



A comparative study between Pilates and Suryanamaskar on flexibility in women having sedentary lifestyle using sit and reach test and shoulder and wrist test

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Abstract

Individuals who undertake no leisure time activity and individuals who undertake <30 min of physical activity each day are all defined as sedentary. Yoga is an ancient Indian form of physical activity which may assist in achieving recommended levels of fitness. Pilates inspired to reach the desired level of muscular strength and flexibility on simple equipment such as mats. The aim is to study the effects between Pilates and Suryanamaskar on flexibility in women having sedentary lifestyle using Sit and Reach test and Shoulder and Wrist test. 30 female students of Physiotherapy College, aged 20-40 years were selected as per inclusion criteria. Outcome measures used were Sit and reach test and Shoulder and wrist test. The subjects were made to do 12 Suryanamaskar and Modern Mat Pilates for 6 weeks (3 days/ week). The findings of the study depicted evidence of significant difference in flexibility in pre and post values in Pilates and Suryanamaskar, but when comparison was made between two groups Suryanamaskar training is effective to observe improvising flexibility in sedentary females.

Keywords: Suryanamaskar, Pilates, flexibility, sit and reach test, shoulder and wrist test, sedentary

Introduction

A sedentary lifestyle is a type of lifestyle with no or irregular physical activity^[1]. Individuals who undertake no leisure time activity and individuals who undertake <30 min of physical activity each day are all defined as sedentary. Researchers also define it as time spent engaged in sitting or lying down activities that require an energy expenditure of 1.0 -1.5 basal metabolic rates^[2]. Activities included in it are sitting, reading, socializing, watching television for much of the day with little or no vigorous physical exercise. It can contribute to many preventable causes of death^[1]. The amount of time spent in sedentary behaviour has been independently associated with lower levels of physical activity energy expenditure, increased risk of weight gain, diabetes^[3] and increased risk of metabolic syndrome^[4], and heart disease^[5].

Sedentary activities are described in different domains such as work, leisure, entertainment, commuting^[6]. In addition these activities have been categorized as nondiscretionary or discretionary. Behaviours such as sitting at work, or while commuting via car or bus are nondiscretionary; whereas watching television, reading, using a computer and playing video games are discretionary^[7].

The need to improve flexibility and fitness of sedentary women has prompted development of new and creative approaches that provide for an option for women to participate in regular healthful physical activity^[8]. Among adults of all ages, 28.6% do not exercise enough to meet current public

health guidelines of at least 30 minutes of moderate intensity exercise on most of days of week. This lifestyle is undesirable in terms of future health, but formerly sedentary individuals can gain fitness quite rapidly even with moderate levels of physical activity^[9]. The current targets should be focused on improving overall physical health rather than only reducing body weight. There are many forms of exercise which help and improve physical fitness and flexibility. Activities like Aerobics, Pilates, Zumba fitness, Functional training, Suryanamaskar, Dancing, Walking. Out of these. Suryanamaskar and Pilates have proven to be more effective in improving physical health of people.

Yoga is an ancient Indian form of physical activity which may assist in achieving recommended levels of fitness. Suryanamaskar (SN) is a part of yoga. It is a set of sequential yogic postures which are called as asana^[10]. Suryanamaskar may be recommended to improve muscular endurance and flexibility among college level girls. Studies says it is effective in increasing flexibility and improving upper body muscle endurance.

Despite the increased popularity of Pilates mat exercises within the last two decades, little research has been conducted on the method and its benefits in a sedentary population. The importance of training the core abdominal and lower back muscles to stabilize the torso and allow the whole body to move freely was recognized. This method inspired other exercises to reach the desired level of muscular strength and

flexibility on simple equipment such as mats. Further research is necessary to ascertain the method's potential to improve the outcome of Modern Pilates mat exercises in a sedentary population^[11].

