https://doi.org/10.6063/motricidade.31631

Abstract

Electromyographic analysis of deadlift for construction workers

Renato Machado[1*], Marco Branco[1,2], Hugo Louro[1,3], Fernando Rocha[3,4], Ana Conceição[1,3]

[1] Department of Sport Sciences, Sport Sciences School of Rio Maior, 2040-413 Rio Maior, Portugal;

[2] CIPER, Faculty of Human Motricity, Estrada da Costa, Dafundo, 1495-688 Cruz Quebrada, Portugal;

[3] Research Centre in Sports, Health and Human Development (CIDESD), 5000-801 Vila Real, Portugal.

[4] Education School, Polytechnic Institute of Setubal 2914-504 Setubal, Portugal

***** E-mail: renato.cmachado@hotmail.com

Conflict of interest: nothing to declare. **Funding:** nothing to declare.

Working in construction is physically demanding. The tasks inherent to this professional occupation physically wear workers down, leaving them at a high risk of injury, mainly in the shoulder and knee joints and the lumbar region (Chung et al., 2019; Umer et al., 2018). Those tasks require a great balance capacity and strength of the postural muscles, with the Construction Workers (CW) supporting heavy equipment on unstable surfaces (Manttari et al., 2021). The aim of this study was to analyse the muscular activity in trained civil construction workers (CWPE) and untrained civil construction workers (CWnPE) during a realisation of the deadlift (DL).

Eleven male CW (38.00 ± 9.60 years; 172 ± 1 cm; 87.01 ± 9.8 kg), of which 7 were untrained (N =7) and 4 were trained (N=4). Firstly, each subject filled out a questionnaire, and the maximum repetition for the DL was evaluated. Secondly, the muscular activity was evaluated while performing the deadlift in four different situations: at 50%RM at

rest, 80%RM at rest, 80%RM at fatigue, and 50%RM at fatigue. Surface Electromyography (EMG) measured the muscular activity of the *Biceps Femoris* (BF), *Trapezius Transversalis* (TT), and *Erector Spinae longissimus* (ES). The data were collected through the *MonitorPlux*, using a frequency of 1000Hz, and exported into *MATLAB* software for data processing. The relative values of Root Mean Square (RMS) were obtained, reflecting the muscular activation during the realisation of the exercise, and Mean Frequency (MFREQ), which is an indicator of fatigue (Puce et al., 2021). Means, minimums, maximums, and standard deviations were calculated as significant differences ($p \leq .05$) using the Mann-Whitney U Test.

CWPE had higher muscle activity values and did not present significant differences in muscular activation. The muscle with higher activation was the TT in both groups and was highly perceived at the set at 80%RM at fatigue, being observed the greater activation on the CWPE (TT left: 42.93 ± 31.40%; TT right: 64.75 ± 68.43%) when compared to the CWnPE (TT left: 32.31 ± 25.87%; TT right: 36.69 ± 29.61%). CWnPE showed significant differences between sets of different intensities and conditions on the TT ($p \leq 0.05$).

As the results suggest, sets performed in the presence of fatigue and series at higher intensities provide greater muscle activations. There seems to be a strong influence of physical exercise on muscle activity and fatigue in civil construction workers.

Keywords: deadlift; electromyography; construction workers; exercise.

References:

Chung, J. W., So, H. C. E., Yan, V. C. M., Kwok, P. S. T., Wong, B. Y. M., Yang, J. Y., & Chan, A. P. C. (2019). A Survey of Work-Related Pain Prevalence Among Construction Workers in Hong Kong: A Case-Control Study. *International Journal of Environmental Research and Public Health*, 16(8), 1404. https://doi.org/10.3390/ijerph16081404

Manttari, S., Oksa, J., Lusa, S., Korkiakangas, E., Punakallio, A., Oksanen, T., & Laitinen, J. (2021). Interventions to promote work ability by increasing physical activity among workers with physically strenuous jobs: A scoping review. *Scandinavian Journal of Public Health*, 49(2), 206–218. https://doi.org/10.1177/1403494820917532

Puce, L., Pallecchi, I., Marinelli, L., Mori, L., Bove, M., Diotti, D., Ruggeri, P., Faelli, E., Cotellessa, F., & Trompetto, C. (2021). Surface Electromyography Spectral Parameters for the Study of Muscle Fatigue in Swimming. *Frontiers in Sports and Active Living*, 3, 644765. https://doi.org/10.3389/fspor.2021.644765

Umer, W., Antwi-Afari, M. F., Li, H., Szeto, G. P. Y., & Wong, A. Y. L. (2018). The prevalence of musculoskeletal symptoms in the construction industry: A systematic review and meta-

analysis. *International Archives of Occupational and Environmental Health*, 91(2), 125–144. https://doi.org/10.1007/s00420-017-1273-4