Analysis of factors related to shoulder instability in young handball players

Cláudia Torres[a], Edgar Leitão[a], Joana Leal[a], Sara Camelo[a], João Paulo Sousa[a,b,c] and Ângela Maria Pereira[a,d,e]

[a]Department of Physiotherapy, Escola Superior de Saúde Egas Moniz (ESSEM), Egas Moniz Cooperativa de Ensino Superior, Caparica, Portugal; [b]Departamento de Desporto e Saúde, Escola de Ciência e Tecnologia da Universidade de Évora, Monte da Caparica, Portugal; [c]Comprehensive Health Research Center (CHRC), Monte da Caparica, Portugal; [d]Centro de Investigação Interdisciplinar Egas Moniz (CiiEM), Egas Moniz Cooperativa de Ensino Superior, Caparica, Portugal; [e]Hospital Garcia da Orta, Almada, Portugal

ABSTRACT

Introduction: The shoulder of handball players suffers from the ongoing repetition of movement that may lead to the development of joint instability and modification of proprioceptive condition [1]. Because the articular components of the shoulder joint are considered to have extreme importance on the static and dynamic stabilisation and quality of proprioceptive information, they may compromise the athlete's performance [2]. The purpose of our study was to verify if shoulder strength parameters (SSP) and joint position sense (JPS) of shoulder internal and external rotation may contribute to the development of shoulder instability in handball players.

Materials and methods: A cross-sectional design was implemented. The sample was composed by eleven handball players of both genders (4 females and 7 males), under 18 years of age, that practiced the sport for at least 3 years. For the data collection, an isokinetic dynamometer (Biodex System 3) was used. The evaluation of SSP was implemented prior to JPS at a speed of 60°|sec (3 reps) and 180°|sec (20 reps) of internal rotation (IR) and external rotation (ER), with the shoulder positioned at 90° of abduction. The JPS was evaluated using active and passive positioning, 6 repetitions each, at 3 given external shoulder rotation amplitudes (20, 35 and 75 degrees). Prior to the data collection, all subjects signed an informed consent. This study follows all the principles of the Declaration of Helsinki.

Results: For the dominant shoulder, the peak torque (PT) at 60°|sec was 41.4 Nm (±12.2) of ER and 40,6 Nm (±17.5) in IR. For the non-dominant shoulder at 60°|sec, the PT was 34.3 Nm (±10.7) of ER and 42.0 Nm (±2.8) in IR. For the dominant shoulder, the PT at 180°|sec was 37.2 Nm (±12.2) of ER and 37.9 Nm (±15.0) in IR. At the non-dominant shoulder, the PT at 180°|secr was 29.8 Nm (±10.8) of ER and 37.2 Nm (±11.6) in IR. At 60°|sec, the range of motion (ROM) was of 89.6° (±3.2) and at 180°|sec, 88.8° (±0.6). On the dominant shoulder, for the passive positioning, a difference was obtained of 6.7° (±5.8) at 75°, of 1.7° (±2.4) at 35°, and of 0° (±2.3°) at 20°. In the active positioning, a difference was obtained of 1.3° (±3.1) at 75°, of 1.0° (±3.6) at 35°, and 1.2° (±2.7) at 20°. On the non-dominant shoulder, we observed the following results, in the passive positioning, 4.7° (±3.7) at 75°, 1.3° (± 4.1) at 35°, and 0.7° (±3.5) at 20°. Finally, in the active positioning we obtained the following results: 0.5 ± 3.4 (75°), 0.7 ± 2.0 (35°) and 2.7 ± 2.4 (20°).

Discussion and conclusions: Our preliminary results seem to point out that the dominant shoulder improved JPS when compared to the non-dominant. Additionally, we found that during the active positioning athletes had a greater perception of JPS, in comparison to the passive positioning. These results should help on the development of training protocols in handball, to improve shoulder proprioception and help to reduce the risk of injury. Although the results on SSP were not statistically treated, throughout the study protocol the PT seems to decrease significantly. Further studies should help to confirm our results.

CONTACT Ângela Maria Pereira amcfap@gmail.com

References

[1] Langevoort G, Myklebust G, Dvorak J, et al. Handball injuries during major international tournaments. Scand J Med Sci Sports. 2007;17(4):400–407.

[2] Van den Tillaar R, Ettema G. A three-dimensional analysis of overarm throwing in experienced handball players. J Appl Biomech. 2007;23(1):12–19.