Two tests which are most commonly used to check flexibility are Shoulder and wrist flexibility test and Sit and Reach test. In the former test patient is made to lie down prone on the floor against the wall and is asked to raise his hands as up as he can. In this the length from tip of acromion to the tip of middle finger is measured and compared with normal results. Likewise in the latter one, Patient is made to sit with legs straight taking support of the wall with hands straight forward n asked to bent without bending knees or from the back. The distance covered is subtracted from the original and compared with the normal results^[12].

Thus, this study tries to search for an optimal approach in between these two types of training for management of obesity and enhancement of physical fitness parameters like flexibility.

Aims and Objectives.

Aim

- To compare and study the effects between Pilates and Suryanamaskar on flexibility in women having sedentary lifestyle using Sit n Reach test and Shoulder and Wrist test.

Objective

- To determine flexibility using Suryanamaskar in women having sedentary lifestyle using Sit and Reach test and Shoulder and Wrist test.
- To determine flexibility using Pilates in women having sedentary lifestyle using Sit and Reach test and Shoulder and Wrist test.
- To compare Suryanamaskar and Pilates in women having sedentary lifestyle using Sit and Reach test and Shoulder and Wrist test.

Need of Study

- To determine the effects as to how effect of Pilates vs Suryanamaskar can improve flexibility sedentary women.
- Physical inactivity is a modifiable risk factor for cardiovascular disease, osteoporosis and a widening variety of other chronic diseases^[1].
- Reduced flexibility maybe because of various reasons like deskbound lifestyle, physical inactivity or deposition of fat in around the joints restricting complete ROM. Alterations in flexibility can lead to various biomechanical changes in joints and altered postures^[11].
- Hence flexibility is needed to perform daily activities with ease.
- Keeping the body flexible may help decrease tightness and tensions that can lead to chronic and often debilitating physical problems. Suryanamaskar is a series of 12 physical postures made up of a variety of forward and backward bends. The simulated push-up movement and upper body weight bearing positions in the series may help to develop muscular strength and endurance in the pectoral, triceps, as well as the muscles of the trunk. The series gives such a profound stretch to the body that it is

considered to be a complete yoga practice by itself^[13].

- Pilates is a mind–body fitness program gaining in popularity and acceptance within the fitness community. This fitness program incorporates the use of special apparatus and equipment into movement routines designed to enhance flexibility, strength, and coordination^[14].
- Despite the increased popularity of Pilates and Suryanamaskar little research has been done and conducted which is actually beneficial in sedentary population. So in this study we will compare and see whether our goal is achieved.

Materials and Methodology

The study was designed to evaluate the effectiveness of Pilates and Suryanamaskar on flexibility in sedentary women

- Type of study: Experimental
- Sample size: 30; Pilates (n=15), Suryanamaskar (n=15)
- Type of sampling: Simple random sampling
- Study place: MAEER'S Physiotherapy College.

Materials Used For the Study

- Measuring scale
- Measuring tape
- Stepper
- Stick
- Pen and paper.
- Mats for Pilates
- Mats for Suryanamaskar

Inclusion Criteria

- Female population in age group of 20-40 years
- Women not undergoing intense physical activity for more than 30 minutes in a day^[2].
- Having >15 inches value in Sit and Reach test and <12 inches value in Shoulder and Wrist flexibility test^[12].
- Not on any weight reduction programme.

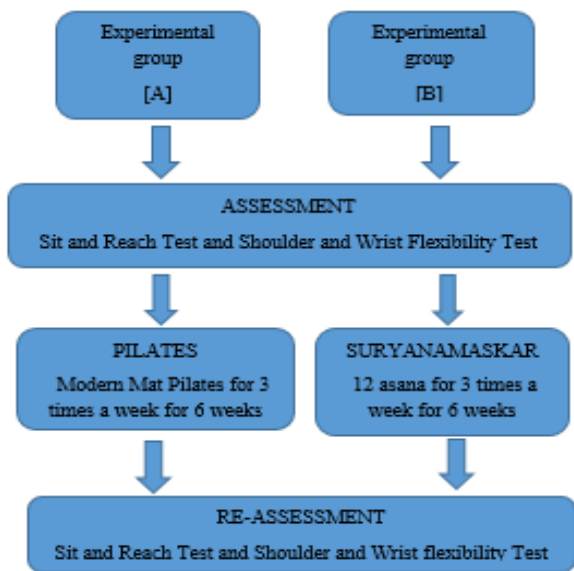
Exclusion Criteria

- Hyper flexible women
- Having Complains of cardiovascular and neurological problems, pulmonary disorders and cardiac problems.
- Doing exercises regularly.
- Not willing to participate.

