

STANDARDIZATION OF SUSHRUTHA PRAKRITI INVENTORY- SPI AN AYURVEDA BASED PERSONALITY ASSESSMENT TOOL WITH SCIENTIFIC METHODS

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ABSTRACT:

Background: Our survey amongst practicing *Ayurveda* doctors had established the need for a standardized *Prakriti* assessment tool. We have developed *Sushrutha Prakriti* Inventory (SPI) based on Ayurvedic concept of personality. The pilot study has yielded a scientifically developed tool called SPI with two parts SPI- Q (questions) and SPI- C (check-list) to assess the *Prakriti* of an individual. **Objectives:** To standardize *Sushrutha Prakriti* Inventory (SPI) based on Ayurvedic concept of personality through scientific methods. **Settings and design:** The SPI tool that was developed through a pilot study was administered to 1200 healthy volunteers of different age group of both male and female subjects from multi centres. The data obtained was subjected to Test-retest for Reliability and Experts Cross validity test, Correlations study between subjective and objective parameters by Cronbach's alpha and Normality test by Kolmogorov Supernova for standardization of the tool. **Method:** The data was collected and subjected to the tests of Reliability, Validity and Normality. A total of 1200 subjects were taken for the test of validation and 120 subjects for Test – retest Reliability and 120 subjects for expert validation by experienced *Ayurveda* physicians. **Results:** Data analysis was done using SPSS-2006 version and there was found to be a strong reliability of the Questionnaire with Pearson correlation score for *Vata*, *Pitta* and *Kapha* being 0.990, 0.952 and 0.954 respectively; the Pearson correlation score for *Vata*, *Pitta* and *Kapha* for Physical Check-list being 1.000, 0.996 and 0.999 respectively. With respect to Test – retest reliability scores for *Vata*, *Pitta* and *Kapha* for Questionnaire is 0.994, 0.975 and 0.976 respectively and 1.000, 0.997 and 0.983 for *Vata*, *Pitta* and *Kapha* respectively for physical Check-list giving a high rate of reliability. The SPI version with 90+60 questions that evolved after Content / Consensual validity by 10 experts had Cronbach's alpha between 0.61 to 0.80. Pearson's correlations of Subjective vs. Objective assessment was > 0.95 and Test-retest reliability was >0.95 for all three *Prakriti*. **Conclusion:** This study has yielded a scientifically standardized tool SPI with two parts, SPI- Q with 90 objective questions and SPI- C with 60 subjective Physical questions.

Key Words: *Prakriti*, *Vata*, *Pitta*, *Kapha*, Personality, *Sushrutha*, Constitution.

INTRODUCTION:

Human being is a social animal and a product of social circumstances. Society influences his life and he influences the society. In the process of the interaction between man and society, a kind of characteristics emerge which can be considered as his way of behavior and subsequently that becomes the pattern of his life which is called personality / *Prakriti*.

There are many ways of understanding and interpreting these characteristics and from time to time many scholars have tried to define personality. Theories, have been developed across the globe, defining and assessing human behavior in terms of his unique traits and types. According to Allport's definition "personality is the dynamic organization within the individual of those psycho-physical systems that determine his unique adjustments to his environment"⁽²⁵⁾.

Personality thus includes three aspects of an individual, the psychological, biological and environmental aspects. It encompasses the enduring characteristics that differentiate people which make each one unique. It is also the personality that leads us to act in a consistent

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and predictable manner both in different situations and over extended periods of time.

The biological aspects consisting of genetic, neurophysiological, and neurochemical components predispose the individual for a particular behavior that he / she may exhibit. Thus, in interaction with socio-cultural components such as learning, language, religion and society as a whole influence the development of personality.^(26.)

Different cultures and schools of thoughts have put forth their concepts of personality through scientific and empirical studies. In the eastern concept, traditional texts of *Yoga* and *Ayurveda* are rich sources of psycho-physical and spiritual knowledge.

Ayurveda describes the personality as *Prakriti*, a Sanskrit word. The word *Prakriti* means nature or natural form of constitution of an individual. It consists of two syllables *pra* and *kriti*. *Pra* means commencement or source of origin, *kriti* means performing and is derived from the root *kr* which means to perform. Therefore they jointly mean natural form or the natural status of one's performance or behavior.

