EXOGENOUS AND ENDOGENOUS PAIN MODELS REDUCE THE POTENTIAL BENEFICIAL EFFECT OF ACTIVE PAUSES DURING COMPUTER WORK

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INTRODUCTION

Knowledge regarding muscle soreness or pain and motor control interaction during precision finger tasks like computer task is very limited. Experimental muscle pain models are of great interest because they can mimic clinical pain conditions. A reorganization of the spatio-temporal activity patterns of the upper trapezius muscle has been reported during experimental pain [1]. We recently reported potential beneficial effect of short time sub-maximal contractions defined as active pauses compared with passive pauses during computer work in normal condition [2]. However; muscle soreness or pain may impair this effect. In this study, we used both exogenous and endogenous pain models to induce pain/ soreness in the trapezius muscle and assessed changes in trapezius muscle surface EMG activity.

METHODS

12 healthy male subjects participated in two separate experiments, (age 23±3 years; height 183±8 cm; weight 77±11 kg). In the first experiment, acute exogenous muscle pain was induced by injection of hypertonic saline while in the second one, endogenous pain was induced by bouts of eccentric exercises. EMG was recorded from the clavicular, descending transverse and ascending parts of the trapezius [2]. The duration of each computer session was set to 2 min interrupted every 40 sec by either an active (30% MVC shoulder elevation) or passive (relax) pause.

In the first experiment after completing the first two non-painful sessions, one 0.5-ml bolus of hypertonic saline (5.8%) was injected into the belly of the right upper trapezius muscle and two computer painful sessions were performed right after the injection. The second experiment was performed over two consecutive days. The procedure composed of computer work performed before, immediately after and 24 hours after eccentric exercises. Eccentric exercise consisted of 50 contractions where the subjects resisted the dynamometer moving from the subject's maximum to minimum shoulder elevation position at a force equal to 100% MVC.

Exposure variation analysis (EVA) was implemented with six levels along the time axis and eight levels along the amplitude axis were generated. The centroid of the map in the 8×6 plane was extracted, providing information about the general tendency towards a displacement of exposure into different period length classes. Pause types and pain status/session were introduced as factors in a full-factorial repeated measure analysis of variance for EVA centroid along both amplitude and time levels. In all tests, $p<0.05$ was considered significant.

RESULTS AND DISCUSSION

EVA centroid along time levels (Figure 1): in the first experiment, active pauses shifted the centroid to lower values parts in the clavicular, descending transverse and ascending parts. In transverse part, active pauses shifted the centroid to lower values in non painful but not in exogenous pain condition. In the second experiment active pause shifted the centroid to lower values in the descending and clavicular parts at before exercises but not with endogenous pain immediately after or 24 h after exercise.

EVA centroid along amplitude levels (Figure 1): in the clavicular and descending parts, higher values of the centroid were found in active compared with passive pauses. Exogenous muscle pain shifted the centroid towards higher values for the descending and ascending parts. In the second experiment with endogenous pain, higher values were recorded with active pauses compared with passive pauses in the clavicular and descending parts. Additionally, higher values were attained before compared with immediately after eccentric exercise.

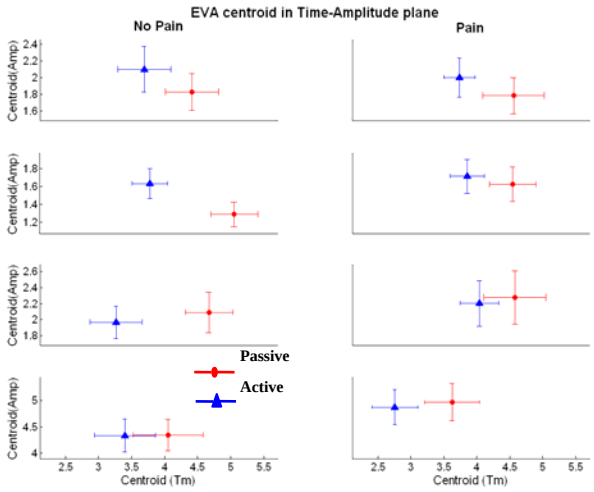

Figure 1: EVA centroid location in time-amplitude plane and effect of exogenous pain in clavicular, descending transverse and ascending parts.

CONCLUSIONS

The present results confirmed that active pauses lead to a more variable activation pattern of the trapezius during computer work. Further, both exogenous and endogenous pain models impaired the potential beneficial effect of active pauses.

REFERENCES

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2. Samani A, et al. *J Electromyogr Kinesiol.* In press, 2009.