HABITUAL BODY POSTURE AND MOUNTAIN POSITION OF PEOPLE PRACTISING YOGA

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ABSTRACT: In the physical exercises of yoga (hatha yoga), the Mountain Pose is a basic arrangement of the body involving, among other things, active extension of the spine in the vertical axis and symmetrical arrangement of individual elements of the body. The aim of the study was to compare the difference between this posture and the relaxed stance in people doing hatha yoga. The study included 28 women and 8 men doing yoga aged 20-58. The study was carried out using the apparatus for computer assessment of posture of the MORA system.The study has shown that all the elements of body posture in the Mountain Pose are placed more correctly (according to the criterion of symmetry related to frontal and transverse planes). Differences in the placement of lines of the spinous processes and of the pelvis in the transverse plane were observed. The angles of inclination of the anteroposterior curvatures of the spine were smaller in the Mountain Pose than in the habitual one. It has been demonstrated that for people doing hatha yoga the Mountain Pose is a more correct (symmetrical) stance than the habitual one. Those who had been doing yoga longer and those who devoted more time to exercise per week were characterised by more correct body stance. The physical exercises of yoga shape the habit of correct stance. The arrangement of the body in the Mountain Pose in the light of the criteria of correct posture may be regarded as optimal.

KEY WORDS: Hatha yoga, mountains pose, body posture, correct body posture

INTRODUCTION

Body posture may be defined as a way of holding oneself straight in a relaxed perpendicular stance. This way of "holding oneself straight" reflects the physical and mental condition of a human being, and is an indicator of kinetic efficiency, muscle balance as well as muscle-nerve coordination [5]. Body posture is also a specific motor habit. Therefore, the quality of our posture will depend on that physical habit. Maintaining one's body posture is a physical task subject to constant processes of manipulation [6]. The habitual body posture is adopted by a man in a natural way; it is subject to permanent changes and may have the hallmarks of an active or passive stance. For people who practise physical exercises, and who have a strong muscular corset, the characteristic posture is the more active one.

The Mountain Pose (tad asana) is one of the basic body arrangements in yoga physical exercises (hatha yoga). It is an active stance in which one aspires to lighten the passive motor apparatus by means of elongating and relieving the spine at the cost of the work of postural muscles. It may be compared to the corrected posture which is taken e.g. during corrective exercises. However, there are some differences, for in the Mountain Pose special attention is paid to elongation of the spine in the sagittal plane. In the corrected posture one usually aims to flatten the pectoral kyphosis, which is sometimes at the cost of increasing the lumbar lordosis, having an adverse influence on the placement of the pelvis and the lower part of the spine.

The work of the body in the Mountain Pose lies mainly in extending the spine in the vertical axis, which leads to flattening the anteroposterior curvatures of the spine and to a decrease of potential pathological lateral curvatures of it. However, arrangement of the body is important, beginning with the correct placement of one's feet, knees, thighs, pelvis, spine, chest, and ending with the correct placement of the head (in the Frankfurt plane) and one's shoulder girdle. Elongation of the spine is done actively, i.e. as a result of the work of one's muscles. The work of each section of it is significant (cervical, pectoral, lumbar as well as the sacral and caudal one) [2,4].

The purpose of this work was to compare the quality of one's posture in the relaxed (habitual) stance as well as in the Mountain Pose in people who do yoga. In the light of the definition concerning good posture it is assumed that the arrangement of parts of the body in the Mountain Pose is optimal.

The following research queries were posed:

1. Are the asymmetries of body parts substantially less frequent in the Mountain Posture than in the habitual one?
2. Is the arrangement of the spine in the Mountain Pose more optimal?
3. Does the quality of posture have a connection with the duration of doing physical yoga as well as with the time devoted to exercise?

MATERIALS AND METHODS

The study participants were 28 women and 8 men doing yoga. The group of people selected for the study was quite diverse with respect to age, for the youngest person was 20 years old and the oldest subject was 58 years old (mean age: $\bar{x}$=35.6 years, standard deviation [SD]=10.9 years). The declared period of time from the moment when the subjects started doing yoga was:

- below 2 years for 7 people, including one man (mean age: $\bar{x}$= 30.9),
- from 2 to 5 years for 16 people, including 2 men (mean age: $\bar{x}$= 34.2),
- over 5 years for 13 people, including 5 men (mean age: $\bar{x}$= 39.9).