Methodology

- In this study total 30 females students participated.
- Demographic details of the participants were collected.
- The subjects were assessed using two tests of flexibility taken prior to start of the study and it was assessed at 0 week and 6 weeks
- All participants studying or working in MAEER'S Physiotherapy College and MIMER Medical College in the age group of 20-40 as per criteria will be taken.
- They were divided into 2 groups each of 15 people.
- 1st group was given Pilates exercises and 2nd group was given Suryanamaskar protocol.
- The duration of the treatment was 6 weeks.
- The protocol was for 3 times in a week for 6 consecutive weeks.
- Progression after 3 weeks to increasing the number of sets

- or performing the same set repeatedly.
- At the end their tightness levels will be checked using two flexibility tests Sit n Reach test which is used to measure hip and trunk flexibility and Shoulder and Wrist Elevation test which is used to measure shoulder and wrist flexibility.



Results and Discussion

Mean and standard deviation were calculated. Paired t-test was used in pre and post intervention within the groups and comparison between 2 groups was done using unpaired t-test. The current study was undertaken to assess and compare the effect of Pilates and Suryanamaskar on flexibility in women having sedentary lifestyle. Flexibility can be improved with stretching exercises. It is an important part of reducing injury risk and soreness that results from activity. Pilates helps in increasing flexibility because Pilates elongates and strengthens muscles, elasticity, and joint mobility. Pilates creates a long, strong muscle by taking advantage of a type of muscle contraction called an eccentric contraction, A body with balanced strength and flexibility is less likely to be injured. Study by Noelia Gonzalez *et al.*, proved there was significant increase in hamstring flexibility using Pilates [15]. Suryanamaskar is a series of 12 physical postures. The alternating backward and forward bending postures flex and stretch the spinal column through their maximum range giving a profound stretch to the whole body. It helps to promote sleep and calmness, improves muscle flexibility, strengthens abdominal muscle and improves human organ capacities. These components in turn enhance an individual’s physical fitness. Study by Nigar Shigalkar *et al*, found improved flexibility in college females using Suryanamaskar [16]. In this study, 30 females were selected and divided into 2 groups. The outcome measure were two tests. Viz Sit and reach test and Shoulder and wrist test. Each subject received 3 treatment sessions for 6 weeks. In 1st group subjects received Pilates protocol and in 2nd group subjects received Suryanamaskar protocol. When the comparison of pre and post treatment of Pilates group was done using Sit and Reach test we found significant

