

The Effect Of Yoga Training On Balance And Proprioception Of Ankle

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Abstract

The purpose of this study was to investigate the effect of five weeks yoga training on static and dynamic balance and proprioception in healthy women. The study included 15 healthy female (mean age 22.47±1.12 years) from Yogaşala yoga center, İstanbul- Turkey. The static balance(SB) was evaluated using one leg standing test and the dynamic balance (DB) was evaluated using star excursion balance test. Proprioception of the ankle was evaluated at 10° dorsiflexion, 11 degree plantar flexion and 25° plantar flexion angles with both eyes open and eyes closed (EOP, ECP) by using the active reproduction test. All tests were performed before and after the 5 weeks yoga training program. Measurements of static and dynamic balance showed statistically significant improvement after the program (P <0.05). However the proprioception results showed no statistically significant differences between the pre and post yoga training (p>0.05). Conclusions: Yoga training affects the balance positively and no effects on proprioception.

Key words: Dynamic balance, Proprioception, Static balance, Yoga

Introduction

Balance is the ability to keep the center of gravity of the body on the support surface and it is maintained by the neuromuscular mechanisms. For balancing during activities, the motor system creates motor responses according to the mechanical load act on the body. Input of proprioceptive, visual and vestibular systems generate a proper motor response to maintain the mass center at the support center (Balaban et al., 2009). Proprioception plays an important role in dynamic joint stability and modulation of muscle function and appears to have the best impact on balance control (Islam et al., 2004; Mattacola and Wills, 1997). The neural adaptation is facilitated by physical activities and systematic exercise programs improve the kinesthesia (Knobloch et al., 2005; Verhagen et al., 2004). People who exercise regularly have better balance and proprioceptive senses. Several studies showed that physical training and sport have a positive influence on sense of joint position and balance (Hübscher et al., 2010; Pánics et al., 2008; Aydın et al., 2000). Yoga is a system of movement and breathing exercises focusing on awareness of self, breathing and energy. It is a form of mind-body fitness that could improve physical and emotional balance. There is some evidence for its benefits in some common conditions such as back pain, asthma, hypertension, depression and anxiety, symptoms of menopause and balance and stability in the elderly (Verrastro, 2014). However there despite yoga's popularity, are very few studies have been conducted to investigate the effects of on balance and there have been no systematic reviews surveying the quality of available research for yoga and balance (Jeter et al., 2014). This study aimed to investigate the effect of five weeks yoga training on static and dynamic balance and proprioception in healthy women.

Materials and Methods

Sample

This study was conducted in Yogaşala yoga center during February 2015-April 2015 as a graduation project in Physiotherapy and Rehabilitation Department of Faculty of Health Sciences at Yeditepe University, İstanbul-Turkey. The study included 15 healthy women (mean age 22.47±1.12 years, mean weight 56.40±9,94 kg and mean height 166.00±7.00cm. Subjects who had consumed alcohol, or who had visual or hearing impairment, or cardiovascular, neurological or rheumatological diseases were not included in this study. Informed consent was received from each participant.

Procedures

Static balance was measured using one leg standing test on stable platform with both eyes open for 60 second and eyes closed for 30 second (EOSB, ECSB) and the subjects were told to maintain their balance for maximum duration. Measurement was stopped when the stance foot shifted in any way or the non-stance foot touched the ground (Gulbandilar et al., 2008; Cımbız et al., 2006).

The dynamic balance (DB) was evaluated using star excursion balance test (SEBT). The SEBT was performed with the subjects standing in the middle of a grid formed by eight measure tapes extending out at 45° from each other. The subject was asked to reach as far as possible along each of the eight measure tapes, make a light touch on the tape, and return the reaching leg back to the center, while maintaining a single-leg stance with the other leg in the center of the grid. When reaching in the lateral and posterolateral directions, subjects must reach behind the stance leg to complete the task. They began with the anterior direction and progressed clockwise around the grid. All subjects began with a right stance leg in the center of the grid. After completion of the three trials in the eight directions and another 5-min rest period, the test continued with a left stance leg. Each reach distance was recorded with a mark on the tape as the distance from the center of the grid to point of maximum excursion by the reach leg (Dabholkar et al., 2012; Gribble and Hertel, 2003).

Proprioception of the ankle was evaluated at 10° dorsiflexion, 11° plantar flexion and 25° plantar flexion angles with both eyes open and eyes closed (EOP,ECP) by using the active reproduction test. Measurements performed by using specially designed apparatus and an goniometer while the subject in sitting position extended his legs in quiet environment at normal room temperature. After a trial test, the subjects were told to move their ankles to target angles, and the best value that represented the

nearest distance to the target angle was recorded throughout three repetitions. All the evaluation methods were performed in the left and right sides (Muammer et al., 2014). All tests and measurements were performed before and after the 5 weeks yoga training program as 2 session per week and each session continued for 50 minutes.

