

Standardization of *Matrakala* in Term of Seconds With Special Reference to *Ashtanga Hridaya*

Komang Sumertavan, Final Year, BAMS, ALNRMAMC, Koppa

Kavyashree, T.C., Final Year, BAMS, ALNRMAMC, Koppa

Mamatha, K., Final Year, BAMS ALNRMAMC, Koppa

Prof. (Dr.) Milind Hukkeri, ALNRMAMC, Koppa

Dr. Prashant Kumar Jha, Reader, Research Methodology, ALNRMAMC, Koppa

Abstract: Number of works are being done since long past for better absorption of drugs and it is observed that duration of surface contact with drug is subject of great significance for absorption of drugs. Ayurveda has its own terms to measure time by name of Matrakala. Definition of Matrakala clearly indicates that the strength and stamina of individual involved with measurement may bring the differences in time. Lacking of scientific calculation to generalize the duration is evident. So, a standardized measurement in terms of seconds is required to avoid the differences. Deviation in terms of seconds also exists between the two definition of measurement of matrakala. The taken work revealed the measurement of one matrakala in relation to second.

Keywords: Matrakala, drug absorption, duration of contact with surface.....

Actions of drug depend upon the dose, the route of administration, the physico-chemical properties of preparation, permeability, blood flow, surface area and duration of drugs. Duration of drugs in contact with surfaces plays pivotal role in permeability and absorption. Time of contact with surface becomes important specifically for applications of drugs in eyes, ear, mouth etc. In eyes, chances of washing of drugs by tears are common while in mouth chances of swallowing of drugs persist. Bioavailability is dependent upon the absorption, which is correlated with time specifically in oral or external application of drugs. Patients' compliance is also important considering the nature of constituents. Hence standard method of time measurement with minimal difference is important aspect of drug application for purpose of generalization. In Ayurveda, *Matrakala* is referred to deal with duration of application of drugs.

Matra denotes to measurement¹ while *Kala* is connoted with time². *Kala* is said to sequential or non-sequential exploration of *Kalana* (mutative activity)³. Smallest unit is taken in reference to length of breath including inhalation and exhalation³. *Charak Samhita* evinces time with the year and status of patient⁴. *Kala* is taken in broader reference including day-night, seasons, years etc. The term '*Matrakala*' simply means measurement of time. It is mentioned for time required for application of drugs. *Ashtanga Hridaya* defines *Matrakala* as, 'the time required for the finger to move around the right knee once or time required for closing and opening of the eyelids once'¹⁰. It is evident from definition that measuring of *Matrakala* may bring variations based on speed and strength of individuals while the measurement of standard international second is based on the atomic clock frequency oscillation of cesium atoms⁹, hence chances of differences are minimal in million years in case of seconds. This variation might be longer in case of *Matrakala*. So, standardization of *Matrakala* in terms of second is demand of time to avoid variations and confusion among the *Ayurvedic* physicians for apprehension of duration of numbers of preparations applied and mentioned in *Matrakala*.

Materials and Methods: For standardization of *Matrakala*, both males and females were selected. The age of volunteers varied from 18 to 45. They were asked to rotate the fingers completely around the knee. Time was recorded on completion of every 10 circles using stopwatch. Total 100th circles were completed at interval of every 10. Completion of circle was observed critically and video was also made to cross-check if the circle is not completed by any volunteer or similar pace was not maintained throughout during the process of experiment. In case of half encircling, the process was repeated. Thereafter, they were further asked to blink their eyes and time was recorded for every 10 blinkings, till 100 blinkings were completed. Time for complete closing and opening of eye was noted. In case of half closing or opening, the whole process was asked to repeat. This was also done separately for male and female. Per encircling time and per blinking time were also calculated.

Statistical Analysis: Independent t-test was performed to compare the time taken in encircling of knee and blinking of eyes without taking the gender in consideration.