The declared time which the subjects devoted to physical exercises of yoga per week (on average) was:

- up to 5 hours for 15 people, including 4 men (mean age: $\bar{x}$=37.2),
- from 5 to 10 hours for 13 people, including 2 men (mean age: $\bar{x}$=33.3),
- more than 10 hours for 8 people, including 2 men (mean age: $\bar{x}$=36.4).

Apparatus for computer assessment of body posture of the MORA system, 4th Generation (CQ Elektronik System) was used in the study. The subject was placed with his or her back to the recording camera. The exposure lasted for about 5 seconds. The relaxed (habitual) stance was recorded, and then the Mountain Pose. Before recording, spinous processes (C7-S1), back upper iliac spikes (M1, M2), and lower angles of shoulder blades (Ł1, Ł2) were marked on the subject.

In both frontal and transverse planes the analysis included:

- the angle of trunk inclination (KNT) [in degrees], defined by the route of the straight line C7-S1 in relation to the perpendicular,
- the route of lines of spinous processes in relation to the straight line C7-S1 (UK) [in mm],
- the placement of the shoulders, assessed by their symmetrical arrangement towards each other (KLB) [in mm],
- the placement of the shoulder blades, assessed by their symmetry towards each other horizontally (UL), in protrusion (UB) as well as in symmetry towards the spine (OL) [in mm],
- the placement of waist triangles, assessed by their symmetry both perpendicularly (TT) and horizontally (TS) [in mm],
- the placement of the pelvis, defined by the magnitude of its inclination (KNM) (frontal plane) as well as its twist (KSM) (transverse plane) [in mm].

In the sagittal plane the following were considered:

- the route of the straight line C_7-S_1 towards the perpendicular defining the angle of trunk bend (KPT),
- angle deviation from the perpendicular of the upper pectoral section (angle α) [in degrees],
- angle deviation from the perpendicular of the pectoral-lumbar section (angle β) [in degrees],
- angle deviation from the perpendicular of the lumbar-sacral section (angle γ) [in degrees].

The whole data were converted in the Excel spreadsheet by calculating their mean values ($\bar{x}$), standard deviations (SD) and variance (V). In order to determine the statistical significance of differences in data for the placement of body parts in the relaxed stance and in the Mountain Pose, the following tests were used: Student's (t), Cochran-Cox's (C), and Snedecor's (F).

TABLE I. POINT SCALE OF PLACEMENT OF INDIVIDUAL COMPONENTS OF BODY POSTURE

Tested parameters	The number of points for the following deviations							Max. number of points
	Up to 1mm	1,01-2mm	2,01-3mm	3,01-5mm	5,01-10mm	10,01-15mm	More than 15mm	
KNT	0	1	2	3	3	3	3	3
KPT	0	1	2	3	3	3	3	3
UK	0	0	0	1	2	3	4	4
KLB	0	0	0	0	1	2	3	3
UL	0	0	0	0	1	2	3	3*
UB	0	0	0	0	1	2	3	3*
OL	0	0	0	0	1	2	3	3*
TT	0	0	0	0	1	2	3	3*
TS	0	0	0	0	1	2	3	3*
KNM	0	0	0	0	1	2	3	3
KSM	0	0	0	0	1	2	3	3

Legend: KNT – angle of trunk inclination; KPT – angle of trunk bend; UK – deviation of the lines of spinous processes (mm) in relation to the straight line C7-S1 ; KLB – symmetry of shoulders (mm); UL – symmetry of shoulder blades in relation to the perpendicular (mm); UB – symmetry of shoulder blades in the transverse plane (mm), OL – symmetry of shoulder blades in relation to the spine; TT – symmetry of waist triangles in relation to the perpendicular (mm); TS – symmetry of waist triangles in relation to the horizontal (mm); KNM – placement of the pelvis in the frontal plane; KSM – placement of the pelvis in the transverse plane.
* - the number of points for one of the placements, which was assessed the highest

TABLE 2. MEANS ($\bar{x}$), STANDARD DEVIATIONS (SD) AND VARIANCE (V) OF THE TESTED COMPONENTS OF POSTURE IN THE RELAXED STANCE AND THE MOUNTAIN POSE