increase in flexibility and the one tailed p-value is <0.0001, which is extremely significant. The flexibility has reduced significantly post treatment when compared to pre-treatment. Similar study was done by Betul Sekendiz *et al.*, in which he found Pilates to be an efficient training method with significant changes in posterior trunk flexibility in sedentary adult females [11]. On the other side when the comparison of pre and post treatment of Suryanamaskar group was done using Sit and Reach test we too found significant increase in flexibility and the one tailed p-value is <0.0001, which is extremely significant. Equivalent study mentioned by Madan Singh Rathore *et al.*, demonstrates improved flexibility and endurance in college level girls using Suryanamaskar [17]. Pilates group showcase to have significant improvements in skeletal muscle mass, flexibility, balance, core- and abdominal muscle strength and body awareness; however when evaluated using Shoulder and Wrist test pre and post treatment was found to be considered not significant with one tailed p-value 0.1249. However according to Tolani N; Pilates helps in increasing flexibility [18]. The possible reason for flexibility to not increase could be that Pilates will build your strength and improve your posture, but could give u tight hip flexors. Also Suryanamaskar will also work on core and posture but can give greater emphasis on flexibility [19]. The other comparison was done using Shoulder and Wrist test pre and post treatment in Suryanamaskar where it was found there was significant increase in flexibility and the one tailed p-value is <0.0001, which is extremely significant [16]. Similar findings were done by Fondran *et al.*, in which he concluded that Suryanamaskar helps in increasing flexibility and upper body muscle endurance [13]. At the end when the comparison of Pilates and Suryanamaskar using Sit and Reach test and Shoulder and Wrist test was done we found there was significant increase in flexibility in Suryanamaskar group as compared to Pilates. Hence Pilates is effective in increasing because; Pilates will help soothe the soreness. Stretching helps pump vital nutrients to your muscles and tendons, which help keep them healthy and minimize your risk of injury. It also stimulates the production of joint lubricants (synovial fluid) and prevents adhesions. As circulation increases, your legs, back, neck, and shoulders loosen up, relieving aches and stiffness. Pilates also leads to subtle posture improvements, which will also eliminate tension, driving away headaches, backaches, neck aches, and other aches and pains [20]. ;But Suryanamaskar when combined with Pilates is more effective because; Regular physical activity leads to significant changes in terms of increased health related fitness, and can reduce risk factors for developing a range of disabling medical conditions which occur in inactive people. In general exercise is beneficial for health and physical fitness, while a sedentary lifestyle has a negative effect on a person’s wellbeing. Similar study was done by Komal Jakhotia *et al.*, in which it was concluded that Suryanamaskar has an impact in increasing flexibility in sedentary females [21]. The attributing reasons for improvement are, There are a number of changes that occur over time in the anatomical structure and physiological function of the contractile units (sarcomeres) in muscle if a muscle is stretched during an exercise. Suryanamaskar helps to stretch

the muscle, which leads to increase in the number of sarcomeres and thus reduces tightness and increases flexibility.

The Benefits of Suryanamaskar

1. Regular practice of Suryanamaskar help to shed excess body flab, Study by Rajni Nautiyal *et al.*, found there was significant reduction in weight loss using Suryanamaskar [22].
2. It loosens up the joints in the body and tones the muscles and the internal organs.
3. The posture in Suryanamaskar stretch our muscular system and makes our body very flexible. Study by Deepak Negi *et al.*, proved there was significant increase in flexibility in college going females using Suryanamaskar [23].
4. It helps regulate menstrual cycles and makes childbirth easier.
5. Regular practice of Suryanamaskar gives strength, vitality and flexibility to the body.
6. Suryanamaskar is a common sequence of asana. Its roots are hidden within the ancient tradition of Surya worshipping Hindu population of the Indian subcontinent. Suryanamaskar comprehensively includes asana, pranayama, mantra and meditative awareness. Different evidence-based study suggested that Suryanamaskar improves metabolic function, strengthen and flexible musculoskeletal system, balances endocrinal system, tunes central nervous system, supports urogenital system and boosts gastrointestinal system. Suryanamaskar practice revitalizes body and keeps mind calm, attentive and stress-free. Most of the physiological and psychological effect of Suryanamaskar still unexplored on the scientific ground but thousand years old tradition of these yogic practices explains its immense therapeutic potential. Thus, it should be a need to incorporate Suryanamaskar practices in modern lifestyle for healthy mind and body. Study by Amit Vaibhav *et al.*, and Manju Deorari *et al.*, recommend Suryanamaskar to keep mind and body healthy [24] and also improve emotional maturity and psychological wellbeing [25].

So the results obtained from the study and statistical analysis supported by H2 hypothesis prove that Suryanamaskar has a positive effect on increasing flexibility in sedentary women.