Result:

Time taken to complete circles around the knee

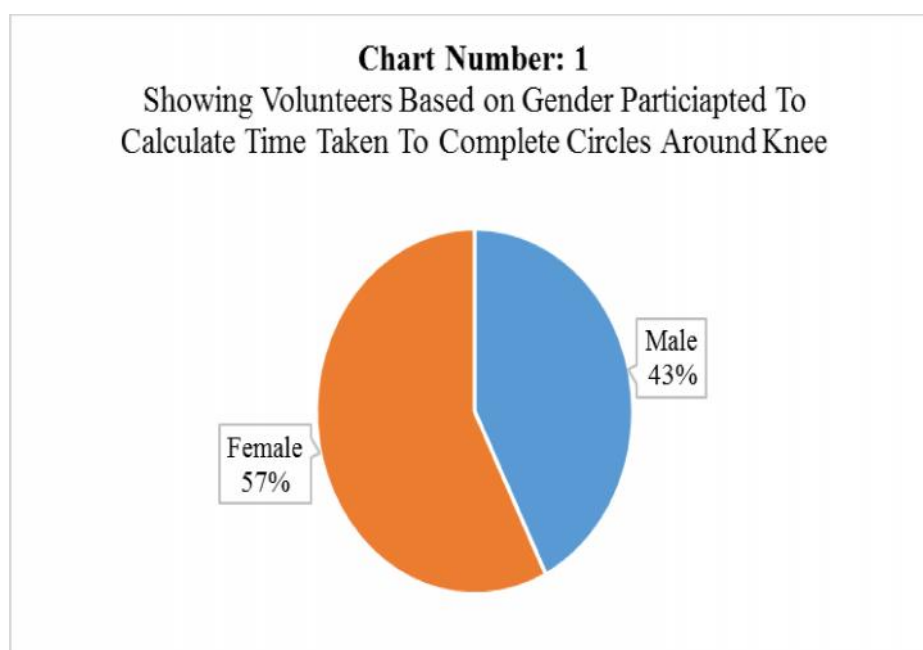


Table Number: 1

Showing Mean and Standard Deviation of Time Taken for Completion of 10-100 Circles and Per Circle Time For Males

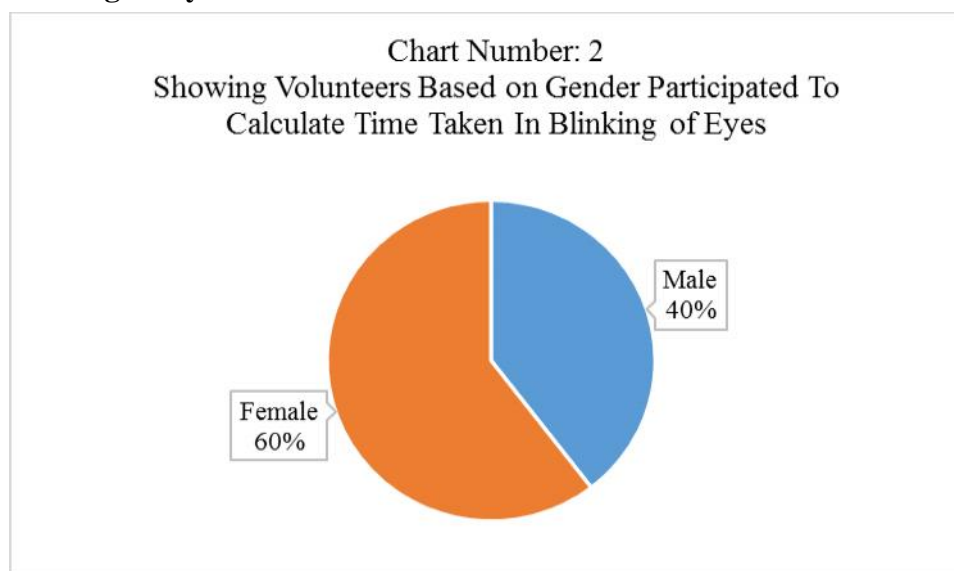
[illegible]

Table Number: 2

Showing Mean and Standard Deviation of Time Taken for Completion of 10-100 Circles and Per Circle Time For Females

	10 Circles	20 Circles	30 Circles	40 Circles	50 Circles	60 Circles	70 Circles	80 Circles	90 Circles	100 Circles
Mean	8.55	17.24	28.02	38.22	46.95	55.38	64.04	72.48	80.99	89.94
Std. Deviation	1.71	3.05	6.19	12.89	13.92	14.60	15.42	16.16	17.20	18.12
Per Circle Time (In Second)	0.85	0.86	0.93	0.95	0.94	0.92	0.91	0.90	0.90	0.90

Time taken for blinkings of eyes:

**Table Number: 3**

Showing Mean and Standard Deviation of Time Taken in 10-100 Blinkings of Eyes and Time of Each Blinking By Males

