

Zanesljivost meritev občutka za položaj zgornjega skočnega sklepa v odprti kinetični verigi

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Uvod: Občutek za položaj sklepa je pomemben del propriocepcije, ki prek specializiranih mehanoreceptorjev posreduje informacije o dejanskem položaju telesnih segmentov (1). Ker je oslabitev propriocepcije lahko eden izmed prvih znakov razvoja nevroloških in mišično-skeletnih okvar (2), je za njeno ocenjevanje treba zagotoviti zanesljivost merilne naprave in testnega postopka. Namen raziskave je bil ugotoviti zanesljivost meritev občutka za položaj zgornjega skočnega sklepa pri zdravih mladih preiskovancih, merjenega z elektrogoniometrom. **Metode:** V raziskavi je sodelovalo 30 zdravih preiskovancev (27 žensk, 3 moški), v povprečju starih $20,7 \pm 1,5$ leta. Za merjenje občutka za položaj sklepa je bil dvakrat v razmiku sedmih dni uporabljen elektrogoniometer Biometrics SG110, nameščen po poteku Ahilove tetive. Protokol je bil narejen na podlagi pregleda podobne raziskave (3). Vse meritve so preiskovanci opravili sede z zaprtimi očmi, na način aktivno pri 10° dorzalne fleksije ter 25° in 40° plantarne fleksije v zgornjem skočnem sklepu. Celoten postopek je trajal približno 20 minut. Izračunali smo absolutno razliko med doseženim in testnim kotom v sklepu ter absolutno napako. Iz absolutnih napak je bil izračunan intraklasni koeficient korelacije (ICC) in 95-odstotni interval zaupanja. **Rezultati:** Pri vseh kotih so se pri drugem merjenju absolutne napake zmanjšale. Povprečna vrednost absolutnih napak pri prvem merjenju je znašala $4,0^\circ$, pri drugem pa $3,3^\circ$. Največja razlika med absolutnimi napakami prvega in drugega merjenja je bila pri kotu 25° plantarne fleksije, pri katerem so bile pri prvem testiranju absolutne napake največje. Kot 25° plantarne fleksije se je tako izkazal za najmanj zanesljivega (ICC od 0,07 do 0,08). ICC pri 10° dorzalne fleksije je bil med 0,14 in 0,40. Najvišji ICC je bil pri 40° plantarne fleksije med 0,52 in 0,54, kar kaže na zmerno zanesljivost (4). **Zaključki:** Glede na rezultate lahko sklepamo, da meritve občutka za položaj zgornjega skočnega sklepa z elektrogoniometrom Biometrics SG110 niso dovolj zanesljive. Vir napak bi lahko bil protokol, merilna naprava, preiskovanci ali preiskovalec. Testni koti so za nekatere preiskovance predstavljali tudi njihovo končno mejo gibljivosti, zato so ta položaj težko dosegli in ga vzdrževali zahtevanih 5 sekund, s čimer se je povečala stopnja napak. Vir napak je lahko izbira tipa elektrogoniometra, nenatančna namestitvev in posledično težava pri določitvi ničelnega položaja ali premik kože med gibanjem. Razvidno je tudi, da so povsod pri ponovnem testiranju absolutne napake manjše, kar kaže na dejavnik učenja. Potrebne so dodatne raziskave za zagotovitev zanesljivega protokola za testiranje občutka za položaj zgornjega skočnega sklepa z elektrogoniometrom. Raziskava je potekala v okviru ARRS projekta L3-5509.

Ključne besede: zanesljivost, občutek za položaj zgornjega skočnega sklepa, elektrogoniometer, propriocepcija, odprta kinetična veriga.

Reliability of the talocrural joint position sense measurement in the open kinetic chain

Background: Joint position sense is one of the important parts of proprioception which provides information about the actual position of body segments through specialized mechanoreceptors (1). Since decline in proprioception may be one of the first signs of neurological and musculoskeletal impairment (2), proprioception requires a reliable measuring device and procedure for its evaluation. The purpose of the study was to determine the reliability of measurements of the talocrural joint position sense in healthy young subjects, measured by electrogoniometer. **Methods:** 30 healthy subjects (27 female, 3 male) an average age of 20.7 ± 1.5 years participated in the study. For measuring joint position sense, electrogoniometer Biometrics SG 110 was used twice in a seven-day interval. The electrogoniometer was placed over Achilles' tendon and a protocol described in the study by Bronner et al (3), was used. All measurements were made active (active) in a sitting position with eyes closed in three test angles: 10° dorsal-flexion, 25° and 40° plantar-flexion in the talocrural joint. Testing lasts approximately 20 minutes. Absolute differences between target and testing angle in the talocrural joint and absolute error were calculated. On the basis of absolute errors, the intraclass correlation coefficient (ICC) and a 95% confidence interval were calculated. **Results:** For all angles in the second measurement, absolute errors were smaller. Average of absolute errors in the first measurement was 4.0° and in the second measurement it was 3.3°. The largest differences in the absolute errors between the first and the second measurement were at 25° of plantar-flexion, where the absolute errors in the first measurement were the largest. The least reliable angle was 25° of plantar-flexion (ICC: 0.07–0.08). ICC at 10° of dorsal-flexion was between 0.14 in 0.40. The highest ICC (0.52–0.54) was at 40° of plantar-flexion, which shows moderate reliability (4). **Conclusions:** According to the results, it can be concluded that measurement of talocrural joint position sense using electrogoniometer Biometrics SG110 is not reliable. The source of errors could be the measurement protocol itself, the device, subjects or the tester. In some subjects, testing angles were at the end range of their motion and therefore, it was difficult to reach and maintain this position for 5 seconds, which caused an increase in error. The possible source of errors could be the type of electrogoniometer, imprecise placing and consequently difficulty to determine null position or skin movement. It is evident, that in all re-tests the absolute errors were decreased, which indicates learning process. Further research is required to establish a reliable protocol for measuring the ankle joint position sense using electrogoniometer. The research was made according to the ARRS project L3-5509.

Key words: reliability, talocrural joint position sense, electrogoniometer, proprioception, open kinetic chain.

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