1) Paired t-test was applied in pre –post of Pilates in Sit and Reach test that showed the one tailed P values is <0.0001.Hence considered extremely significant.

t=7.618 with 14 degrees of freedom

Paired t-test was applied in pre-post of Suryanamaskar in Sit and Reach test that showed the one tailed P value is <0.0001. Hence considered extremely significant.

t=9.275 with 14 degrees of freedom

Table 1

Sit And Reach Test				
	PRE		POST	
	Mean	S.D	Mean	S.D
Pilates	9.36	3.050	10.8	3.034
Suryanamaskar	8.46	2.264	14.4	3.203

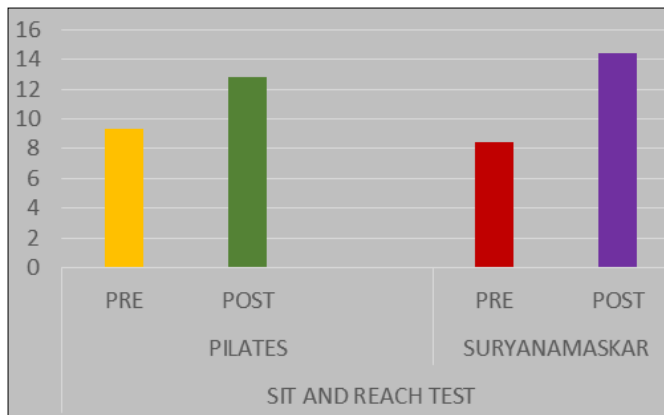


Fig 1: Representing pre and post flexibility difference in Pilates and Suryanamaskar using sit and reach test

2):- Paired t-test was applied in pre –post of Pilates in Shoulder and Wrist test that showed the one tailed P values is 0.1249. Hence considered not significant.

t=1.200 with 14 degrees of freedom

Paired t-test was applied in pre-post of Suryanamaskar in Shoulder and Wrist test that showed the one tailed P value is <0.0001.Hence considered extremely significant.

t=7.924 with 14 degrees of freedom

Table 2

Shoulder and wrist test				
	Pre		Post	
	Mean	S.D	Mean	S.D
Pilates	12.3	3.052	11.7	2.491
Suryanamaskar	15.3	2.491	8.8	2.004

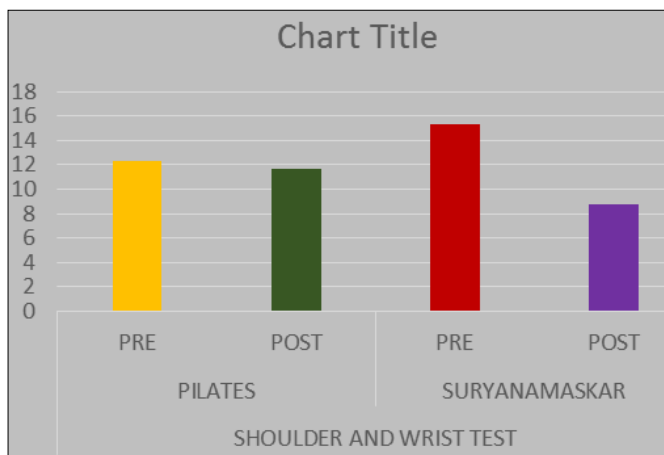


Fig 2: Representing pre and post flexibility difference in Pilates and Suryanamaskar using shoulder and wrist test

3) Unpaired t-test was applied in Sit and Reach of Pilates and Suryanamaskar showed the P value is 0.0019 considered very significant. The tests suggest that difference between two S.D's is very significant.

t=3.160 with 28 degrees of freedom

Comparing both groups

3) Unpaired t-test was applied in Sit and Reach of Pilates and Suryanamaskar showed the P value is 0.0019 considered very

significant. The tests suggest that difference between two S.D's is very significant. $t=3.160$ with 28 degrees of freedom

Table 3

Sit and reach test		
Mean		
	Pilates	Suryanamaskar
Post difference	10.8	14.4
Significance	Very Significant	