In *Ayurveda* practice the first step is to recognize the *Prakriti* state of a person before the examination of diseased condition. Hitherto *Prakriti* assessment has been purely a subjective one and based on one's own traditional / personal experience. *Prakriti* is of seven types namely *Vataja*, *Pittaja*, *Kaphaja*, *VataPittaja*, *VataKaphaja*, *PittaKaphaja* and *VataPittaKaphaja* *Prakriti* / *sama* *Prakriti*. *Prakriti* is formed in the womb of the mother at the time of conception. A study by Bhushan and Kalpana has demonstrated a correlation between the tissue type Human leukocyte antigens (HLA) and *Prakriti* types to support this.^[12]

The different variants of *Prakriti* are based on the principles of *Tridoshas* viz., *Vata* (motion), *Pitta* (metabolism) and *Kapha* (structure)⁽¹⁾. This concept had so far remained elusive to modern day biomedical scientists and was looked upon as esoteric. Of late these theories stand the potential of satisfying modern biological theories and findings of a couple of recent studies. Patwardhan *et.al.*⁽¹²⁾ hypothesized and demonstrated correlation between HLA alleles and *Prakriti* type, thus opening new research avenues for the concept of an association between HLA alleles and the Ayurvedic *Tridosha* theory of individual *Prakriti* types.

In another study the concept of *Tridosha* was found to have a sound empirical basis in terms of accuracy of estimation with statistical confidence level above 90% that could be used for the scientific establishment of *Ayurveda* in a new light⁽⁸⁾. Further, there have been preliminary attempts to develop a clinical tool to

diagnose physiological classifications of *Prakriti*. A few such attempts are worth mentioning. Deepak Chopra did publish one in his book called *Ayurveda* body-type questionnaire having three sections each for *Vata*, *Pitta* and *Kapha*⁽¹¹⁾. The data extractable from this tool seems linear where as there is coupling seen in the presentations of these *Prakritis*. The data extractable from Kasture's⁽²¹⁾ questionnaire, though is non-linear he does not seem to have sufficiently stressed on the higher mental predispositions⁽³⁴⁾ and seems to have just listed the attributes of *Prakriti* and cannot be effectively used as a tool. A software that intends to measure *Prakriti* called *Ayu-Soft*⁽³²⁾ seems to have inconsistencies in terms of close ended and too many questions thus compromising on the user friendliness of the instrument.

Further, these tools have not been subjected to standard tests of validity and reliability. In this regard our study on need of a standardized *Prakriti* assessment tool has affirmatively strongly confirmed^[35]. With this background they have felt the need to standardize a concise clinical instrument which is comprehensive, user friendly, nonlinear and with open ended questions. In order to fulfill this requirement the scientifically developed SPI^[36] was subjected for scientific methods of tool standardization after analyzing the results of pilot study. The developed SPI which has 2 parts (part –A with 90 Questions and part – B with 60 Physical Check-list) with total 150 questions was administered to 1200 subjects after obtaining the informed consent.

AIMS AND OBJECTIVES:

Standardization of SPI (*Sushruta* *Prakriti* Inventory) consisting of an objective self-rating Questionnaire (SPI-Q) and subjective Check-list (SPI-C) based on Ayurvedic concepts through scientific methods for clinical and research purpose.

METHODS:

This study included the following steps;

1. Modification and correction of SPI based on Pilot study results.
2. Assessment of *Prakriti* using SPI on 1200 subjects (Main study)
3. Reliability study by Retest on 120 randomly selected subjects from the same group after a lapse of 10 days.
4. Study of Validity by correlation of clinical a with SPI assessment on the same 120 subjects of Retest.

Design of the Study

Thus developed SPI was administered to 1200 subjects after obtaining the informed consent. The subjects

were briefed about SPI-Q and they were informed to select and tick the appropriate ones in the tool. All the subjects were examined by the investigator / trained personals to elicit the features of check -list found. The scorings of SPI-Q and SPI-C were added on individual basis to quantify the proportion of *tridoshas* in the subjects.

Study Design: An Observational study with 1200 healthy subjects was undertaken to study to assess the validation of *Prakriti* scale and develop reference interval for the *PRAKRITI* scale on sub-scale basis viz. *VATA*, *PITA* and *KAPHA*.

