Alternations between physical and mental tasks – a viable option for job rotation?

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Job rotation has been suggested as an intervention preventing musculoskeletal disorders, but studies aiming at determining suitable rotation patterns between physical tasks have shown ambiguous results. As an alternative, alternations between physical and mental tasks may be an option, supported by evidence suggesting that a mental task performed after a period of fatiguing physical work may lead to better recovery than a passive break. Previous studies of alternations have used exhaustive physical tasks, which may be of limited occupational relevance. The present study aimed at determining the extent to which a working memory task at three difficulty levels performed between bouts of a repetitive physical task would enhance recovery of perceived and electromyographic (EMG) signs of fatigue.

Fifteen healthy females participated in a controlled experiment with three study conditions on different days. They performed ten consecutive work bouts of seven minutes of pipetting and three minutes of n-back (a working memory task) at either an easy, moderate or hard difficulty level. Muscle activity in the right trapezius muscle and in the forearm extensors was measured continuously using EMG. Perceived fatigue in corresponding body regions was measured at regular intervals throughout the experiment using the CR-10 Borg scale.

Trapezius EMG activity ($p<0.001$) and ratings of perceived fatigue (Borg CR-10) in shoulder ($p<0.001$) and lower arm ($p<0.001$) increased gradually over the 10 work bouts, with a mean difference between the first and last work bout of 8.8 % RVE (SD 10.3), 2.1 (SD 1.7) and 1.7 (SD 1.3), respectively. These increases did not depend on the difficulty of the mental task. However, EMG in the lower arm increased marginally less with the hard mental task than with the easy mental task (interaction $p=0.033$). Participants recovered during each period of the mental task, to a similar extent in the three mental conditions.

Thus, we found that a mental task interspersed between repeated bouts of a repetitive physical task allowed recovery of fatigue, but that that the difficulty level of the mental task was of minor importance. Alternations to productive mental tasks in an otherwise predominantly physical work could therefore be an attractive option for job rotation schemes, allowing workers to recover from fatiguing or hazardous exposures while not losing productive time. We recommend future studies to address alternations between physical and mental tasks in other time patterns and for other ecologically valid tasks than the ones used in this study, and to determine whether the difficulty level of the mental task is important under these conditions.