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A co-relative survey study of Praman *Sharir* and *Balpariksha* (Strength Examination)

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Abstract

Classical Ayurvedic Texts like *Charak Samhita* describes very minute aspects of *Sharir Rachana* & also its relations with other branches of Ayurveda. It is clearly mentioned that, height of every individual should be equal to 84 own finger width *(Swangul Praman)*. If any individual fulfills this condition, he/she has better state of strength. To prove above statement of *Acharya Charaka*, it is necessary to co-relate the height and strength of individuals. For this purpose we have performed a project which is in search of relation between height and strength. Strength is measured on the basis of exercise capacity, energy level, and fatigue occurrence. For above said purpose height of individual was measured and exercise as skipping steps was advised to those individuals. Data was obtained after application of various parameters, inferences, and conclusions were drawn. From above research project, it can be said that research statement is true.

Keywords: Praman Sharir, Swangul Praman, Balpariksha.

1. Introduction

Rachana Sharir is very important part of *Ayurvedic* Classical Texts. Keen observations about various structures of sharira like Dhatu, Kurcha, Koshtha, Marmas etc. have been performed by our *Acharyas. Acharya Charaka* has described about proportions of different organs of human body in Vimansthan, Chapter eighth in *'Praman Sharir'*.

In this chapter it is stated that, ideally the height of an individual should be equal to 84 own finger width. If it is equal to 84 own finger width, that individual will have well maintained body strength[1]. To re-search the relation between height and body strength, a survey study was conducted. Body strength should be measured by individual's exercise capacity[2]. Therefore we planned to find relation between height and exercise capacity of an individual.

AIM: To study relation between height and exercise capacity (i.e. strength).

Objectives

1. To calculate height of individual in his/her own finger width pattern *(Swanguli Praman).*
2. Measurement of maximum exercise capacity of each individual.
3. Measurement of parameters like Pulse variations, Respiratory Rate Variations, Blood Pressure Variations.
4. Observation of occurrence of fatigue during exercise.
5. To find out any relation between height and body strength.

2. Study Design

This study was conducted at department of *Rachana Sharir* of *Radhakisan Toshniwal Ayurved Mahavidyalaya, Akola (Maharashtra- India).* Total 100 students of this institute were randomly selected irrespective of gender, cast, religion, height, weight, age and studying year.

I-step- For calculation of individual's own finger width height his/her width of proximal joint of middle finger of palm was measured by vernier caliper. The figure obtained by the vernier caliper is equal to the *swanguli praman* of that individual. Thus with this aspect we have calculated the height of each individual with the help of *swanguli praman*.

This obtained data was divided into five different groups.

SN	Group	Range of Height (*swanguli*)
1	I	60-65.9
2	II	66-70.9
3	III	71-75.9
4	IV	76-80.9
5	V	81-85.9

II step- After above step, Pulse Rate, Respiratory Rate, And Blood Pressure of each individual was measured. These are pre measured parameters. The difference in those parameters after exercise would show the exercise capacity of each subject.

III step- Exercise of Skipping was allotted to each individual. The number of skipping actions was fixed to 135 (on the basis of pilot study conducted on 10 non subject individuals. Maximum number of skipping actions was counted. Average 120 skipping actions were calculated. We have further extended this average capacity by adding 15 numbers of skipping action to get the maximum capacity of strength of an individual. Thus the target to achieve the 135 skipping actions was assigned)Now this was very important step, because in this step keen observation was made for fatigue occurrence. For this purpose an eye was kept on each subject to find out slowing down speed of skipping action. After specific skipping actions each subject got slows down, that no. of skipping action was observed and mentioned. This no. of skipping action was mentioned as ***'n'.*** Also in this step time required for 135 skipping actions was measured and mentioned in chart. Those subjects who can't complete 135 actions, the time required for given exercise was found by mathematics.

IV step- Post exercise measurement of parameters i.e. Pulse, Respiratory Rate, Blood Pressure was done. The difference between pre and post measured parameters for each group was found. After that, ***mean difference*** in those parameters was found as follows.

Pulse- Pre exercise pulse was measured, post exercise pulse was also measured then difference between those numbers was found. Then summation of all these differences was done and divided by 20 which is group member's count. The number now find out is ***Mean difference*** of pulse rate. This is done for all 5 groups. By this way ***Mean differences*** of Respiratory Rates, systolic blood pressures were found. Mean difference of blood pressure was found only in between systolic BP, because only systolic blood pressure shows considerable variations.

V step- Inferences are drawn by comparison of pre measured and post measured parametric data, time requirement, and fatigue occurrence between all groups. Charts were prepared.

3. Selection Criteria

1. Individuals of age between 20 to 25 years, because of young age and good exercise capacity.
2. Males and females both were selected for this project.

