EFFECTS OF LOW-LOAD REPETITIVE WORK ON SENSITIZING SUBSTANCES AND METABOLISM IN THE TRAPEZIUS MUSCLE OF FEMALE PAIN SUBJECTS AND CONTROLS - DETERMINED WITH MICRODIALYSIS AND NEAR INFRARED SPECTROSCOPY

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Aims
Low-load repetitive work (LLRW) is an important risk factor for the development of work-related muscle pain (WRMP). The mechanisms linking repetitive work to WRMP are still not understood. One testable hypothesis is that sensitizing substances may accumulate during LLRW, and that the resulting stimulation of chemo-sensitive receptors in the muscle plays an important role. Our aims were to investigate the effects of LLRW on sensitizing substances and metabolism in the trapezius muscle of female pain subjects and controls, and whether eventual effects were accentuated by work-duration.

Methods
Twenty asymptomatic females were studied during baseline rest, 30 minutes (REP 30, n=10) or 60 min (REP 60, n=10) of LLRW and 60 min recovery, and 14 females with trapezius muscle pain (TMP) were studied during 30 min of work. Intramuscular microdialysate (IMMD) samples were obtained for analysis of glutamate, prostaglandin E2 (PGE2), lactate, and pyruvate concentrations. Local muscle oxygenation (%StO2) was assessed with near infrared spectroscopy. Capillary blood was sampled for lactate analysis, and subjects rated their perceived exertion (RPE, Borg-CR 10).

Results
In the TMP group IMMD [glutamate], and [lactate] increased significantly in response to work (P<0.0001 and P<0.005), as was also seen in the REP 30 and REP 60 group (P<0.05 and P<0.01). However, no progressive increase with work duration was found. [Glutamate] was at all time points significantly lower in the TMP group, as compared to the REP 30 group (P<0.005). During recovery [lactate] was significantly increased in the TMP and REP 30 group (P<0.001 and P<0.05), and tended to be significantly increased also for the REP 60 group. For [glutamate] baseline concentration was reached at the end of the recovery in all groups. In the TMP group [pyruvate] increased significantly in response to work (P<0.0001), and continued to increase progressively during recovery (P<0.0001). [Pyruvate] remained unchanged for the asymptomatic females during work, but was significantly increased during recovery for REP 30 and 60 (P<0.001 and P<0.05). A significant interaction was found between the TMP and the REP 30 group for [pyruvate] during recovery (P<0.05). In all groups [PGE2] remained unchanged in response to work, but in the TMP group an overall significant decrease during recovery was found (P<0.005). The %StO2 decreased significantly in response to work for the pain group (P<0.05), an effect that tended to be correlated with the effect of work on IMMD lactate (P=0.076). In the healthy group the %StO2 remained unchanged, independently of work duration. For the TPM group the [blood-lactate] decreased significantly in response to work (P<0.005), and reached baseline levels at the end of the recovery period. This effect of work on blood-lactate was negatively correlated to the effect on IMMD lactate (P<0.05). For the REP 30 group, the [blood-lactate] tended to be lower after work, and was significantly lower at the end of the recovery period, as compared to baseline (P<0.05). A significant interaction between the TMP and the REP 30 group was found for [blood-lactate] (P<0.001). RPE was not correlated to IMMD lactate or %StO2.

Conclusions
The findings of unchanged [PGE2] in response to LLRW and of lower [glutamate] in the TMP group do not support the idea that PGE2 and glutamate (in the periphery) play an important role in chronic WRMP. The combined findings of increased IMMD [lactate], [pyruvate], decreased %StO2, and the tendency to a significant correlation between IMMD lactate and %StO2 indicate an increased (anaerobic) metabolism in trapezius muscle pain. We found significant effects of LLRW on the interstitial milieu in the trapezius muscle, but no progressive increase due to work duration.