IECBS 2024 Conference

The 4th International Electronic Conference on Brain Sciences

23–25 October 2024 | Online

MDPI

EFFECT OF KNEE JOINT FIXATION ON HUMAN POSTURAL STABILITY

Anna Shulman[1], Maksim Baltin[2], Alexandr Eremeev[1], Margarita Nikulina[1], Anton Eremeev[1], Tatyana Baltina[1]

1 - Kazan Federal University Kazan, Russia;
2- Sirius University of Science and Technology Sochi, Russia.

INTRODUCTION & AIM

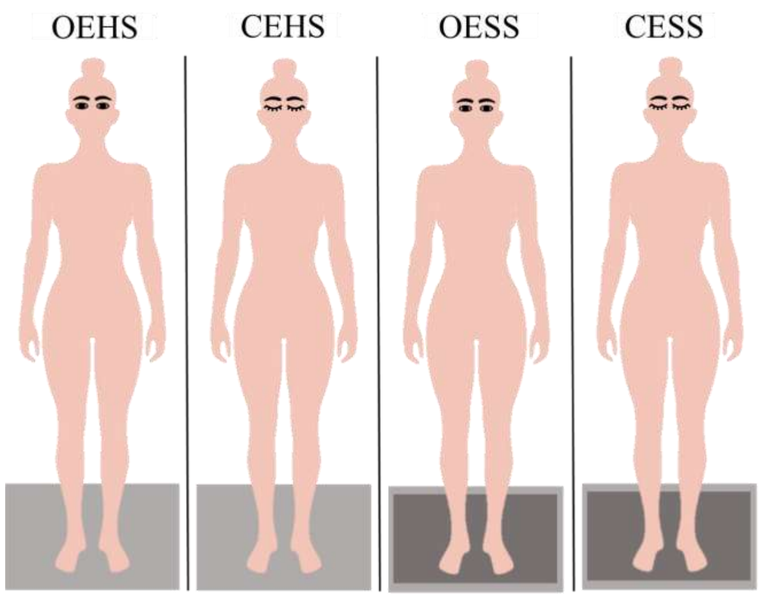
The analysis of motor strategies includes only ankle and hip strategies, without considering the possible role of the knee joint, although coordinated control of knee joint movements plays a significant role in maintaining posture stability.

Analyses of postural muscle activity in combination with a stabilographic study can give a more detailed picture of how the posture regulation system is constructed.

The aim of our work was to assess the activity of the lower limb muscles during the maintenance of vertical posture with knee joint fixation in conditionally healthy subjects.

METHOD

Electromyography and stabilometry parameters were recorded in healthy subjects with and without knee joint fixation.
The tests included: eye-open test (control), Romberg test, and "Target" test.



The following tests were used to assess the quality of upright posture maintenance:

1. Basic trial (with eyes open and closed on a hard surface - OEHS and CEHS).The study was performed for 1 minute with eyes open, then for the same time with eyes closed.
2. Trial, with decreasing quality of the support surface. Recordings were performed in a basic stand on soft foam mats for 1 minute with eyes open (OESS) and for the same time with eyes closed (CESS).

RESULTS & DISCUSSION

Stabilometry results of control and knee fixation were compared.

1. **Knee fixation reduced the total power of pressure center** oscillations in all tests except for the Romberg test with closed eyes, in which some shift of the spectrum to higher frequencies was observed.
2. The **test "Target"** both in norm and at knee fixation the spectrum **shifted to the zone of higher frequencies**, the changes were less pronounced in the experimental group.
3. At **restriction of knee joint mobility** there was a **decrease in the activity** of the anterior tibial muscle.
4. During **visual deprivation** in the **Romberg test**, the electrical **activity** of the tibial muscle **decreased**.
5. When registering electromyograms from the cambaloid muscle, there was a tendency to a decrease in activity in tests with fixation of knee joints.

CONCLUSION

1. **Restriction of knee joint mobility** results in a marked **improvement** in postural stability.
2. **Deprivation of vision** in the Romberg test combined with **restriction of knee joint mobility worsens** the ability to control **body balance**.
3. **Restriction of knee joint mobility** leads to a **decrease** in tibial **muscle activity**. With visual deprivation in the Romberg test, the electrical activity of the tibial muscle decreases.
4. At **restriction of knee joint mobility** the system of **balance regulation improves** due to activation of vestibular and proprioceptive afferent systems.

FUTURE WORK

Further research in the field of posturology will allow a better understanding of the relationship between knee joint mobility limitations and postural control, as well as the development of effective methods of rehabilitation and improvement of postural stability in patients with these limitations.