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4. Rejection criteria

1. Those individuals who have regular practice of skipping exercise, because it would create bias in our study.

2. Individuals with body condition which alters body strength like DM, Hypertension, Sickness, fever, dehydration, anemia, any other unhealthy condition.

The Data collected and compared as follows-

Pulse/minute

SN	Height group			Height group			Height group			Height group			Height group		
	60-65.5 *Angul*			**66-70.9 *Angul***			**71-75.9 *Angul***			**76-80.9 *Angul***			**81-85.9 *Angul***		
	Before	**After**	**Diff.**	**Before**	**After**	**Diff.**	**Before**	**After**	**Diff.**	**Before**	**After**	**Diff.**	**Before**	**After**	**Diff.**
1	77	88	11	66	76	10	78	116	38	60	75	15	88	91	3
2	69	102	33	66	116	50	77	116	39	76	90	14	75	112	37
3	64	106	42	69	101	32	74	84	10	71	90	19	85	128	43
4	83	123	40	75	120	45	66	107	41	75	114	39	77	84	7
5	102	148	46	66	120	54	82	85	3	88	117	29	85	107	22
6	75	119	44	102	149	47	68	106	38	79	124	45	77	98	21
7	78	124	46	78	90	12	74	75	1	88	91	3	75	102	27
8	72	124	52	76	77	1	77	80	3	75	112	37	68	85	17
9	64	102	38	63	98	35	85	121	36	85	132	47	69	98	29
10	78	123	45	85	106	21	77	81	4	82	123	41	75	90	15
11	85	127	42	72	140	68	75	112	37	76	103	27	72	98	26
12	70	105	35	96	125	29	68	115	47	71	109	38	69	78	9
13	68	110	42	78	120	42	69	123	54	72	112	40	78	94	16
14	65	113	48	76	123	47	75	139	64	76	109	33	74	89	15
15	69	109	40	86	140	54	72	110	38	67	102	35	75	93	18
16	73	123	50	67	119	52	69	141	72	69	114	45	77	95	18
17	75	110	35	62	110	48	78	120	42	72	98	26	62	89	27
18	76	118	42	74	123	49	74	105	31	78	95	17	74	90	16
19	66	115	49	73	120	47	75	102	27	76	88	12	73	103	30
20	78	118	40	77	104	27	77	118	41	77	85	8	77	109	32
			820			770			666			570			428
Mean Pulse variation			41			38.4			33.1			28.5			21.4

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Respiratory Rate

SN	Height group			Height group			Height group			Height group			Height group		
	60-65.5 *Angul*			**66-70.9 *Angul***			**71-75.9 *Angul***			**76-80.9 *Angul***			**81-85.9 *Angul***		
	Before	**After**	**Diff.**	**Before**	**After**	**Diff.**	**Before**	**After**	**Diff.**	**Before**	**After**	**Diff.**	**Before**	**After**	**Diff.**
1	28	38	10	20	35	15	30	50	20	20	30	10	26	37	11
2	20	36	16	22	33	11	21	34	13	22	34	12	20	30	10
3	18	34	16	20	32	12	18	35	17	20	31	11	20	30	10
4	22	30	8	17	35	18	20	34	14	20	22	2	16	27	11
5	12	23	11	23	36	13	26	35	9	22	32	10	15	23	8
6	15	32	17	16	33	17	37	38	1	28	29	1	17	26	9
7	13	30	17	20	37	17	23	36	13	21	31	10	18	25	7
8	11	23	12	20	28	8	19	32	13	18	26	8	20	31	11
9	16	32	16	20	37	17	20	30	10	14	23	9	21	37	16
10	17	34	17	21	35	14	18	27	9	16	27	11	20	28	8
11	15	28	13	24	29	5	14	26	12	18	29	11	19	23	4
12	14	27	13	24	35	11	16	26	10	15	28	13	21	30	9
13	15	30	15	18	36	18	15	25	10	15	29	14	22	27	5
14	17	32	15	15	25	10	17	27	10	20	37	17	18	27	9
15	13	32	19	17	33	16	12	22	10	17	29	12	23	24	1
16	15	25	10	15	19	4	15	23	8	18	30	12	19	25	6
17	16	32	16	14	21	7	17	31	14	15	28	13	18	32	14
18	17	35	18	15	22	7	20	31	11	14	26	12	19	25	6
19	15	28	13	17	24	7	16	35	19	19	29	10	20	31	11
20	14	22	8	17	25	8	21	31	10	21	33	12	20	25	5
			280			235			233			210			171
Mean variation in respiratory rate			14			11.75			11.65			10.5			8.55