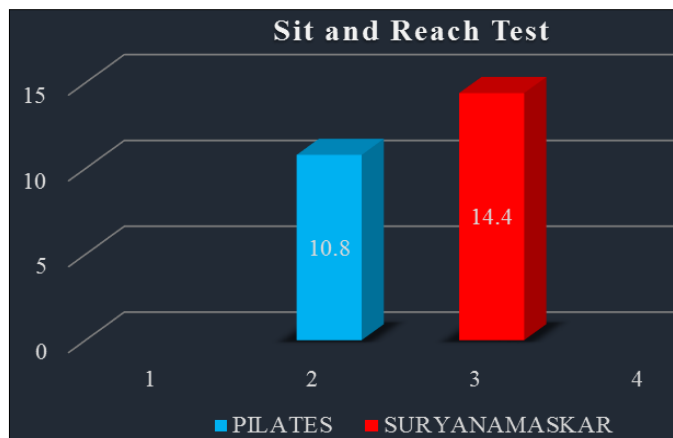


Fig 3: Representing pre and post difference in flexibility in Pilates and Suryanamaskar using sit and reach test

4) Unpaired t-test was applied in Shoulder and Wrist of Pilates and Suryanamaskar showed the P value is 0.0007 considered extremely significant. The tests suggests that difference between two S.D's is extremely significant. $t=3.545$ with 28 degrees of freedom

Table 4

Shoulder and Wrist Test		
Mean		
	Pilates	Suryanamaskar
Post difference	11.7	8.8
significance	extremely significant	

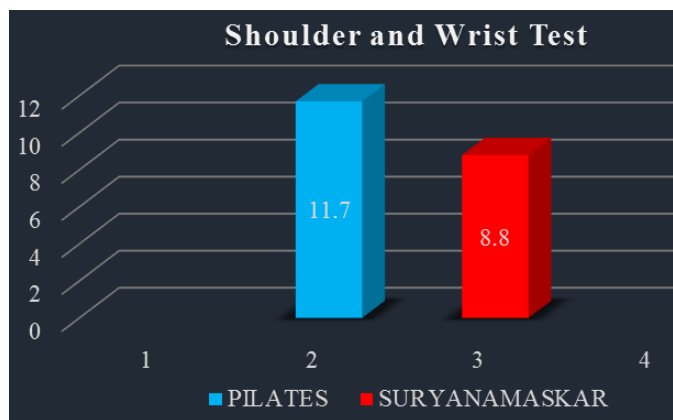


Fig 4: Representing pre and post difference in flexibility in Pilates and Suryanamaskar using shoulder and wrist test

Conclusion

Women who were given Suryanamaskar had more increase in

flexibility as compared to Pilates

The flexibility also improved in Pilates group but women in Suryanamaskar group had better response.

So Suryanamaskar is beneficial in increasing flexibility in sedentary women

Therefore Suryanamaskar may be incorporated into daily fitness routine Regular practice of Suryanamaskar as an exercise, will give benefits of fitness and wellness in one's life.

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The poverty of words has never been so profound than now, when I wish to express my feelings

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References

1. Amy E, Mark MSC, Ian Janseen. PhD, Relationship between screen time and metabolic syndrome in adolescents. 2008; 30(2):153-60. J Pub health. Oxford journals.org/PubMed.
2. Pate RR, O'Neill JR, Lobelo F. The evolving definition of sedentary. Department of Exercise Science, Arnold School of Public Health, University of South Carolina, Columbia, SC 29208, USA; Exerc Sport Sci Rev. 2008; 36(4):173-8.
3. Westerterp KR. Pattern and Intensity of Physical Activity, Nature. 2001; 410:539
4. Earl S Ford, Harold W Kohl, Ali H Mokdad, Umed A Ajani. Sedentary Behavior, Physical Activity, and the Metabolic Syndrome among U.S. Adults. 2005; 13(3):608-614.
5. Morris JN, FRCP DPH, Margaret D, Crawford MD. Coronary Heart Disease and Physical Activity Of Work Evidence Of A National Necropsy Survey, 1958.
6. Charles E. Matthews. Amount of Time Spent in Sedentary Behaviors in the United States; Institute for Medicine and Public Health, Department of Medicine, School of Medicine, Vanderbilt University, Nashville, TN, 2003-2004, 167(7).
7. Mark G Davis, Kenneth R Fox, Melvyn Hillsdon, Debbie J Sharp, Jo C Coulson, Janice L. Thompson. Objectively Measured Physical Activity In A Diverse Sample Of Older Urban UK Adults Centre For Exercise, Nutrition And Health Sciences, School For Policy Studies, University Of Bristol, Bristol, United Kingdom, 2010. 0195-9131/11/4304-0647/0.
8. Kelley K, Pettee Gabrie. Assessment of Physical Activity Behavior Framework for Physical Activity as a Complex and Multidimensional Behavior, 2012, 9(s1).
9. Overweight & Obesity
10. Ross A, Thomas S, Altern J. Complement. The Health Benefits of Yoga and Exercise: A Review of Comparison