Table 1: Number of subjects according to age group.

Age in years	Number of subjects	%
16-20	320	26.7
21-30	456	38.0
31-40	136	11.3
41-50	88	7.3
51-60	124	10.3
61-70	40	3.3
71-80	36	3.0
Total	1200	100.0
Mean ± SD	31.43±15.62	
Gender	Number of subjects	%
Male	556	46.3
Female	644	53.7
Total	1200	100.0

Test- Retest

In order to ascertain the reliability of SPI 10 percent of the subjects

(120) were randomly selected for retest after a gap of 10 days.

Cross-Validation

The same 120 subjects who were subjected for test-retest reliability were subjected for cross validation with 5 Ayurvedic experts.

RESULTS:

The data collected were scored and subjected to both descriptive and inferential statistics. The descriptive statistics were calculated using percentage, mean and standard deviation.

Cronbach's coefficient alpha was used to calculate the internal consistency to assess consistency of results across items within the scale.

The reliability of the SPI was calculated by using the Chi-square data through Split – half method and Spearman brown test.

Pearson's correlation coefficient (r) was calculated for establishing cross validity.

Intra – Class correlation coefficient was used to assess the consistency, conformity of measurements made by multiple respondents' measuring the same quantity.

Cronbach Alpha for consistency /Reliability of items in *VATA*, *PITTA* and *KAPHA* after deleting item.

Cronbach classification

- $0 \leq \alpha \leq 0.40$: Not reliable
- $0.41 \leq \alpha \leq 0.60$: Moderate reliability
- $0.61 \leq \alpha \leq 0.80$: Good reliable
- $0.81 \leq \alpha \leq 1.00$: very High reliable

The scale as a whole proved good reliability with Cronbach's alpha α between 0.61 - 0.80

Norms for *PITA*, *VATA* and *KAPHA* for Male

Range of score was calculated on $\pm 1SD$

Table 2: Norms according to age* (Abstract)

Age in years	VATA		PITA		KAPHA	
	Male	Female	Male	Female	Male	Female
16-20	10	15	14	11	15	16
21-30	10	16	13	13	16	15
31-40	11	15	12	13	15	18
41-50	11	17	12	13	17	15
51-60	11	15	13	14	15	16
61-70	9	16	13	12	16	12
71-80	9	15	9	10	15	15
Average	10	16	13	12	16	15

*Note: If the distribution is not normal, percentile distribution is used to find the reference interval

Table 3: Norms according to age (Abstract) (30+20 statements)

Age in years	VATA		PITTA		KAPHA	
	Male	Female	Male	Female	Male	Female
16-20	14.0	14.0	18.0	17.0	25.0	23.8
21-30	14.1	14.1	17.6	17.0	24.2	23.0
31-40	15.0	15.0	17.0	17.0	22.9	22.1
41-50	15.0	15.0	17.0	17.0	21.7	21.3
51-60	15.0	15.0	16.7	17.0	20.6	20.5
61-70	15.0	15.0	16.0	17.0	19.5	19.7
71-80	15.5	15.5	16.0	17.0	18.3	18.9
Total	14.8	15.9	16.8	17.0	21.5	21.1

Table 4: Test –test reliability of Inventory of tridoshas

	Pearson correlation	Test-retest reliability
TRIDOSHAS INVENTORY		
VATA	0.990	0.994
PITA	0.952	0.975
KAPHA	0.954	0.976
TOTAL	0.968	0.983
PHYSICAL FEATURES		
VATA	1.000	1.000
PITA	0.996	0.997
KAPHA	0.999	0.999
TOTAL	1.000	1.000

Table 5: Expert validation of VATA, PITA and KAPHA

	VATA	PITA	KAPHA
EXPERT1	0.966**	0.947**	0.909**
EXPERT2	0.959**	0.930**	0.895**
EXPERT3	0.955**	0.919**	0.870**
EXPERT4	1.000**	1.000**	1.000**
EXPERT5	0.991**	0.995**	0.980**
Values are Pearson correlation, ** highly significant			