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Systolic Blood Pressure

SN	Height group			Height group			Height group			Height group			Height group		
	60-65.9 *Angul*			**66-70.9 *Angul***			**71-75.9 *Angul***			**76-80.9 *Angul***			**81-85.9 *Angul***		
	Before	**After**	**Diff.**	**Before**	**After**	**Diff.**	**Before**	**After**	**Diff.**	**Before**	**After**	**Diff.**	**Before**	**After**	**Diff.**
1	120	150	30	120	140	20	130	180	50	130	150	20	110	120	10
2	130	150	20	110	140	30	100	150	50	120	130	10	110	150	40
3	120	130	10	110	160	50	110	140	30	110	120	10	110	130	20
4	120	140	20	118	170	52	112	150	38	120	136	16	112	128	16
5	130	170	40	126	160	34	120	140	20	110	130	20	114	122	8
6	120	162	42	132	160	28	100	110	10	120	140	20	130	144	14
7	110	145	35	108	120	12	120	140	20	120	138	18	120	130	10
8	114	152	38	116	160	44	120	134	14	122	140	18	124	132	8
9	120	162	42	128	160	32	130	142	12	112	136	24	126	140	14
10	110	156	46	120	120	0	120	140	20	122	140	18	110	130	20
11	125	155	30	120	120	0	122	136	14	118	136	18	116	128	12
12	110	142	32	120	140	20	114	144	30	110	130	20	118	138	20
13	120	154	34	124	152	28	116	134	18	122	140	18	110	128	18
14	130	160	30	112	146	34	122	144	22	124	140	16	128	138	10
15	126	162	36	122	138	16	118	148	30	110	132	22	130	142	12
16	122	154	32	120	148	28	120	120	0	112	134	22	140	160	20
17	128	146	18	122	144	22	122	124	2	118	140	22	120	140	20
18	126	142	16	124	164	40	110	128	18	122	138	16	128	142	14
19	128	174	46	120	152	32	110	120	10	110	130	20	132	142	10
20	112	162	50	118	156	38	110	122	12	122	140	18	118	152	34
			647			560			420			366			330
Mean variation in systolic BP			32.4			28			21			18.3			16.5

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Time taken for 135 skipping actions

S N	Height group			Height group			Height group			Height group			Height group		
	62-65.9 *Angul*			**66-70.9 *Angul***			**71-75.9 *Angul***			**76-80.9 *Angul***			**81-85.9 *Angul***		
	No. of performed actions	**Time taken**	**Required Time for 135 skipping actions**	**No. of performed actions**	**Time taken**	**Required Time for 135 skipping actions**	**No. of performed actions**	**Time taken**	**Required Time for 135 skipping actions**	**No. of performed actions**	**Time taken**	**Required Time for 135 skipping actions**	**No. of performed actions**	**Time taken**	**Required Time for 135 skipping actions**
1	110	68	83.5	45	35	105.0	43	43	135.0	51	28	74.1	62	36	78.4
2	105	57	73.3	100	80	108.0	50	46	124.2	40	37	124.9	65	45	93.5
3	108	69	86.3	45	36	108.0	84	51	82.0	47	34	97.7	68	36	71.5
4	84	45	72.3	98	60	82.7	72	46	86.3	55	52	127.6	78	45	77.9
5	36	31	116.3	63	67	143.6	48	28	78.8	52	31	80.5	120	67	75.4
6	110	120	147.3	136	89	88.3	44	25	76.7	81	45	75.0	110	56	68.7
7	108	108	135.0	48	28	78.8	37	27	98.5	120	65	73.1	122	81	89.6
8	101	87	116.3	60	48	108.0	65	34	70.6	118	78	89.2	110	72	88.4
9	98	99	136.4	62	34	74.0	57	38	90.0	102	68	90.0	112	76	91.6
10	87	89	138.1	33	21	85.9	60	38	85.5	108	65	81.3	78	49	84.8
11	82	108	177.8	97	48	66.8	89	62	94.0	87	54	83.8	83	51	83.0
12	100	105	141.8	49	34	93.7	118	89	101.8	85	55	87.4	89	45	68.3
13	88	110	168.8	95	75	106.6	124	80	87.1	80	58	97.9	92	72	105.7
14	67	132	266.0	88	68	104.3	135	101	101.0	121	68	75.9	82	60	98.8
15	92	118	173.2	108	87	108.8	158	98	83.7	108	67	83.8	87	58	90.0
16	98	128	176.3	143	112	105.7	128	92	97.0	97	66	91.9	94	40	57.4
17	70	89	171.6	128	102	107.6	145	97	90.3	80	66	111.4	90	49	73.5
18	97	111	154.5	45	35	105.0	126	89	95.4	98	59	81.3	80	57	96.2
19	89	86	130.4	150	124	111.6	65	47	97.6	85	56	88.9	92	85	124.7
20	89	87	132.0	138	112	109.6	73	59	109.1	87	42	65.2	78	50	86.5
			2796.9			2001.9			1884.6			1780.6			1704
Mean Time taken in sec.			**139.84**			**100.09**			**94.23**			**89.03**			**85.19**