	10 Blinkings	20 Blinkings	30 Blinkings	40 Blinkings	50 Blinkings	60 Blinkings	70 Blinkings	80 Blinkings	90 Blinkings	100 Blinkings
Mean	5.63	11.24	16.95	22.83	28.88	34.83	40.51	46.65	52.52	58.45
Std. Deviation	1.63	3.24	5.16	6.80	8.30	9.95	11.77	12.87	14.27	15.50
Blinking Time (In Second)	0.56	0.56	0.56	0.57	0.57	0.58	0.58	0.58	0.58	0.58

Table Number: 4

Showing Mean and Standard Deviation of Time Taken in 10-100 Blinkings of Eyes and Time of Each Blinking By Females

	10 Blinkings	20 Blinkings	30 Blinkings	40 Blinkings	50 Blinkings	60 Blinkings	70 Blinkings	80 Blinkings	90 Blinkings	100 Blinkings
Mean	6.15	11.98	17.96	24.06	30.63	36.44	43.09	49.45	55.07	62.20
Std. Deviation	1.96	4.34	6.41	8.01	9.64	10.85	12.97	14.73	17.23	17.67
Blinking Time (In Second)	0.61	0.59	0.60	0.61	0.61	0.61	0.61	0.62	0.61	0.62

Significance Value at 95% confidence interval for Independent t-test for comparing time taken for completion of 100 circles and time taken for 100 Blinkings

In Male : <0.05

In Female : <0.05

Discussion: The mean of time taken to complete 100 circles around the knee by fingers was noted respectively 72.47 seconds and 89.94 seconds by males and females. Males maintained the average 0.72 second for every circle while females were noted taking time in range of 0.85-0.95 second to complete a circle. The time variation is directly related with physical strength and stamina as more of males were observed active in physical activities and it is already reported than Indian males are more involved in physical activities than Indian females⁷. However, a work of *British Columbia* revealed that women are with greater muscle endurance and stamina than men of similar age and athletic ability⁸. But a different pattern was noted in case of time taken for blinkings of eyes as mean time of 58.45 seconds was taken for 100 blinkings by males whereas the time taken for the same number of blinkings by females was noted as 62.20 seconds. Even the range of time taken per blink was also higher in females than males, being 0.56-0.59 seconds in males and 0.59-0.61 seconds in females. However, difference in time taken based on gender is not big, still it is well known fact that brains of both males and females are wired differently and females are more socially skilled and emotionally involved with works than males⁹.

The statistical analysis to find the similarity between time taken for encircling and blinking, revealed differences among the mean. It means they can't be taken as synonymous as presented in definition of *Matrakala* by *Ashtanga Hridaya*. If the differences for *Matrakala* above thousands exists then the difference of time will come in between 2.33 minutes to 4.62 minutes as per noted from result. Depending upon the individual's physiology and patients' compliance with formulation, it may be a big durational difference for surface-contact of various drugs. Hence, proper study for duration of contact with surface in terms of seconds is need of time. It should further be elaborated with specific procedures of application of drugs in defined alteration.

References:

1. Apte, V.S. (1963). *The Student's Sanskrit-English Dictionary*. p.434. Motilala Banarasidas, Delhi.
2. Apte, V.S. (1963). *The Student's Sanskrit-English Dictionary*. p.146. Motilala Banarasidas, Delhi.
3. Chakravarty, H. N. (2012). *Tantrasara of Abhinavagupta*. Chapter-6, pp. 87-88. Rudra Press, Portland.
4. Sharma, P.V. (2014). *Charak Samhita*. Vimanasthana 8/125, Vol. 1, Ed. and tranl. Revised ed. p.384. Chowkhambha Orientalia, Varanasi.
5. Available on: https://en.wikipedia.org/wiki/International_System_of_Units (assessed on 6-8-2018).
6. Available on: https://en.wikipedia.org/wiki/Unit_of_time (assessed on 6-8-2018).
7. Available on: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3974063/> (assessed on 7-8-2018).
8. Available on: <https://www.independent.co.uk/news/science/women-more-stamina-muscle-endurance-exercise-sport-men-science-study-university-of-british-columbia-a7911776.html> (assessed on 7-8-2018).
9. Available on: <https://www.theguardian.com/science/2013/dec/02/men-women-brains-wired-differently> (assessed on 7-8-2018).
10. Vidyanath, R. (2013). *Ashtanga Hridaya of Vagbhata*. Sutrasthana 22/33, p. 337. Chaukhamba Surbharati Prakashan, Varanasi.