Examined parameters	Relaxed stance			Mountain Pose (tad asana)		
		SD	V		SD	V
KNT	1,19	0,99	0,83	0,99	0,9	0,91
UK	7,03*	3,09	0,44	5,42	2,96	0,55
KLB	6,44	5,88	0,91	4,72	3,52	0,75
UL	7,61	7,6	1	6,05	6,03	1
UB	26,83	15,84	0,59	19,34	11,14	0,58
OL	11,87	7,87	0,66	9,35	6,27	0,67
TT	10,47	7,49	0,71	7,56	5,39	0,71
TS	14,11	10,54	0,75	10,76	6,17	0,57
KNM	3,32	2,46	0,74	2,5	2,1	0,84
KSM	13,8	8,84	0,64	10,41	7,45	0,72
KPT	2,91	1,61	0,55	2,47	1,51	0,61
angle a	13,32	4,14	0,31	9,48	3,49	0,37
angle β	12,86	1,96	0,15	11,35	2,74	0,24
angle γ	9,67	3,78	0,39	8,31	3,89	0,47
points for body posture	12,47*	3,03	0,24	10,56*	3,03	0,29

Legend: KNT – angle of trunk inclination; UK – deviation of the lines of spinous processes (mm) in relation to the straight line C7-S1 ; KLB – symmetry of shoulders (mm); UL – symmetry of shoulder blades in relation to the perpendicular (mm), UB – symmetry of shoulder blades in the transverse plane (mm), OL – symmetry of shoulder blades in relation to the spine; TT – symmetry of waist triangles in relation to the perpendicular (mm); TS – symmetry of waist triangles in relation to the horizontal (mm); KNM – placement of the pelvis in the frontal plane; KSM – placement of the pelvis in the transverse plane. KPT – angle of trunk bend; angle α - angle deviation from the perpendicular of the upper pectoral section, angle β - angle deviation from the perpendicular of the pectoral-lumbar section; angle γ - angle deviation from the perpendicular of the lumbar-sacral section.
* - statistically significant differences between the relaxed stance and the Mountain Pose at the 0,05 level of significance are in bold

Furthermore, the placement of individual body parts was calculated according to a specified point scale (Table 1), considering their importance in maintaining the correct body posture. The following postures were defined: very good (up to 5 points), good (6-10 points), average (11-15 points), faulty (16-20 points) and bad (21-25 points).

RESULTS

The study on body position indicated that all the components of posture are more correct (according to the criterion of symmetry in relation to both frontal and transverse planes) in the Mountain Pose (Table 2). The differences in the placement of some body parts were found to be statistically significant, including the route of lines of the spinous processes (UK) as well as the placement of the pelvis in the transverse plane (KSM) (Table 2), both extremely important for correct posture.

The angles of inclination of anteroposterior curvatures of the spine are smaller in the Mountain Pose than in the habitual one, and the differences in the inclination of the upper section of the spine (angle α) as well as the pectoral-lumbar section (angle β) in the tested postures were statistically significant (Table 2).

The sum total of points reflecting the quality of stance in the Mountain Pose in comparison to the quality of the habitual posture shows that for those who practise yoga the Mountain Pose is a better (more symmetrical) position than the habitual one (Table 2). It was also observed that there is a strong inclination towards improvement of one's posture proportionally to the time devoted to exercises of physical yoga during the week (Fig. 1). The inclination towards

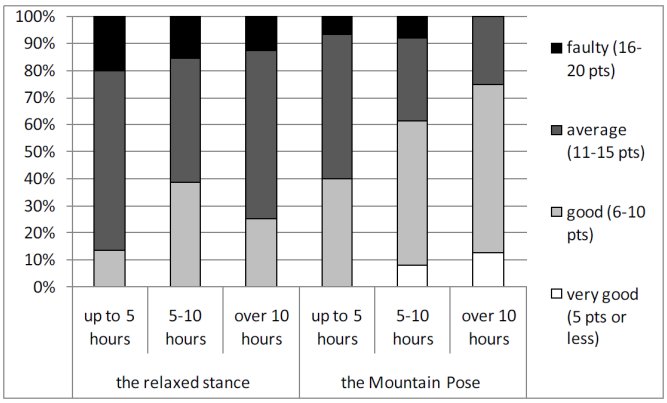

FIG. 1. QUALITY OF THE HABITUAL STANCE AND THE MOUNTAIN POSE AND THE AVERAGE DECLARED AMOUNT OF TIME DEVOTED TO HATHA YOGA EXERCISE DURING THE WEEK [IN HOURS]