Statistical Analysis

For the statistical analysis of the data, the Statistical Package for the Social Sciences (SPSS) 22 analysis software (IBM, USA Partner Company: AIMS Analytical Information Management Solutions, Software Training Consulting Corp. İstanbul, Turkey) was used. The arithmetic mean and standard deviation were calculated to summarize the descriptive data. The paired t test was used to compare the pre-yoga and post-yoga values.

Results

There were statistically significant differences between the pre-yoga and the post-yoga values of the static balance for both legs (p<0.05) (Table 1).

Table 1: Comparison of the one leg standing balance test between the pre and post yoga education

Parameter	Pre-yoga X±SD	Post-yoga X±SD	P
Right leg Eyes open	38.67±4.8	53.6±4.5	0.00
Right leg Eyes Closed	20.33±2.1	27.8±2	0.00
Left leg Eyes open	37.27±5.8	50.93±6	0.00
Left leg Eyes Closed	20.27±0.6	27.93±1.6	0.00

There also were statistically significant differences between the pre-yoga and the post-yoga values of the dynamic balance for both legs ($p < 0.05$) (Table 2).

Table 2: Comparison of the star excursion balance test between the pre and post yoga for both legs.

Parameter	Right leg		P	Left leg		P
	Pre yoga X±SD	Post yoga X±SD		Pre -yoga X±SD	Post -yoga X±SD	
Anterior	82.9±15.9	90.4±12.6	0.003	82.0±15.7	93.3±11.8	0.001
Anteromedial	85.2±16.8	91.4±14.1	0.009	86.2±18.1	93.2±14.4	0.011
Medial	86.3±14.6	93.5±12.0	0.017	85.9±13.7	94.8±11.7	0.004
Posteromedial	81.9±11.7	90.0±12.0	0.001	83.2±12.5	90.6±11.9	0.008
Posterior	78.0±12.6	87.7±10.8	0.001	78.2±14.1	87.3±13.1	0.001
Posterolateral	72.2±13.1	82.0±13.7	0.004	70.7±13.9	76.6±12.1	0.030
Lateral	62.4±10.8	72.4±12.5	0.001	64.6±15.9	73.5±9.9	0.012
Anterolateral	74.8±15.9	84.1±11.1	0.003	73.7±15.9	83.0±10.9	0.006

In relation to proprioception measurements there was no statistically significant differences between the pre and post yoga education for both ankles ($p > 0.05$).

Discussion and Conclusion

Yoga is a useful exercise program for all body segments. It is applied for therapeutic purposes in the treatment of many diseases. In addition, it is applied for protective purposes in healthy people and. It creates positive influences on the musculoskeletal system (Ülger et al., 2007). Yoga has been shown to improve strength, flexibility, concentration, and energy in some individuals and is widely practiced in many settings throughout the world. The practice of yoga includes working on these outcomes as well as breathing and meditation to improve overall well-being. Yoga may be a useful adjunct to therapy programs and is currently being used in clinics. It may also provide a method to keep adolescents not typically interested in team sports interested in exercise (Donahoe-Fillmore et al., 2010). Ülger et al. Investigated the effects of Hatha Yoga on flexibility and balance as one leg standing test of healthy women and they found that the yoga program has positive effects on flexibility and balance (Ülger et al., 2007). A study investigated the effects of hatha yoga training on health related physical fitness variables including muscular strength, agility, power and speed and the results indicated that these parameters significantly improved in group who received yoga education compared with the control one. The findings indicate that regular hatha yoga practice can elicit improvements in the health-related aspects of physical fitness and may contribute to enhance health status and wellness (Gaurav 2011). The effect of a 12-week yoga intervention on fear of falling and balance in older adults was investigated and the results indicated that yoga may be a promising intervention to manage fear of falling and improve balance, thereby reducing fall risk for older adults. Rehabilitation therapists may wish to explore yoga as a modality for balance and falls programming; however, future research is needed to confirm the use of yoga in such programming (Schmid et al., 2010). According to Jeter et al. yoga may have a beneficial effect on balance, but variable study design and poor reporting quality obscure the results. Balance as an outcome is underutilized, and more measures are needed (Jeter et al., 2014). In this study balance evaluated as static and dynamic. The static balance was evaluated using one leg standing test in both eyes open and eyes closed conditions on both sides. The dynamic balance was evaluated in both sides using star excursion balance test in the anterior, anteromedial, medial, posteromedial, posterior, posterolateral, lateral and anterolateral directions. The positive effect of yoga training on the different types of balance is obvious and confirms the reality of the effect of yoga on balance. In relation to proprioception measurements there was no statistically significant differences between the pre and post yoga education for both ankles. Few studies investigated the effect of yoga on proprioception. Soubhagyalaxmi et al. investigated the effect of yoga practice on proprioception in congenitally blind students and they demonstrated that the yoga may help to improve proprioceptive function in visually impaired children (Soubhagyalaxmi et al., 2014). Further studies are necessary to refine details of the effect of yoga on proprioception. In conclusion Yoga training affects the balance positively and no effects on proprioception, however further studies are needed in both healthy and patients population.

Conflict of interest

The authors declare no conflict of interest

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