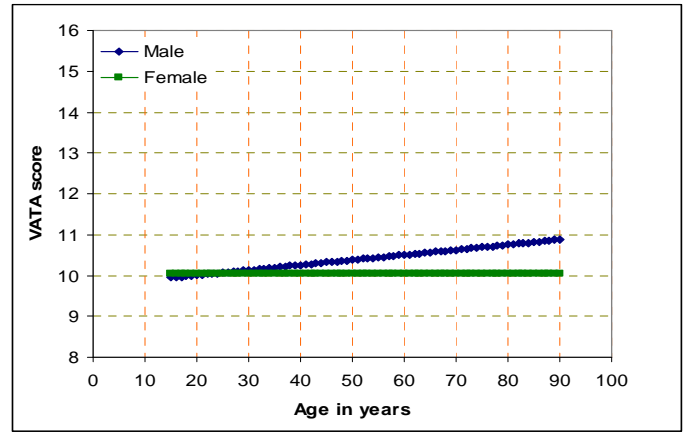


Figure 1: Graph showing the scores for Vata against age

The graph shows that as the age increase the scores for Vata have decreased in males and in case of females the scores for Vata have remained the same as age advanced.

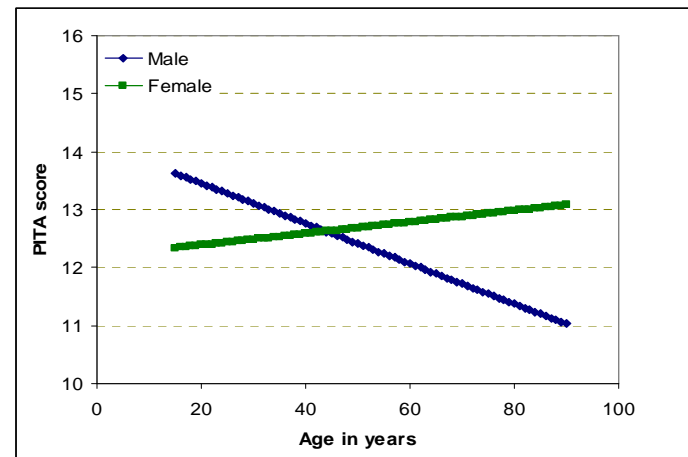


Figure 2: Graph showing the scores for Pitta against age

The graph shows that as the age increase the scores for Pitta have decreased in males and in case of females the scores for Pitta have increased as age advanced.

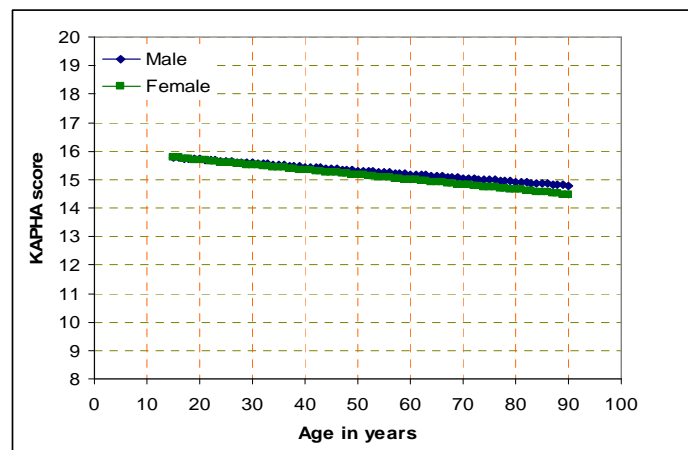


Figure 3: Graph showing the scores for Kapha against age.

The graph shows that as the age increase the scores for *Kapha* have decreased in males and females as age advanced.

Statistical Methods: Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean \pm SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance. Cronbach alpha has been performed to assess the consistency and reliability of response of the scale to measure the *PRAKRITI* and confirm the scale is summative scale, Biserial correlation has been used to assess the item-total correlation to understand the items correlation. Normality test has been performed for the *VATA*, *PITA* and *KAPHA* score, Reference Interval has been developed by either Normal method (if normal distribution is accepted) or Percentile method (if normal distribution is not accepted). Classification of *PRAKRITI* SCALE was done with 27 combinations, one category represents the completely Normal population, and 26 variants of *VATA*, *PITA* and *KAPHA* were also assessed. Pearson correlation has been done for expert validation.

