

## THE INFLUENCE OF YOGA POSES AND BREATHING ON MOBILITY OF THE BABEȘ-BOLYAI UNIVERSITY STUDENTS

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**ABSTRACT.** **Context:** The Hatha-Yoga system aims to improve lung capacity and increase joint mobility. **Purpose:** The purpose of this study was to improve the mobility of the spine in students in year 1 of faculties, without a physical education and sports profile. This study involved 15 students (boys and girls), from the geography profile, first year of Babeș-Bolyai University, Cluj-Napoca. This study aims to assess the effects of 7 weeks of asana, with a number of 12 asana combined under the name Salute of the Sun (Surya Namaskara). **Subjects and Methods:** A total of 15 participants (age: 20.5 years) were divided into a yoga group asana (YA) and non-yoga (NY), who practiced only mobility exercises from the warm up gymnastics exercises in high school curricula. Participants participated in a 50-minute once-a-week session for 7 weeks. The YA Group practiced basic asana with specific breathing instructions (pranayama), while the NY group practiced exercises in the pre-university curriculum. All tests were evaluated at first and after 7 weeks of exercise. **Statistical analysis:** The changes in scores were analysed with the paired t-test for each group. Pre-post results were compared for the measured values. **Results:** Both groups showed significant improvements in spine mobility after 7 weeks. However, group YA recorded values higher than that of the NY group. **Conclusions:** The introduction of yoga exercises, as a complementary form of training, in the 7 weeks, students, improved the mobility of the spine.

**Keywords:** *Yoga, asana, pranayama, Surya Namaskara.*

**REZUMAT.** **Influența unor posturi și respirații din yoga asupra mobilității la studenții Universității Babeș-Bolyai.** **Context:** Sistemul Hatha-Yoga are ca scop îmbunătățirea capacității pulmonare și mărirea mobilității articulare. **Scop:** Scopul acestui studiu a fost de a îmbunătăți mobilitatea coloanei vertebrale la studenții din anul 1 a unor facultăți, fără profil de educație fizică și sport. În acest studiu au participat un număr de 15 studenți (băieți și fete), de la profilul geografie, anul I a Universității Babeș-Bolyai, Cluj-Napoca. Acest studiu și-a propus să evalueze

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efectele a 12 asane combinate sub numele de Salutul Soarelui (Surya Namaskar) pe o perioada de 7 săptămâni. **Subiecți și metoda:** Un total de 15 de participanți (vârsta medie: 20,5 ani) au fost împărțiți într-un grup de yoga asana (YA) și non-yoga (NY), care practicau doar exerciții de mobilitate din încălzirea de gimnastică practicare în școlile de masă. Participanții au participat la o sesiune de 50 de minute, o dată pe săptămână, timp de 7 săptămâni. Grupul YA a practicat asane de bază cu instrucțiuni specifice de respirație (pranayama), în timp ce grupul NY a practicat exerciții aflate în programa școlară din sistemul preuniversitar. Evaluările au avut loc la început și după 7 săptămâni de exerciții. **Analiza statistică:** Modificările scorurilor au fost analizate cu testul t. Rezultatele pre-post program au fost comparate pentru toate valorile măsurate. **Rezultate:** Ambele grupuri au arătat îmbunătățiri semnificative ale mobilității coloanei vertebrale, după de 7 săptămâni. Cu toate acestea, grupa YA a înregistrat valori superioare celei din grupul NY.

**Cuvinte cheie:** *Yoga, asana, pranayama, Surya Namaskara.*

## Introduction

The term Yoga derives from the Sanskrit word “yuj”, which means “to attach”, “to unite”. (*Satyananda, Swami (2008) [1996]*) The system appeared in India and has been practiced since the first half of the millennium Bc. (*Crangle, Edward Fitzpatrick (1994)*)

The first presentation of the yoga system outside India was made by Hindu priest Swami Vivekananda (1863-1902) at Harvard University in 1893. (*Minor, Robert Neil (1986)*) Yoga is called a system of practices because it encompasses numerous forms of practice, from physical to exclusive meditation. Standard Yoga, Hatha Yoga, combines asana (posture), pranayama (breathing) and meditation, in different percentages: 89.9%, use breathing (pranayama), 54.9% use asana together with meditation. (*Dinesh T, Gaur G, Sharma V, Madanmohan T, Harichandra Kumar K, Bhavanani A, et al., 2015*)

Asana refers to the posture of the body, and was first used in *Yoga Sutras, Patanjali* (2nd and 4th century BC). (*Monier-Williams, M. 1899*) Over time there have been numerous research on the effects of yoga practice. Research has followed the effects on stress, anxiety, cardio-vascular diseases, cancer, diabetes, etc. (*McCall MC, 2014*). In regard to the development of yoga mobility, research confirms the positive effect of this. (*Sharm L., 2015*)

## Subjects and Methods

There were 32 volunteers students, who expressed their wish to participate in the research.

