ed when the number of potential conflicts between aircraft increased, but additionally, $PTCO_2$ decreased. It was concluded that among military air traffic controllers, increased workload is associated with an adaptive increase in physiological activity, but that the introduction of stress in the task may induce maladaptive physiological responses, including an increase in ventilation beyond metabolic demands (i.e. hyperventilation).

16. Speaking and activation: speech detection by respiratory parameters

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Since speaking in itself produces physiological activation or arousal, whether a subject is speaking or not must be controlled for in clinical psychophysiology. Under ambulatory conditions we would like to be able to detect speaking from a respiratory channel alone, since auditory recording picks up sources other than the subject's voice. In a laboratory experiment we tried to establish the adequacy of the Respitrace system for speech detection and to determine parameters that could best indicate speech. Sixteen patients with anxiety disorders and 19 nonanxious controls were instructed to speak continuously for 4 min, to relax (10 min), to speak again (4 min), and to fill out questionnaires (4 min). Eleven parameters were derived from the calibrated Respitrace signal for the last 3 min of each task. Variability was indicated by their coefficients of variation (CV%). Additionally, heart rate (HR), skin conductance level (SCL), and non-specific fluctuations (NSF) were analyzed. Inspiratory/expiratory time (IE ratio) best distinguished the initial speaking from writing with 96.9% correct classifications at a cutoff criterion of 0.54. This criterion was also successful in distinguishing speaking from relaxing (97.0% correct), although indicators of variability in timing (CV% of IE ratio, expiratory time, and respiratory rate) yielded higher discriminability. Discriminant analyses supported this criterion and suggested the inclusion of variability and volume parameters for a better classification, but discriminant functions did not generalize well across conditions. NSF was higher during speaking than writing ($P < 0.02$); additionally HR, SCL, and ML were higher during speaking than relaxing ($Ps < 0.001$). These results show the efficacy of a single parameter (IE ratio) for speech detection, one which does not require volume calibration.

17. Breathing and biomechanical indices of musculoskeletal strain in repetitive computer work

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Ergonomic models of musculoskeletal strain in computer work have focused primarily on biomechanical indices (e.g. key force, keystroke repetition, work posture);

relatively little attention has been given to psychophysiological indices (e.g. hyperventilatory responses to mood disturbances). This report explores the relationship between psychophysiological and biomechanical factors with right-hand musculoskeletal strain in 47 data-entry computer workers. Self-ratings of right-hand musculoskeletal strain (i.e. discomfort, pain, stiffness, or soreness), boredom, and fatigue were taken during prolonged periods of data-entry work during each of three consecutive workdays. End-tidal P_{CO_2}, key force, and keystroke repetition were monitored on a continuous basis. An examination of changes in these measures indicates consistent increases in right-hand musculoskeletal strain within each of the three workdays. In addition, there was a corresponding pattern of psychophysiological strain, as characterized by increases in boredom and fatigue and decreases in end-tidal P_{CO_2} (i.e. hyperventilation) within each of the three workdays. However, there was no consistent pattern of increases in key force or keystroke repetition. These results suggest that the psychophysiological demands (i.e. chronic mild hyperventilation) of mood disturbances attendant to repetitive computer work are associated with right-hand musculoskeletal strain. It is proposed that ergonomic models of musculoskeletal strain in repetitive computer work should be expanded to include psychophysiological stress factors in addition to conventional biomechanical stress factors.

18. Respiratory and psychophysiological strategies in the treatment of stage fright

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Most people breathe between 12 and 18 breaths per min; higher frequencies are a sign of stress, predictive in the long term of distress and illness. Breathing 11 breaths per min not only reduces anxiety, but produces an alert, highly intuitive state ideal for optimum functioning in normally stressful public, or private, situations. Surveys show some people are more afraid of public speaking than anything else. Stagefright hits most of us at some point, and can be not only highly upsetting but damage careers and self-esteem. In addition to cognitive strategies, one of the most effective antidotes and preventives is a 3-stage breathing process based on the yogi Whole Body breath. I liken this to the evolution of the computer: first room-sized, then table model, and finally the micro-chip. The Whole Body Breath, taught to people lying on the floor, creates a deep sense of relaxation and well-being. Later, seated in a chair, the clients learn to do two contradictory things simultaneously; beginning with the lower abdomen, expanding the rib cage while still inhaling they then maintain the lifted rib cage instead of collapsing while exhaling. This remarkable breathing pattern enables anyone to be at ease in any situation.

Panel Session III Hyperventilation and panic: psychological aspects

Chair: Bo von Scheele, Stress Medicine AB, Sweden