Mishra et al (2004) has shown using a integrative yoga module in improving manual dexterity in children.
8. Sripad H Ghaligi et al (2005) studied the effect of Vedic chanting on memory and attention in adolescents.
9. Gaitonde Herambi Suresh (2006) published a study on how yoga improves self-concept in school going teenagers.
10. Nilkamal N et al (2006) used integral yoga module which revealed how it improves the personality in children.
11. Sudhir Singh et al (2006) has compared yoga with physical exercises to assess personality of the adolescents. Yoga group had better improvement in Warmth, Enthusiasm, Excitableness, Venturesome and Tense, while in Physical activity (Control) group participants became more Emotional maturity, Excitable, Dependent, Depressive and Controlled.
12. Badve Rashmi Narendra et al (2009) studied the effect of yoga on logical and analytical thinking in High-school going students.
13. Ashutosh Mishra et al (2009) did a study to see the immediate effect of kapalabhati on verbal and spatial memory in children and has shown significant improvement.
14. Nidhi et al (2010) studied the effect of yoga on adjustment skills in community home children.
15. Aravind Prasad V.V et al (2010) studied the effect of chanting Gayatri mantra changes on higher brain functions in high-school going girls.

16. Revant Indhana et al (2011) studied the effect of Bhramari pranayama in healthy adolescents to observe changes in attention and concentration.

Table 3: Yoga studies

Authors, year	Subjects and settings	Design	Outcomes
Uma K et al (1989)	45 mentally retarded children	Pre-Post design with control group	Improvement in IQ and Social adaptation.
Platania-Solazzo A(1992)	40 hospitalized children	Pre-Post design with control group	Decreased self-reportive anxiety and anxious behavior
Zaba R (2003)	70 children with mild idiopathic scoliosis	Pre-Post with control group	Increased rate in Maximal Mid Expiratory Flow
Hadi N (2007)	107 healthy adults	Randomized control design	Improvement in physical and mental health
Carei TR(2009)	11-21 years Girls and Boys	Randomized control group	Reduction in food pre-occupation
Rangan R et al (2009)	49 boys of 11-13yr range	Pre-Post design with control group	Enhancement in Verbal and Spatial memory
Deshpande S et al (2009,2010)	226, aged 18-71 years	Randomized control design	Changes seen in Guṇas, Self - esteem & General health status
Khemka SS et al (2011)	108, aged 17-63 years	Pre-Post design	Improved Guṇas personality and stabilized EQ
Fricchione GL et al (2011)	24 children of the age group 3-16 years	Pre-Post design	Improved behavior in Autism
White LS(2012)	4 <sup>th</sup> and 5 <sup>th</sup> grade girls	Randomized wait-list control design	Increased in Self-esteem and Self-regulation
Nogge JJ(2012)	51 -11 <sup>th</sup> and 12 <sup>th</sup> grade students	Cluster-Randomized	Improvement in psychosocial well-being

### 3.1.6 What is lacking in literature?

The present available published inventories are definitely a good attempt in developing and standardizing the scales in order to measure tridoṣas and triḡuṇas. This points at the scope of all the available studies. However, there lies a lacuna of no available scales which are specifically standardized to measure the tridoṣas and triḡuṇas in adolescents. All most all the developed scales are concerned with children or majorly focused on the adult group. None of the questionnaires are based on the comprehensive knowledge of Āyurveda and not associated with satisfactory reliability and validity. However, adult scales cannot be administered on adolescents and expect any desired results from it, they require a different mode of questions to evaluate. Hence, the present study inventory was developed in order to measure the tridoṣas specifically for adolescents in the age group between 13-18yrs based on the concepts from Āyurveda classical texts. Also, there are no studies available on the effect of yoga in adolescents. So, a yoga module was developed to check the efficacy of Integrative yoga module in measuring the tridoṣas in adolescents.

### 3.3 Summary table of scientific papers on prakṛti questionnaires:

Table 4: Prakṛti studies

Author and Year	Samples	Psychometric Properties
Uma K. et al (1971)	Adults various age category	Reliability and validity are not established
Mohan V, & Sandhu S (1986)	Adults different age category	Validity and Reliability not achieved
Das RC (1991)	Adults various age category	Triḡuṇas (Sattva, Rajas and Tamas) have negative correlation between them, did not establish reliability and validity
Marutham P et al (1998)	Adults different age category	Did not have good reliability and validity, there was negative correlation between sattva, rajas and tamas.
Wolf DB (1999) and Stempel HS et al (2006)	619 adults, Various age group	Rigorously established reliability and validity, with good cronbach's alpha and good total item correlation
Joshi RR (2005)	280 adults, 18-70yrs	The model of regression showed good scores but there's no trace of reliability and validity
Shilpa S and C.V Murthy (2011)	1548 adults, general adult category	A well-established reliability and validity seen.
S.P Suchitra, HR Nagendra (2013)	200 children, 6-12yrs	Is associated with good reliability and validity

Ramakrishna BR (2014)	300 adults, 19-24yrs	Extremely good Cronbach alpha values and validity is established
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