Norms were developed using the Mixed Model of PROC MIXED of SAS 9.2, with random Intercept and age as effect, using the following SAS code

```
odsrtf;
odsgraphicson;
procmixed data=datafemale;
Model k_total=age/cl;
Random intercept;
run;
odsgraphicsoff;
odsrtfclose;
```

1. t-test of a correlation coefficient

Objective: To investigate whether the difference between the sample correlation co-efficient and zero is statistically significant.

Limitations: It is assumed that the x & y values originates from a bivariate normal distribution and that relationship is linear. To test an assumed value of population co-efficient other than zero, refer to the Z-test for a correlation co-efficient.

$$r = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sqrt{\sum (x - \bar{x})^2 \sum (y - \bar{y})^2}}$$

$t = \frac{r\sqrt{(n-2)}}{\sqrt{(1-r^2)}}$ is calculated and follows student t distribution with n-2 degrees of freedom.

2. Classification of Correlation Co-efficient (r)

Up to 0.1	Trivial Correlations
0.1-0.3	Small Correlation
0.3-0.5	Moderate Correlation
0.5-0.7	Large Correlation
0.7-0.9	Large Correlation
0.9- 1.0	Nearly Perfect correlation
1	Perfect correlation

3. Cronbach classification

$0 \leq \alpha \leq 0.40$:	Not reliable
$0.41 \leq \alpha \leq 0.60$:	Low reliability
$0.61 \leq \alpha \leq 0.80$:	Very reliable
$0.81 \leq \alpha \leq 1.00$:	High reliable

4. Significant figures

- + Suggestive significance (P value: $0.05 < P < 0.10$)
- * Moderately significant (P value: $0.01 < P \leq 0.05$)
- ** Strongly significant (P value: $P \leq 0.01$)

Statistical software: The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, Med Calc 9.0.1 ,Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

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DISCUSSION:

Ayurvedic physicians invariably use *Prakruti* in diagnosis and management. The descriptions of *Prakruti* characteristics are in the form of generalizations and this is deciphered by the trained physician as a tool to apply and understand individual specific *Prakruti* of a subject. This status has remained till date making *Prakruti* analysis by physicians very subjective. In the past couple of decades some *Ayurveda* based organizations have been making initial attempts to develop a standardized tool in fulfillment of their commercial interest's thus compromising scientific credibility. Few scientific organizations have been able to develop research based standardized tool falling short of scientific temper in one or the other way. Is there a real need for a research based standardized tool to assess *Prakruti*? To address this question the following preliminary study to know the necessity of the standardized tool to assess *Prakruti* was undertaken and the following observations were noticed.

Hence a tool which could measure the *Prakruti* as belonging to respective doshic type was developed and standardized. This had 2 sections consisting of physical feature (physical checklist) and self rating questionnaire consisting characteristics of *Vata*, *Pitta* and *Kapha* (Physiological, Psychological, Social, Intellectual and Spiritual). The self explanatory questionnaire to be answered by the subject and physical checklist assessment by the physician was the aim of this work. Individual questions were devised to elicit three aspects of human personality described in *Ayurveda*. These questions were designed to be simple and understandable. It was refined based on the opinions of 2 psychologists and 12 Ayurvedic experts. The items were then separately analyzed by 6 Ayurvedic experts. The reliability and validity were checked on subjects in age group 16 to 75 years. 1200 normal healthy subjects both sexes were selected from medical, nursing colleges and hospitals of Bangalore south. The subjects were then separately analyzed by Ayurvedic experts. The data so obtained correlated significantly with our findings. The Expert validation was done on 120 subjects, these subjects were randomly selected and their original score were compared with score given by the experts who assessed the *Prakruti* according to their own knowledge. The score/values were compared through Pearson correlation, after correlation it was found to have highly significant correlation as all the values of five experts were above 0.80; suggestive of P value: ≤ 0.01 ($P \leq 0.01$).

The questionnaire was validated by comparing the test and retest reliability scores in the subject of study sample (n=30) which were randomly chosen. There was found to be a strong reliability of the questionnaire with Personal correlation score for *Vata*, *Pitta* and *Kapha* for

Tridosha Inventory being 0.990, 0.952 and 0.954 respectively; the personal correlation score for *Vata*, *Pitta* and *Kapha* for physical features being 1.000, 0.996 and 0.999 respectively with respect to Test – retest reliability scores for *Vata*, *Pitta* and *Kapha* for Tridosha Inventory as 0.994, 0.975 and 0.976 respectively and 1.000, 0.997 and 0.983 for *Vata*, *Pitta* and *Kapha* for physical features giving a high rate of reliability.