Studies. DOI: 10.1371/Journal.Pone.0061910

11. Betul Sekendiz, Ozkan Altun, Feza Korkusuz, Sabire Akin. Effects of Pilates exercise on trunk strength, endurance and flexibility in sedentary adult females. *Journal of body work and movement therapies*. 2007; 11:318-326.
12. Exercise physiology, Nutrition, Energy and future performance, Seventh edition, William McArdle, Chapter 31-Physical activity and ageing, section 7, pg no:837-838.
13. Kristine M. Fondran. The Effect of Suryanamaskar Yoga on Resting Heart Rate, Blood Pressure, Flexibility, Upper Body Muscle Endurance and Perceived Well Being in Healthy Adults.
14. Lisa Marie Bernardo. The Effectiveness of Pilates Training In Healthy Adults *Journal of Bodywork and Movement Therapies* *Bodywork and Journal of Movement Therapies*. 2007; 11:106-110.
15. Noelia González-Gálvez, María Carrasco Poyatos. Pablo Jorge Marcos Pardo, Yuri Feito. The Effect Of Pilates Method In Scholar's Trunk Strength And Hamstring Flexibility: Gender Differences. *International Journal of Sport and Health Sciences*, 2014, 8(6).
16. Dr. Nigar Shikalgar PT, Dr. Safa Anwar PT. Rochelle Janice Rego2 (P.T.) Effect Of Two Weeks Training Of Suryanamaskar On Flexibility In College Female Students *IJAMSCR*. 2017; 5(4):928-932.
17. Madan Singh, Rathore, *et al.*, The effect of Suryanamaskar on muscular endurance and flexibility among college level girls. *Indian Streams Research journal*, 2015, 2(10).
18. Tolani N, Szabó Z, Köteles F, Szabo A. Physical and psychological benefits of once-a-week Pilates exercises in young sedentary women: A 10-week longitudinal study. 2016; 163:211-218.
19. Which is best for all-round flexibility-Pilates or Yoga?
20. Denise Austin. Every Body Benefits from Pilates.
21. Komal A Jakhota, Apurv P Shimpi, Savita A Rairikar, Priyanka Mhendale, Renuka Hatekar, Ashok Shyam, *et al.* Suryanamaskar: An equivalent approach towards management of physical fitness in obese females *J Yogav*, 2015, 8(1).
22. Dr. Rajni Nautiyal. Effect of Surya Namaskar on weight loss in obese persons, *India International Journal of Science and Consciousness*. 2016; 2(1):1-5.
23. Deepak Negi. Effect of Hatha Yoga on Flexibility of College Going Female Students *Asian Journal of Multidisciplinary Studies*, 2016, 4(5).
24. Amit Vaibhav, Swati Shukla, Om Prakash Singh, Surya Namaskar. (Sun Salutation): A Path to Good Health. *International Journal of Pharmacological Research*, 2016, 6(07).
25. Manju Deorari, Mrignayani Agarwal, Pratima Shukla. A Study on the Effect of Surya Namaskar on Emotional Maturity and Psychological Wellbeing *Manju International Journal of Yoga and Allied Sciences*, 1(2).