**Selection criteria:** any student who wanted to improve their overall physical fitness, especially mobility.

**Exclusion criteria:** of the 32 volunteer students were removed from the research program those who regularly practice (2-3 times a week) yoga exercises (hatha-yoga) and those who had certain medical problems related to the spine and/or heart.

In the end the number of volunteers was 15 (7 boys and 8 girls), with an average age of 20.5 years).

Participants were randomly allocated in two groups: YA- those doing the yoga routine and YN- those using the standard exercises in the high school curriculum. All participants attended a 50-minute training session once a week for 7 weeks and were also advised to exercise at home at least twice a week.

For the YA group exercises were selected from the simplest forms, existing in the Hatha Yoga system, under the name "Salute of the Sun" (*Surya Namaskara*), which has 12 exercises. Each exercise is executed separately. (Fig. 1)

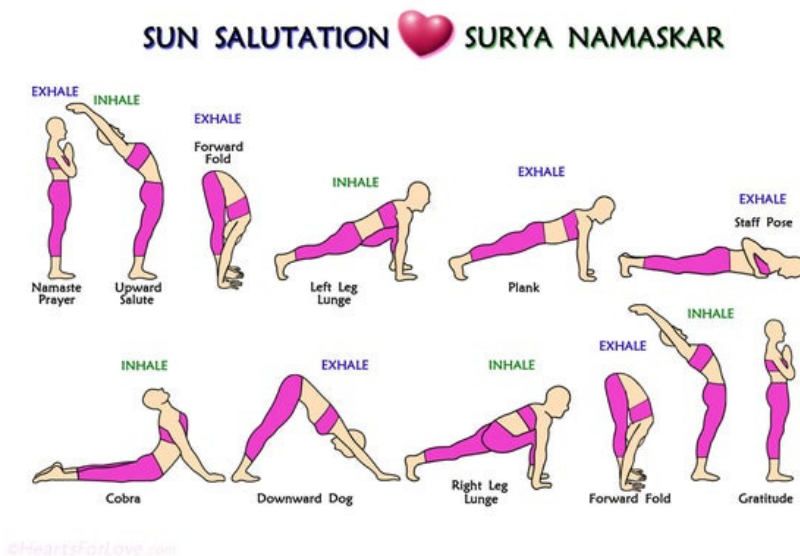


Fig. 1. *Surya Namaskar*  
(<https://www.etsy.com>)

**Table 1.** YA exercises

<b>No.</b>	<b>Position</b>	<b>Execution</b>
1-3.	Stand. Palms placed on the face of the chest.	<ol style="list-style-type: none"> <li>1. Inspire on the nose, with the arms lifted above the head.</li> <li>2. It's the body's extension, with the hips forward and the stretched legs.</li> <li>3. Exhale, bend down the trunk forward and bring the palms to the ground. The forehead touches the knees.</li> </ol>
4.	Forward lunge	Apnea, keep the palms on the ground, the left leg moves in the back, and the right leg goes into lunge. The head rises and archs towards the back.
5.	Triangle position	We bring the right foot back, entering the push-up position. We're lifting the hips, imitating the position of the triangle. The heels are placed on the ground. Inspiration.
6.	Position M	Exhale. The knees, chest and chin rest on the ground.
5	Cobra position	Inspiration. The basin goes down the ground. The entire trunk rests on the arms.
7	Triangle position	We bring the right foot back, entering the push-up position. We're lifting the basin, imitating the position of the triangle. The heels are placed on the ground. Inspiration.
8-9	Forward lunge	Exhale. Push the left foot forward, while his right leg stays in the back, going into the lunge, with his palms rested against the ground and his head raised.
10	Stand in flexion	Apnea. We bring the right foot forward, the basin rises, the knees straighten, and the head stays down so that, along with the trunk, it gets as close as possible to the thighs.
11.	Body extension	Inspire on the nose, with the arms lifted above the head.
12.	Stand. Palms placed on the face of the chest.	Return to the position sitting with your palms placed in front of the chest.

For the NY group, the general warm up exercises existing in the pre-university curriculum were selected. (*Table 2*)

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**Table 2.** NY Exercises

Group	Implementation	Number of repetitions
Neckhead	1. Flexi-extensions,	32
	2. Rout (left-right)	
	3. Head spins (left-right)	
Arms	1. Forward-to-back spins	32
	2. Twists (left and right)	
	3. Flexions and extensions	
Trunk	1. bending (left and right)	32
	2. twists (left and right)	32
	3. Bending	32
	4. rotations of the trunk (right-left)	32
Lower limbs	1. Lunge forward	12
	2. Side lunge	12
	3. Squats	10

For the mobility test the subjects are standing on a gym bench with a height of 30 cm. they are asked to bend forward and attempt to reach for the floor with their fingertips. The examiner then measures the distance between the subject's right long finger and the bench using a standard measuring tape. If the fingertips are above the bench the score was negative and positive if the fingertips were beneath the surface of the bench. (Table 3 and 4). (*Rikli R, Jones, 2013*)