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No. of skipping actions after which fatigue occurred

n = no. of skipping actions after which occurrence of fatigue observed

SN	Height group **60-65.9 *Angul***		Height group **66-70.9 *Angul***		Height group **71-75.9 *Angul***		Height group **76-80.9 *Angul***		Height group **81-85.9 *Angul***	
	No. of skipping actions performed	*n*	No. of skipping actions performed	*n*	No. of skipping actions performed	*n*	No. of skipping actions performed	*n*	No. of skipping actions performed	*n*
1	110	57	45	35	43	25	51	28	62	31
2	105	46	100	60	50	31	40	34	65	29
3	108	45	45	32	84	47	47	35	68	32
4	84	49	98	45	72	38	55	41	78	42
5	36	11	63	38	48	28	52	33	120	81
6	110	50	136	72	44	28	81	53	110	78
7	108	45	48	33	37	19	120	67	122	90
8	101	40	60	39	65	39	118	56	110	77
9	98	38	62	40	57	25	102	57	112	67
10	87	35	33	20	60	42	108	58	78	47
11	82	43	97	45	89	62	87	42	83	51
12	100	59	49	25	118	80	85	45	89	58
13	88	39	95	51	124	81	80	45	92	60
14	67	37	88	49	135	81	121	93	82	48
15	92	41	108	72	158	90	108	81	87	48
16	98	45	143	82	128	71	97	64	94	58
17	70	30	128	63	145	83	80	52	90	59
18	97	45	45	25	126	65	98	65	80	45
19	89	41	150	78	65	40	85	45	92	56
20	89	48	138	60	73	36	87	45	78	41
		844		964		1011		1039		1098
Mean no of "n"		42.2		48.2		50.55		51.95		54.9

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5. Observations

1. Height above 85.9 finger width (*angul)* and below 60 finger width (*angul)* was not found in any individual.

2. In Height group **60-65.9** mean pulse variation is **41**,

In Height group **66-70.9** mean pulse variation is **38.4**,

In Height group **71-75.9** mean pulse variation is **33.1**,

In Height group **76-80.9** mean pulse variation is **28.5**,

In Height group **81-85.9** mean pulse variation is **21.4.**

3. In Height group **60-65.9** mean variation in respiratory rate is **14**

In Height group **66-70.9** Mean variation in respiratory rate is **11.75**

In Height group **71-75.9** Mean variation in respiratory rate is **11.65**

In Height group **76-80.9** Mean variation in respiratory rate **10.5**

In Height group **81-85.9** Mean variation in respiratory rate is **8.55**

4. In Height group **60-65.9** mean variation in systolic blood pressure is **32.4**

In Height group **66-70.9** Mean variation in systolic blood pressure is **28**

In Height group **71-75.9** Mean variation in systolic blood pressure is **21**

In Height group **76-80.9** Mean variation in systolic blood pressure is **18.3**

In Height group **81-85.9** Mean variation in systolic blood pressure is **16.5**

5. In Height group **60-65.9** mean time taken for 135 skipping actions is **139.84** sec

In Height group **66-70.9** mean time taken for 135 skipping actions is **100.09** sec

In Height group **71-75.9** mean time taken for 135 skipping actions is **94.23** sec

In Height group **76-80.9** mean time taken for 135 skipping actions is **89.03** sec

In Height group **81-85.9** mean time taken for 135 skipping actions is **85.19** sec

6. **OBSERVATION OF OCCURRENCE OF FATIGUE- 'n'**

In Height group **60-65.9** mean no. of skipping actions after which fatigue occurred is **42.2**

In Height group **66-70.9** mean no. of skipping actions after which fatigue occurred is **48.2**

In Height group **71-75.9** mean no. of skipping actions after which fatigue occurred is **50.55**

In Height group **76-80.9** mean no. of skipping actions after which fatigue occurred is **51.95**

In Height group **81-85.9** mean no. of skipping actions after which fatigue occurred is **54.9.**

6. Result

1. After performance of exercise of same quantity pulse rate, respiratory rate, systolic blood pressure varies in increasing order as height group decreases. It means for same bulk of exercise, efforts required to less height groups are more than higher height groups.

2. Time required completing 135 skipping exercise increases as height group decrease. It means for same quantity of exercise lesser height groups require more time.

3. As height group decreases, fatigue occurs early. It means that fatigue occurrence is observed late in higher height groups, in other words individuals with higher height group acquired less fatigue.

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7. Conclusion

As per *Charak Samhita Viman Sthan,* 84 *swangul* height is ideal. If it is present an individual will have more strength. It means that individual can perform more exercise with less fatigue and more work with more enthusiasm. By above study it is proved that research statement is true.

8. References

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