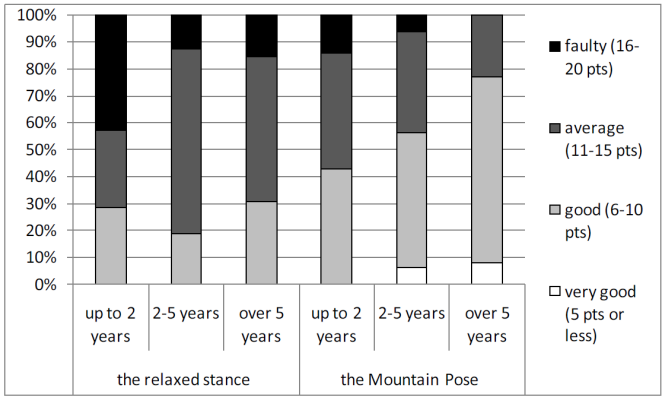

FIG. 2. QUALITY OF THE HABITUAL STANCE AND THE MOUNTAIN POSE AND THE DECLARED TIME OF DOING HATHA YOGA EXERCISE [IN YEARS]

improvement of body posture is also proportional to the time for which a particular person has been practising physical yoga (Fig. 2). Bad posture was noted in none of the subjects.

DISCUSSION

Hatha yoga exercises elongate the spine by means of active muscle work; they increase mobility in the joints and eliminate muscular contractions. In each asana, one aims to arrange individual body parts in relation to oneself as well as the ground in such a way that the achieved pose is stable and comfortable. The arrangement of body parts cannot upset body equilibrium. Conscious work with one's body while remaining in the asana stimulates neural connections between the peripheral and central nervous system as well as stimulating parts of the brain responsible for physical coordination and balance [4,7]. One of the most significant asanas in hatha yoga (physical yoga) is the Mountain Pose.

The assessment of the placement of individual parts of the body in both tested postures (the habitual posture and the Mountain Pose) has demonstrated that our body is arranged more correctly (according to the criterion of symmetry in frontal and transverse planes) in the Mountain Pose. Adopting the Mountain Posture activates postural muscles, decreasing the strain of intervertebral discs, which is a result of the action of gravitational force and creates the habit of good posture. Evaluation of the shaping of anteroposterior curvatures of the spine has shown that inclination angles of its individual sections are smaller in the Mountain Pose, which implies greater flattening of the spine. It happens as a result of active elongation (lengthening) and also causes a reduction of possible lateral curvatures of the spine. One ought to remember that elongation of the spine is not recommended for people with flattening of physiological curvatures of the spine (flat back) and the physical exercises of yoga are appropriately adjusted to those people. However, the majority of adults have deepened anteroposterior curvatures of the spine [2]. In such cases, physical exercises of yoga help to strengthen excessively stretched muscles, stretch out the contracted ones and elongate the spine, thus decreasing excessive pectoral kyphosis and cervical and lumbar lordosis, as well as helping to place one's pelvis in a correct frontal bend. A study among 118 women and men above 60 years of age proved the significant role of yoga exercises in appropriate shaping of anteroposterior curvatures of the spine. It was demonstrated that reduction of an excessive angle of kyphosis (more than 40 degrees) occurred among subjects who attended physical yoga classes for 24 weeks, 3 times a week. The differences were statistically significant in relation to control groups of people not doing physical yoga [3]. Therefore, these exercises may increase the effectiveness of therapy in the presence of considerable disorders of body equilibrium.

The effect of physical exercises of yoga has been tested by means of e.g. monitoring changes of body posture among fifteen 10-year-old children. After 6 months of physical yoga classes, a reduction of the asymmetry of shoulders and hips as well as a decrease of the protrusion of the head occurred in the subjects, and contractures of pectoral muscles and of back extensors were eliminated [8]. In the present study, some tendencies showing the positive influence of yoga exercises on posture, particularly on its symmetry, were also noted.

As mentioned, in physical exercises of yoga, special attention is paid to elongation of the spine as well as to increasing mobility in the joints. This leads to a reduction, and then elimination of muscular contractures and stiffening, which are the reasons for bad posture. Increasing mobility of the spine, especially with regard to backward bends and twists, not only corrects one's posture, but also prevents or alleviates existing lumbago. A study on the influence of yoga physical exercise showed that alleviation of back pain and a considerable improvement of spinal flexibility happened to a greater extent than during other physical exercises [9]. People who had been practising yoga for a longer period of time noticed a reduction of back pain, as well as a remarkable improvement of body posture [1].

CONCLUSIONS

The physical exercises of yoga shape the habit of good posture. The Mountain Pose achieves the optimal arrangement of the body and is more appropriate than the habitual posture in people who do physical yoga. Those who have done it for a longer period of time and those who devote more time to exercise are characterised by better position of the body.

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