The results hence have shown that the questionnaire stands valid and reliable under the present boundaries of study. Though there have been many questionnaires like Deepak chopra's, Kasture's and Amruth none of them has been standardized. A systematic study to validate these has not been published. This present study appears to be a systematic scientific study of its kind in developing a standardized tool to elicit the *Prakruti*.

In the present study descriptive statistical analysis was carried out to find out the percentage of subjectives attending each question in the questionnaire. The significance of the questionnaire was assessed at 5% level of significance, the significance was interpreted as follows: $0.05 < P < 0.10$ suggestive of significance, P value: $0.01 < P \leq 0.05$ suggestive of moderate significance and P value: $P \leq 0.01$ suggestive of strong significance. Cronbach alpha was performed to assess the consistency and reliability of the questionnaire. Normality test was performed for the *Vata*, *Pitta* and *Kapha* scores. Reference interval was developed by normal method in normal distribution (*Pitta* and *Kapha*) and percentile normal; population method was adopted in not normal distribution (*Vata*). Classification of *Prakruti* scale was done with 27 combinations where one category represented the complete normal population and other 26 variants of three doshas were also assessed. Peasons correlation was applied for establishing the expert validation.

Discussion on results

In the age wise distribution no of subjects appearing for the study were more in the age group between 21 to 30 years followed by 80 subjects in the age group of 16 to 20 years, this was be due to more number of students appearing in the study. In gender wise distribution more number of females (161) appeared for the study. This was due to more number of female students in medical and nursing college. In occupation wise distribution maximum number of subjects appeared for the study were students (155), this was mainly due to conducting the study in medical and nursing college in which normally girls take more admissions. In the descriptive statistics of *Vata* inventory; maximum 253 (84.3%) subjects have accepted Q 17 (Item No. 60), this is mainly due to the excessive use of spices in south India where generally people like to eat sweets, spicy,

hot and oily food. Minimum 19 (6.3%) subjects have accepted the Q30 (Item No 90), this is mainly due to the religious belief prevailing in India. In descriptive statistics for *Pitta* inventory maximum 206 (68.7%) subjects have accepted the Q5 (Item No. 18) this is mainly due to the expectations of loyalist prevailing among the people for due consideration for generosity. Minimum 50 (16.7%) subjects have accepted Q30 (Item No 88) this is because nobody likes to accept the negativity unless it's a serious issue. In descriptive statistics for *Kapha* inventory maximum 269 (89.7%) subjects have accepted the Q23 (Item No.68) this is because maximum subjects were students who like to project themselves are intelligent. In the cronbach alpha for consistency/reliability items in Tridosha inventory is between $0.61 \leq \alpha \leq 0.80$ suggestive of good reliability. This is mainly because of the selection of items encompassing all features were directly sourced from the classics by following the standard procedures (suggested by Edward and Jackson). In the classification of the subjects based on the results 210 (70%) subjects had medium – *Vata*, *Pitta* and *Kapha*, suggestive of the normal population and less variability in the results and in the questionnaire there by pointing to the accuracy of the tool. In the expert validation of the tool on 75 subjects by five experts yielded highly significant correlation which is suggestive of the accuracy of the tool.

CONCLUSION:

Study resulted in a standardized, reliable and valid instrument as is reliable since reliability is significant, is valid since correlation between questionnaire and physical checklist and *Prakriti* diagnosed by doctors is significant. Hence this tool can be used as a basis for developing similar tools to suit people across different sections of the society at large. Such endeavors will go a long way in preventing most of the geriatric problems and counter the effects of the disease, thus helping to create a disease free society. This instrument is having its own limitations such as it can not be used for adult age above 17 years and children of physical and mental ailments. The instrument can be used for only English medium students. The sample number of male and female is not equal. In future one should be assessed A larger sample with broader age range and different socio cultural background. The questionnaire can be applied to the Indian sample and non-Indian sample. This would tell us about whether the *Prakriti* theory is universally applicable and whether socio cultural background influences the scores. *Prakriti* questionnaire can be administered to the clinical population to find out the tridosa pattern among different clinical group.

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