

EFFECTS OF COMPRESSION SOCKS ON POSTURAL BALANCE USING BIODEX STABILITY SYSTEM AMONG UNIVERSITY NETBALL PLAYERS

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Abstract

The purpose of this study was to observe the effects of wearing compression socks on postural balance in university netball players. Fourteen advanced learner netball players performed three trials of 20 seconds each of dynamic postural balance test on Biodex Stability System, while wearing two socks, (a) Normal Socks and (b) Compression Socks. Data on overall, anterior/posterior and medial/lateral stability indexes were analyzed using Paired Sample T-tests. The results revealed that wearing compression materials significantly enhanced static and dynamic postural balance among the university netball players. The improvements in these key variables are likely due to enhanced somatosensory feedback information which allowed the lower limbs to better regulate postural stability. It is suggested that compression socks can be used by university netball players to improve their postural stability.

Keywords: Compression socks, stability, netball, somatosensory feedback

Introduction

Balance is associated with risk of injury and those with poor balance tend to suffer more injury (Hrysomallis, 2007; McGuine & Keene, 2006). Balance should be maintained while performing sport-specific movements, and deficiencies in balance have been shown to have a detrimental effect on the performance of these movements (Wikstrom, Powers, & Tillman, 2004). In some cases, strategies used to maintain equilibrium are more important than maintaining the degree of balance. Most equilibrium assessments tended to measure overall equilibrium performance, but not individual segment kinematics. Because of the risk of injury and performance implications associated with faulty movement biomechanics, it may be harmful to neglect to observe movement strategy. It is possible to achieve balance through three main strategies: ankle, hip and stepping (Emery, 2003). The ankle strategy restores equilibrium through movement created primarily at the ankle joint. Under dynamic conditions, this strategy plays a primary role in restoring stability under static conditions (King & Zatsiorsky, 2002), but its main function is to restore anterior-posterior stability due to the limited medial-lateral movement at this joint. The hip strategy restores equilibrium through movement created primarily at the hip complex. This strategy is commonly used in both mediolateral and anteroposterior instability when balance disturbances are large and rapid or when the surface is unstable or smaller than the support base (Horak & Nashner, 1986; Shumway-Cook, Brauer, & Woollacott, 2000; Tropp, Odenrick, & Gillquist, 1985).

Compression socks are designed to apply pressure to the lower legs. The socks support the maintenance of blood flow and decrease discomfort and swelling and it are made from a higher content of elastic fibers like Lycra and spandex than other socks. They can also be made from various materials including cotton and microfiber. Lim and Davies (2014) stated that compression sock are one of the compression therapies frequently used in physical therapy. Compression socks are used by athletes to enhance their physical performance, and some sock manufacturers had modified the version of compression socks to be used for medical purposes (Kiikka, 2015). According to Yoo (2015), wearing socks can help to protect the foot but can decrease sensory input. Modifiable socks (i.e. compression socks) are needed to restore the availability of the somatosensory feedback which is very important in information regulation during dynamic sports activities. Therefore, the purpose of this study was to determine the effects of wearing compression socks on the postural balance abilities among university netball players.

Methods

Participants

Fourteen university netball players (18-25 years old) agreed to participate in the study. All participants had at least five years in competitive netball and normal training throughout the year. The Universiti Teknologi MARA Human Ethical Committee approved all experimental procedures on human participants. Written consent was obtained before the start of the study.

Procedures

The Postural Stability Test was conducted using the Biodex Stability System (BSS). It emphasizes the subject's ability to maintain the center of balance under controlled lab conditions. The participants were asked to stand on the platform; the tests began with level 12 platform stability (for static balance test). For the dynamic balance test, level 12 (no movement at all on the platform) was set on the platform stability until it reached level 1 (highest dynamic movement on the platform). The test duration was set for 20 seconds each trial. The participants were given three trials each for each variable and each sock condition in a randomized order. There were two socks conditions in this study, namely (a) Normal Socks (NS) and (b) Compression Socks (CS). The clinical compression socks (Zero Point, Finland) were constructed from nylon (72%) and lycra (28%), with a clinical compression level of 20–30 mm Hg (Hasan, Davids, Chow, & Kerr, 2016). The control socks were normal socks of similar thickness to the compression socks.