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Ankle stiffness assessment in individuals with chronic ankle instability in dual-task single leg stance on an unstable surface

Nuno Dias[a], Hugo Estupendo[a], Isabel Valente[a], Luis Carmo[a] and Andreia S. P. Sousa[a]

[a]Center for Rehabilitation Research, School of Health, Polytechnic of Porto, Porto, Portugal

ABSTRACT

Introduction: The ankle sprain is one of the most prevalent traumatic injuries in sport, associated with a significant risk of developing Chronic Ankle Instability (CAI) [1,2]. This condition involves postural control deregulation expressed in feedback and feedforward mechanisms and stiffness as a consequence of incorrect or ineffective sensorial input that compromise the ankle joint stability [3]. This study aims to analyse the functional stiffness and postural stability in single leg stance on an unstable surface with dual tasking subjects with CAI.

Material and methods: A cross sectional study was performed with a sample of 28 athletes of modalities of increased risk for ankle sprain. Participants were divided into two groups according to the presence ($n = 14$ (11 with mechanical ankle instability; 8 with CAI in the non-dominant limb), age 22.0 ± 2.225 years) or absence of unilateral CAI ($n = 14$, age 22.5 ± 1.75 years) identified through the Ankle Instability Instrument and the Foot and Ankle Outcome Score. The ground reaction forces, and centre of pressure (CoP) were assessed during dominant and non-dominant single leg stance during 30 sec on an unstable surface while the participants performed the Stroop test. The measures of CoP displacement, root mean square (RMS), standard deviation, velocity and area and functional stiffness were assessed through the data obtained by a force plate. Functional stiffness was assessed through the relation between the moment of force and the angular position of the ankle according to the method proposed by Winter [4]. This study was approved by the School of Health's Ethical Committee and was performed in a research centre.

Results: The CAI group showed an increase in the functional stiffness for mediolateral direction in the lesioned limb when this limb was the dominant one ($U = 1.000$; $p = .001$) but also when this limb was the non dominant one ($U = 15.000$; $p = .033$) and in the contralesional dominant limb ($U = 7.000$; $p = .004$). An increase in the RMS in the antero-posterior direction was observed in the lesioned limb ($U = 13.000$; $p = .017$), and a decrease in the CoP displacement in the non lesioned limb ($U = 25.000$; $p = .034$), in comparison to the control group but only when these limbs were dominant.

Discussion and conclusion: Subjects with CAI seem to present increased bilateral functional stiffness as a possible strategy to increase postural stability in single leg stance, however stiffness assessments based on kinematics should be performed to confirm these findings. Rehabilitation should consider strategies to promote more efficient bilateral postural control mechanisms in subjects with chronic ankle instability.

CONTACT Nuno Dias nunoffdias.wk@gmail.com

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References

[1] Brown C, Padua D, Marshall SW, et al. Individuals with mechanical ankle instability exhibit different motion patterns than those with functional ankle instability and ankle sprain copers. Clin Biomech. 2008;23(6):822–831.

[2] Brown CN, Rosen AB, Ko J. Ankle ligament laxity and stiffness in chronic ankle instability. Foot Ankle Int. 2015;36(5):565–572.

[3] Morasso P, Casadio M, De Santis D, et al. Stabilization strategies for unstable dynamics. J Electromyogr Kinesiol. 2014;24(6):803–814.

[4] Winter DA, Patla AE, Rietdyk S, et al. Ankle muscle stiffness in the control of balance during quiet standing. J Neurophysiol. 2001;85(6):2630–2633.

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Benefits of a virtual environment program at the level of functional physical fitness in non-institutionalized elderly

Ana Freitas[a], Ana Pacifico[a], Catarina Costa[a], Margarida Almeida[a] and Ângela Maria Pereira[a,b,c]

[a]Department of Physiotherapy, Escola Superior de Saúde Egas Moniz (ESSEM), Egas Moniz Cooperativa de Ensino Superior, Caparica, Portugal; [b]Centro de Investigação Interdisciplinar Egas Moniz (CiiEM), Egas Moniz Cooperativa de Ensino Superior, Caparica, Portugal; [c]Hospital Garcia de Orta, Almada, Portugal

ABSTRACT

Introduction: Balance is one of the main concerns in the elderly population since there is a decline in the somatosensory system functions which may lead to a high probability of falling [1]. The risk of falling is one of the main problems