Study explores link between vision and musculo-skeletal problems

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CAN vision problems cause musculo-skeletal complaints and vice versa?

The weight of current evidence points to a discernible yet complex connection between eye problems and neck and upper back complaints and is one that deserves further investigation, according to a new study by an international team of researchers

Hans O. Richter PhD, Associate Professor at Gävle University College, Sweden, said that unravelling the intricate links between musculo-skeletal complaints and vision problems is a key question for the growing number of individuals who work in front of a computer screen every day.

"It is vital to seek further knowledge of how tensing and relaxing the neck and shoulders affect the eyes and how eye complaints can trigger and/or aggravate muscular aches in the shoulders and/or neck region. The findings may show, for instance, that patients who experience back and neck pain working with computers should have their eyes examined," said Dr Richter.

Dr Richter's study, carried out in collaboration with research colleagues at the Karolinska Institute, Uppsala University, and the University of Minnesota shows that when the tone is reduced in the focusing muscle of the eye, nerve impulses to the neck and shoulders are also affected. The team now wants to go on to investigate the connection between eye problems and neck and back complaints in a cross-disciplinary study.

Why working with computers can be a pain in the neck

Dr Richter noted that more than 60 million people in the European Union now work with computers. Many of them experience vision problems in connection with computer-screen work, including eye fatigue, eye pain, a gravely feeling in the eyes, stinging, bloodshot eyes, dryness, temporary functional near-sightedness, often together with headaches and pains in the neck and/or shoulders.

Mapping what causes these work-environment problems is a major issue for international organizations like the International Labour Organisation (ILO) and the World Health Organisation (WHO).

Focusing the lens of the eye requires coordination between various nerve and muscle groups in the eye, neck and shoulder region, said Dr Richter.

The findings of his team's study, published in the European Journal of Neuroscience, show that reducing the tone of the focusing muscle (by placing an optical lens over the eye and at the same time seeing to it that the lack of focus incurred is compensated for by relaxing the accommodation) affects or deactivates the section of the cerebral cortex that regulates muscular movement in the head, neck, and shoulder region.

"Negative accommodation is an antagonistic process steered in an optical direction opposite to the one employed in response to visual stress during near vision tasks" Dr Richter told *EuroTimes*.

The experiments were carried out using a PET (Positron Emission Tomography) scan, where radioactive marker substances are used to monitor the activity in the brain of volunteers who were asked to focus the lens

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of their eyes on different types of stimuli under varying optical conditions.

Five right-handed male myopes with a mean age of 25 years were selected for the study. Oculomotor dysfunctions were excluded after an orthoptic screening procedure that included examination of acuity, motility, stereopsis, retinal correspondence and fusion.

All subjects had a best-corrected visual acuity of 20⁄20 or better, and had normal visual-oculomotor status with no history of eye complaints or disease. The refractive myopic errors ranged from -1.25 D to -5.50 D. Pseudomyopia was ruled out by comparing the subjective optimal correction with the optic correction under cycloplegia (Cyclogyl 1%, one drop twice in each eye at five-minute intervals at least 30 min before examination). This difference was negligible for all five subjects.

Phorias, as assessed with a standardised prism cover test at 40 cm, were all within physiological limits, said Dr Richter. The near points of both accommodation and convergence functions as measured using standardised orthoptic procedures and the Royal Air Force Ruler (RAF, Clement Clarke International, Edinburgh, England) yielded normal and age-appropriate sufficiency values (mean 14.14 D, SD 1.167, range 12–16).

Researchers also determined eye dominance subjectively. Outside the

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scanner, subjects were asked to indicate their habitual preference in the use of the left or right eye, when only using one eye or, alternatively, whether they were indifferent to which eye to use. In pre-experimental trials inside the scanner, subjects were requested to choose the preferred eye to use in the negative accommodation / vergence task when the other eye was fully occluded.

Questions raised by the findings of the study are whether eye problems can cause stiffness, muscle aches, etc. in the neck/cervix and shoulder region. The reverse?-whether complaints in muscles and joints in the neck/cervix and shoulder region can affect the ability of the eye to focus merits further investigation, concluded Dr Richter.

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