

Evaluation of the Effects of Menstrual Cycle on Postural Stability in Active Young Women

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Abstract

Menstruation is considered as the primary biological factor between men and women. Many studies indicate that the prevalence of injury is higher in female athletes than in male athletes. In the previous studies, an association between postural stability and injury rate has been reported. The purpose of this study is to evaluate the stability of physically active women during different phases of the menstrual cycle. Young women who exercised regularly and had a regular menstrual cycle (n = 19, age: 20.4±1.2 years; height: 164.78±4.66 cm; body weight: 54.63±3.41; BMI: 20.11±0.97 menstruation: 28.47±1.26) participated in the study. The Menstrual cycle is divided into three different phases. The stability was measured in the early menstrual phase, the follicular phase, and the middle of the luteal phase. Postural stability index (PSI) and Limit of stability (LOS), tests were performed with the Biodex SD System (Biodex, Shirley, NY). During the ovulation phase, according to LOS test results (p=0.016), a statistical difference was found between the three phases. According to this result, LOS values decreased in the ovulation phase compared to other phases. No difference was determined between anterior-posterior oscillation, mediolateral oscillation, and postural stability index scores and menstrual phases (p=0.34). It is observed that stability in women who perform active sports is affected by different menstrual phases. It can be said that the deterioration in stability is caused by the increase in sex hormones muscle and joint laxity during the ovulation phase.

Keywords: Balance, Menstruation, postural sway.

Introduction

The participation of women in sports activities is increasing every day. However, athletes and physically active individuals often experience lower limb injuries¹. The number of knee and ankle injuries that occur in women during sports activities is increasing, and the main underlying factor of these injuries is defined by increased instability and postural sway^{2,3}. Studies indicate that female athletes are 2-8 times more likely to experience a non-contact ACL injury than male athletes at the same competition level^{1,4-7}. In various studies, the prevalence of lower extremity injuries in female athletes than in male athletes has been associated with anatomical differences, body composition, muscle strength, muscle activation pattern, and hormonal changes in the menstrual phase⁸⁻¹¹. It has also been stated that menstrual disorders in female athletes also affect the musculoskeletal system and are closely related to the increase in injury risk¹². Also, it is emphasized by researchers that hormonal changes during menstruation have effects on tendons and ligaments¹³⁻¹⁷. Estrogen and progesterone receptors are located in skeletal muscles, bones ligaments and nervous system.

For this reason, sex hormones affect the structure and function of these tissues¹⁸). Alpha and beta receptors found in tendons, ligaments, and skeletal muscles have been reported to affect neuromuscular coordination during menstruation¹⁹⁻²¹. In another study, it was observed that estrogen could affect the female neuromuscular system either directly or indirectly through these receptors²². In a study, it was reported that estrogen causes laxity in the tendon ligaments and joints as a result of peak concentration during the ovulation phase of the menstrual phase (Lee et al. 2014). Besides, due to the effects of the hormone estrogen on the tendon and ligament laxity, female athletes have been reported to have a higher risk of injury^{23,24}. In another study, it was stated that the sportive performance of laxity in muscle tone, tendons and ligaments negatively affects balance and stability²⁵⁻²⁷.

Postural stability is defined as being able to hold the body centre of gravity within the centre of support to prevent falls and complete desired movements²⁸. To maintain balance, feedback comes to the brain from various systems such as visual, vestibular, and somatosensory systems²⁹. Within these systems, the somatosensory system is considered to perform the most crucial task³⁰. The somatosensory system supports the maintenance of stability by providing feedback from ligaments in joint capsules, nerves in the