**Table 3.** Initial testing (YA)

No.	First name	Result in cm
1	BM	-10.00
2	BE	-15.00
3	AB	-8.00
4	Cm	-12.00
5	CR	-13.00
6	CL	-20.00
7	DD	-13.00
8	GV	-10.00
9	HZ	-12.00
10	TH	-14.00
11	MC	-9.00
12	MM	-10.00
13	RR	-12.00
14	OX	-14.00
15	SB	-8.00

**Table 4.** Initial testing (NY)

No.	First name	Result in cm
1	DD	-10.00
2	FP	-13.00
3	RS	-21.00
4	RL	-20.00
5	ML	-12.00
6	MS	-10.00
7	MV	-9.00
8	OL	-14.00
9	OS	-15.00
10	LP	-13.00
11	PP	-11.00
12	PPP	-15.00
13	PH	-11.00
14	SH	-9.00
15	ZO	-9.00

Final testing has shown improved values at YA, especially among female subjects. Male subjects have achieved inferior improvements to women, but superior to initial tests. (Table 4)

NY subjects did not achieve higher values than those in the initial test period. (Table 5)

**Table 4.** Final testing (YA)

No.	First name	Result in cm
1	BM	1.00
2	BE	-1.00
3	AB	3.00
4	Cm	2.00
5	CR	5.00
6	CL	-5.00
7	DD	.00
8	GV	4.00
9	HZ	.00
10	TH	-1.00
11	MC	-2.00
12	MM	1.00
13	RR	2.00
14	OX	-3.00
15	SB	4.00

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**Table 5. Final Testing (NY)**

No.	First name	Result in cm
1	DD	-7.00
2	FP	-10.00
3	RS	-14.00
4	RL	-13.00
5	ML	-5.00
6	MS	-7.00
7	MV	-6.00
8	OL	-9.00
9	OS	-10.00
10	LP	-13.00
11	PP	-6.00
12	PPP	-10.00
13	PH	-9.00
14	SH	-8.00
15	ZO	-7.00

To analyse the data we conducted two paired samples t test for each group and an independent sample t test for the final results of each group.

There were no outliers in the data, as assessed by inspection of the boxplots.

The differences between the final results and initial results for the yoga programme were normally distributed, as assessed by Shapiro-Wilk's test ( $p = .308$ ).

The differences between the final results and initial results for standard programme were normally distributed, as assessed by Shapiro-Wilk's test ( $p = .265$ ).

The final results for the yoga programme were normally distributed, as assessed by Shapiro-Wilk's test ( $p = .949$ ).

The final results for the standard programme were normally distributed, as assessed by Shapiro-Wilk's test ( $p = .272$ ).

The standard programme elicited a mean increase of 3.87 cm, 95% CI [2.65, 5.08] between the final and initial measurement and a statistically significant increase between the final and initial measurement,  $t(14) = 6.808$ ,  $p < .001$ .

The yoga programme elicited a mean increase of 12.67 cm, 95% CI [11.3, 14.03] between the final and initial measurement and a statistically significant increase between the final and initial measurement,  $t(14) = 19.871$ ,  $p < .001$ .

Regarding the independent t test there was homogeneity of variances, as assessed by Levene's test for equality of variances ( $p = .976$ )

Yoga group mean final result was 9.6 cm, 95% CI [7.52 to 11.67] higher than standard group.

There was a statistically significant difference between the mean results in the mobility test between yoga group and standard group,  $t(28) = 9.46$ ,  $p < .001$ .

## Conclusion

The introduction of hatha yoga exercises in the university physical education classes brings meaningful improvements in the mobility of the coxofemoral joint.

## REFERENCES

- Crangle, E. F. (1994). *The Origin and Development of Early Indian Contemplative Practices*. Otto Harrassowitz Verlag.
- Dinesh, T, Gaur, G, Sharma, V, Madanmohan, T, Harichandra Kumar, K, Bhavanani, A, et al. (2015). *Comparative effect of 12 weeks of slow and fast pranayama training on pulmonary function in young, healthy volunteers: A randomized controlled trial*. Int J Yoga; 8:22–6. [PMC free article] [PubMed] [Google Scholar]
- Minor, R. N. (1986). "Swami Vivekananda's use of the Bhagavad Gita". *Modern Indian Interpreters of the Bhagavad Gita*, Albany, New York: SUNY Press, ISBN 978-0-88706-297-1
- McCall, M.C. (2014). *In search of yoga: Research trends in a western medical database*. Int J Yoga; 7:4–8. [PMC free article] [PubMed] [Google Scholar]
- Monier-Williams, M. (1899). "Asana". *A Sanskrit-English Dictionary*. Oxford Clarendon Press.
- Rikli R, Jones, CJ. (2013). *Senior Fitness Test Manual*. 2nd ed. Champaign, IL, USA: Human Kinetics;
- Satyananda, S. (2008). *Asana Pranayama Mudra Bandha* (PDF). Munger: Yoga Publications Trust. ISBN 978-81-86336-14-4.
- Sharm, L. (2015). Benefits of yoga in sports – A study. Int. J. Phys. Educ. Sports Health. 1:30–2.  
<https://www.etsy.com>