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MUSCULAR ISOKINETIC ANALISYS OF LONG-TERM DRIVERS ON A CAR-SIMULATOR

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SUMMARY

Driving a car is a dynamic task that imposes lateral and longitudinal forces on the driver, who must be able to generate internal forces to compensate this external load to maintain body stability [1]. These compensations cause lumbar overload to long-term drivers [2].

Speculations suggest that the low back pain in drivers comes from reducing the threshold of pain due to fatigue, relative ischemia in the support area of weight or even muscle stiffness due to continuous stress [3].

INTRODUCTION

The constrained long-term posture in drivers is a risk factor for low back pain [4]. To identify the muscular activation and adaptations on healthy individuals may prevent this pain caused after a long period of direction [5].

Isokinetic device is widely used to measure the muscle action [6]. The failure of the extensor muscles of the trunk is associated with low back pain or dysfunction [7] and muscle fatigue can induce a decrease in peak torque [8]. The isokinetic test performed in sitting posture is the most suitable for the evaluation of trunk extensor muscles, to keep it stretched and promote greater recruitment of muscle fibers [9].

To examine the muscle behavior while driving, a car-simulator shows advantage over real vehicles, facilitating the collection of data for research and it is safer for examiner and driver [10]. Moreover, previous experiments in simulation showed that the driver's behavior in virtual situation is similar to the real [11].

There is information about the long-term driving effects to the muscle [3, 4], but few about the long-term driving effects of muscle function. The aim of this study is to analyze the muscular function in a long-term car driving simulator

METHOD

Four healthy adults (2 male and 2 female, 25.5±1.8 years old) performed on isokinetics device (Biodex Inc) the trunk flexion and extension muscle test, before and after driving in a car driving simulator (FOERST, Driving Simulator F12P®) for an 1.5 hour. The same protocol was applied one week after that, without the driving simulation test, only sitting on the car-simulator chair for the same period, to exclude the environmental bias.

The isokinetic trunk extension test was two sets of four repetitions at 60rad/s, with 10 s rest between sets. To exclude the learning-bias, the first set was excluded and the second set was used for analysis [12]. The variables of the study were Peak Torque; Average Power; Total Work; and Maximum Repetition Total Work.

RESULTS AND DISCUSSION

The driving task reduces the muscular function compared to the control condition (Figure 1).

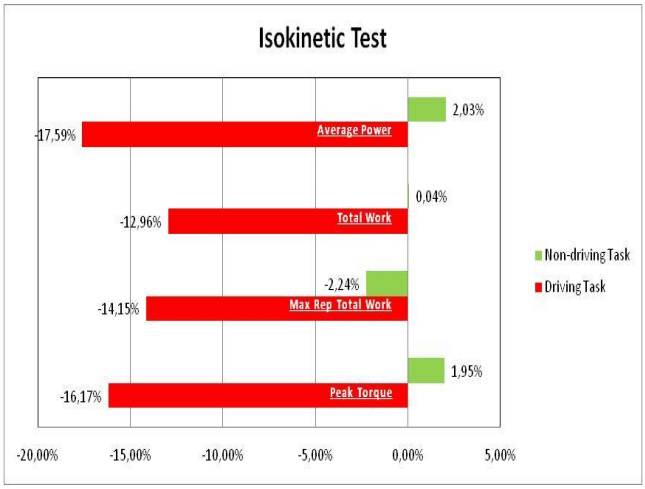

Figure 1: Difference in muscular function between before-after 1.5 hour during the Driving and Non-driving task.

The T paired test showed that Peak Torque [-18.1±6.9% p=0.01] decreased after driving.

The reduction on the extension trunk peak torque suggests that the function muscle changes due to sitting and driving for a long period. This result could be related to muscle fatigue.

Although the sitting posture does not requires the strong activation of the extensor trunk muscles, they are important to prevent unstable spine movements and reduce the risk of low back pain. The fatigue of such muscles increases the risk of low back pain.

CONCLUSIONS

The results suggest that driving tasks may decrease muscular function but more subjects are necessary for this study.

The following studies will increase the number of participants and analyze the activation of the extensor trunk muscles.

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