REAL-TIME BIOFEEDBACK AND ITS ABILITY TO AFFECT
CHANGES IN SPINAL POSTURE DURING REPEATED
LIFTING

Introduction Low back pain (LBP) is the leading cause of disability globally. Occupational risk factors associated with LBP include heavy, repetitive lifting, and awkward and flexed postures. Studies suggest younger people may be at an increased risk of LBP compared to older individuals. Postural feedback as an early intervention may provide a viable preventative approach for reducing the risk of LBP in the workplace.

Methods Thirty-four healthy, young participants were randomly allocated biofeedback (BF) or no biofeedback (NBF). Participants lifted a box weighing 13 kg at a frequency of 10 lifts per minute for up to 20 min. Real-time biofeedback on lumbar posture was provided using two wireless inertial sensors attached to the lumbar spine and sacrum. The BF group received an audible cue when lumbar flexion exceeded 80% maximum flexion. Three-dimensional motion analysis and ground reaction forces were used to estimate moments at the base of the spine and on the passive structures of the lumbar spine. Participants rated perceived exertion throughout the task using Borg’s scale.

Results Both the BF and NBF groups increased lumbar flexion over the duration of the lifting task, although the rate of change (slope) of peak lumbar flexion with BF was significantly less compared to NBF (p=0.009). Normalised bending moments resisted by passive structures of the spine were higher in the NBF group (0.7 Nm/kg) compared to the BF group (0.12 Nm/kg) at 20 min. The BF group demonstrated lower levels of perceived exertion.

Discussion Real-time biofeedback provides a viable approach to increase spinal postural awareness during repetitive lifting tasks, helping to reduce loads on the passive structures of the lumbar spine. A simple wireless inertial system for monitoring posture has potential for use in the work environment, and further evaluations should be undertaken to determine the long-term effectiveness of this approach.
but also contain guidance on the use of levers, crankcases and wheels that are fitted to work stations.

**Methods** This paper presents the results of several research studies performed by NIOM researchers in the field of force necessary for the professional activities. The studies were done using the measuring set: tensometric dynamometer, force converter, amplifier and PC for data collection. Measurements were done at least 3 times for one activity, the average value of force was taken for further analysis.

**Result** During the tests, it was stated that, depending on the technical condition of the transport trolleys used in the hyper-markets (weight including the load of about 430 kg limited by law), kind of the pavement on which they moved and the way they were put into motion, the force necessary to start their movement was from 60 n to 650 n.

**Discussion** These values were 2–3 times higher than the applicable standards (300 n – for pushing, 250 n – for pulling). On the other hand, the measurements of the force needed to launch overloaded trucks used in the transport of gas cylinders or materials in the textile industry (up to about 1500 kg) indicate the necessity to use 500 n – 700 n force – well above the permissible. It is visible that the ergonomic interventions including education and training is necessary.

**BIOMECHANICAL AND PHYSIOLOGICAL PARAMETERS FOR MANUAL MATERIAL HANDLING (MMH) RISK ASSESSMENT IN MARITIME WORKERS**

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**Introduction** According to EU data, the fishing sector is the one with the highest injury rate of all other sectors. Aim of the study is to assess some MMH tasks in which it was possible to use the common standardised protocols in conditions where, although their restrictions, they could provide early indications.

**Methods** NIOSH protocol was used to assess unloading crates of fish (weight of 12 Kg or 16 Kg) out of the boat to the van and while unloading crates, inside the boat, from the refrigerator to the slipway. Unloading crates from the boat to the van was studied also by means of 3DSSPP to estimate compression force at L4/L5 level. Heart rate monitors were used to estimate CCr while handling crates inside refrigerator.

**Result** Results obtained using the NIOSH protocol show LIs between 2.55 and 6.34 and a RWL between 2.52 Kg e 4.69 Kg. 3DSSPP analysis reported L4/L5 compression force ranging between 2.752N and 3946N and low strength percent capability at wrist, shoulder, trunk and hip joints. Unloading crates from refrigerator to slipway analysis reported LIs ranging from 1.63 to 5.83 and a RWL ranging from 2.74 Kg to 7.36 Kg. MMH inside refrigerator showed CCr values of 40.5% and 42.7%.

**Discussion** During boarding, we observed several activities worthy of attention under the biomechanical overload point of view. We investigated the most strenuous tasks according to the crew’s information. All obtained values were largely over the limit for all used methods and are consistent with results from other studies. We observed MMH activities not assessable with any of the methods currently available in the literature because they cannot describe the tasks in their globality. It was also noted that the workers, based on their experience, have adopted enhancements reducing vertical displacement, asymmetry angle and adopting an internal organisation of rotation during MMH tasks.

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