Data Analysis

Data on overall, anterior/posterior and medial/lateral stability index were collected during the postural stability tests in each sock condition. Paired sample t-tests were used to compare postural stability performance with the alpha values were set at $p < 0.05$. All data were analyzed using the Statistical Package for Social Sciences (SPSS V21.0, Chicago, IL, USA).

Findings and discussion

Findings

There were significant differences between compression and normal socks for static balance on the overall stability index; $t(3.509) = 13, p = 0.004$, anterior/posterior stability index; $t(3.329) = 13, p = 0.005$ and medial/lateral stability index; $t(3.357) = 13, p = 0.005$ among the netball players (Figure 1). The results showed that the stability indexes values were significantly lower in the CS condition as compared to the NS condition.

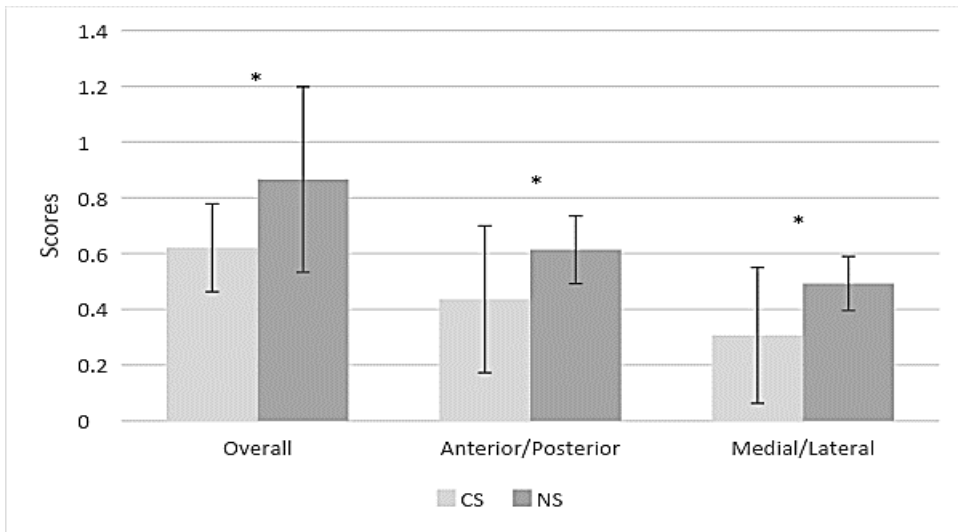


Figure 1: Mean (SD) overall, anterior/posterior and medial/lateral stability index during dynamic balance for netball players under two socks conditions. Notes: * denotes significant difference.

There were significant differences between the compression and normal socks for dynamic in terms of the overall stability index; $t(4.305) = 13, p = 0.001$, anterior/posterior stability index; $t(4.364) = 13, p = 0.001$ and medial/lateral stability index; $t(4.163) = 13, p = 0.001$ among the netball players (Figure 2). The results showed that the stability indexes values were significantly lower in the CS condition as compared to the NS condition.

