

from m. vastus lateralis, biceps femoris (long head), tibialis anterior, gastrocnemius, biceps brachii, and triceps brachii. EMGs from each muscle were synchronized with the pulse of a photoelectric revolution detector. Vo_2 and HR were also measured. After work, the subjects were requested to report their subjective sensations. Vo_2 and HR under bilateral pedaling were significantly less than those under unilateral pedaling. EMGs showed the heavy loads from tibialis anterior under unilateral pedaling, biceps femoris, biceps brachii, as well as triceps brachii. These loads are thought to be caused by the uneffective muscle activities of the leg and the instability of the upper body.

23 Ergonomic Suggestion of Rehabilitation Aid

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The electromyographic activity of five lower limb muscles during stair locomotion was examined in six men aged of 20-22. Stair ascent and descent were performed on three types staircase. These stairs have a slope of 19 degree, 31 degree, 41 degree.

EMG activity was recorded from the following right lower limb muscles: rectus femoris, vastus medialis, biceps femoris, tibialis anterior, and medial gastrocnemius. The signals were transmitted using an 8-channel FM telemetry system. The signals were later transferred to personal computer and digitized at a scanning rate of 500 Hz.

The EMGs of stair gait cycle (SGC), the period between successive initial foot-stair contacts of the same limb is analyzed by averaging technique. In six subjects, the Profiles of ascending EMG activity were at a high level of consistency phasic activity patterns, but descending condition these profiles were at a low level of consistency. This result suggested while ascending the stairs, the subject is required to apply more force in the lower limb muscles than in descending, because in ascending

and descending, the displacement of body and influence of gravity respectively occurred.

24 Effects of Control Ratios on Control Characteristics of Machine in Human-Machine Interface

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Time consumed for dial operation is studied experimentally from the point of control ratios. In the experiments, a special apparatus designed for this research, which can measure time-variation of operation quantity in addition to the time consumed for operation, was employed and control ratios were changed from 1.1 to 12.4. Operation stages are classified based on the operation patterns. For large values of control ratio, time required for fine adjusting operation occupies more than a half of the total operation time. This adjusting time is affected mainly by the go and back operation caused by the stick-slip phenomena.

25 An Ergonomic Study in Scanning Operation at Register Counter

- Three Dimensional Movement Analysis and Measurement of Muscle Load -

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In scanning operation at register counter of the point of sales (POS) system, effect of scanner type (vertical type, horizontal type, and handy type) on movement and muscle load in upper extremity were studied in six healthy females, aged 19-27.

While operator performed repetitive scanning operation of three types of goods (1 liter water pack, coke can, and flat pack), electromyograms (EMGs) bilaterally placed on four sites (biceps brachii, brachio radialis, forearm flexors, and forearm