

Accommodation/vergence eye movements and neck/scapular area muscular activation: Gaze control with relevance for work related musculoskeletal disorders

Hans Olof Richter
University of Gavle, Sweden

If an object of regard falls outside a viewer's depth-of-focus, it appears fuzzy and its subjective contrast is reduced, due to a decrease in contrast modulation of the retinal image. The purpose of our current research is to understand the mechanisms underlying eye-neck/scapular area interactions and gaze control during visually strenuous/fatiguing near work conditions. Adjustments of eye-lens accommodation to a blurred target (e.g. an alphanumeric character at near) appears to activate a postural stabilization process that uses the eye-neck/scapular area muscles to ensure that the target is held in the retinal area of highest visual acuity. The recent results show that extended periods of large amplitudes of ocular accommodation, when the ciliary muscle is highly contracted, was significantly coupled to a bilateral increase in static activity level of the trapezius muscles. Voluntary or reflexive accommodative/vergence effort in response to oculomotor fatigue may, as an unwarranted consequence, cause a dysfunctional tonus increase and/or reduced load variation in the neck, scapular area muscles and upper back. The motor commands to the two effectors appears to be parallel, simultaneous and complementary, i.e. they produce different mechanical effects on different anatomical structures, effects that converge in obtaining the composite result of bringing the image to focus and to an optimal retinal location. Through this eye-neck/scapular area functional linkage, sustained eye-lens accommodation at near can increase muscle activity levels and may therefore represent a risk factor for trapezius muscle myalgia.

Biography

Hans Richter received his Ph.D. degree from Uppsala University, Sweden, in 1993. He was a Postdoctorate Fellow at University of Minnesota Medical School and the Brain Sciences Center 1993-1995 and a Research Associate at Karolinska Institute, Department of Clinical Science, Sweden 1995-2000. He is a co-editor of the book "Accommodation/vergence mechanisms in the visual system" (Birkhauser verlag, Basel). Since 2005 he is Associate Professor in Biological Psychology. Currently he is part of the Centre for Musculoskeletal Research, Sweden. His research interests are neuroscience, visual physiology, motor control, and ergonomics and occupational health. He is a Co-chair of a Technical Committee in Visual Ergonomics (International Ergonomic Association).

Hans.Richter@hig.se