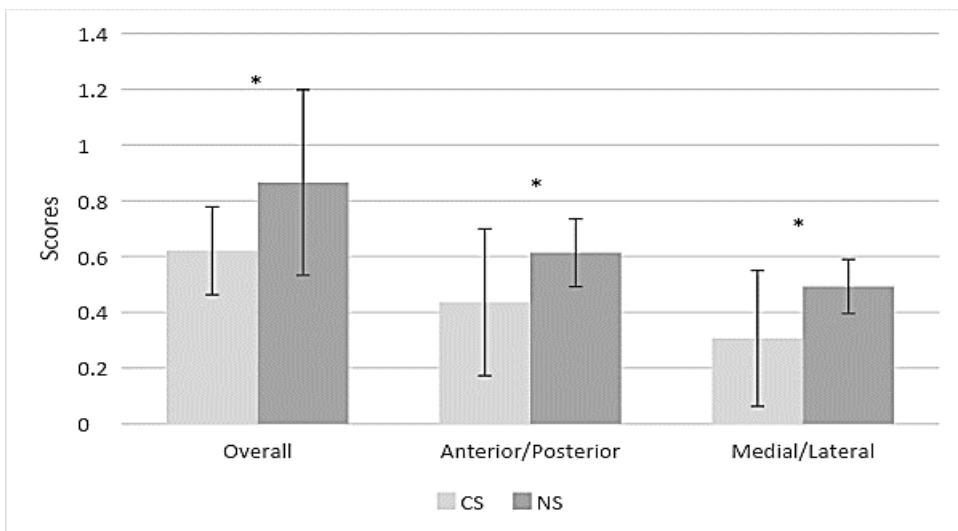


Figure 2: Mean (SD) overall, anterior/posterior and medial/lateral stability index during static balance for netball players under two socks conditions. Notes: * denotes significant difference.

Discussions

This study was conducted to determine the effects of compression sock on postural balance among university netball players. To achieve this aim, we investigated the effects of using two different socks interactions in performing static and dynamic postural balance abilities. Added compression was introduced to the participants in the CS condition and the performance was being compared to the NS condition. Based on our observations, the use of CS provided a significant main effect on enhanced postural stability among the participants. A similar study (Michael, Dogramaci, Steel, & Graham, 2014) also found similar findings when their participants (female athletes) had significantly improved balance task performance when wearing compression materials. The reason behind improved postural stability among the participants was the enhanced somatosensory feedback information received by the legs when wearing the compression materials (Espeit, Pavailler, & Lapole, 2017). This may provide additional beneficial effects because of the textured parts of the socks; the coarse surfaces located at the soles of the feet, medial-lateral and posterior sides of the ankles, anterior and proximal to the tibia bones would increase proprioception. Thus, the compression feature with the length of the socks level the knee would provide greater stimulation to the lower leg mechanoreceptors where it helps the participants achieve better balance control and enhance the afferent of sensory inputs from the feet (Hasan et al., 2016). However, a previous study by Jaakkola et al. (2017) on healthy participants did not find significant differences in the performance of static and dynamic balance after eight weeks' intervention program. In their study, the participants were grouped into clinical compression socks, sub-clinical and control socks group.

Anterior/posterior and medial/lateral movements require large involvement of the lower limbs muscles activities. Netball play involves static (i.e. standing) and dynamic (i.e. turning, twisting and jumping) movements, and these maneuvers produce high load, especially on the lower limb muscles to maintain the postural stability of the body. The use of CS with an enhanced somatosensory feedback may help university netball players to enhance their postural stability during these task maneuvers (Waddington & Adams, 2000). In addition, Espeit et al. (2017) suggested that wearing compression materials may reduce spinal motor neuron excitability of the lower limb muscles (i.e. tibialis anterior) which can lead to enhance postural stability. However, in this study, the participants were only required to maintain their postural balance on the machine without any involvement of implement (i.e. ball) and netball task maneuvers and thus limit its task representative design. It would be interesting for future research to investigate the use of compression materials during dynamic tasks in netball performance, such as passing and shooting.

Conclusions

The effects of wearing compression socks were associated with constructive effects during the performance of postural stability among the university netball players. It is recommended that university netballers should wear compression socks instead of the normal socks to enhance their postural stability. An interesting issue for future

investigations would be to require participants to wear compression socks on either the preferred or non-preferred foot to permit identification of specific effects on separate limbs during postural stability performance.

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