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PROCEEDINGS BOOK

PAPER

HAND REHABILITATION: II – ARTIFICIAL MOVEMENT EVALUATION

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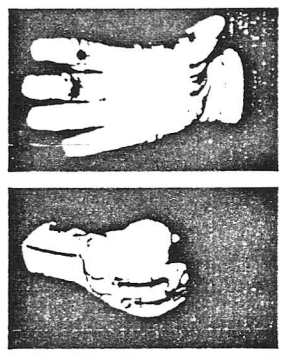
Introduction

Neuromuscular electrical stimulation has been used in upper limb rehabilitation towards restoring motor hand function. Artificial movement control needs a continuous flow of sensory information about the events, allowing the system to re-define stimulation parameters to achieve proper adjustments in ongoing movement.

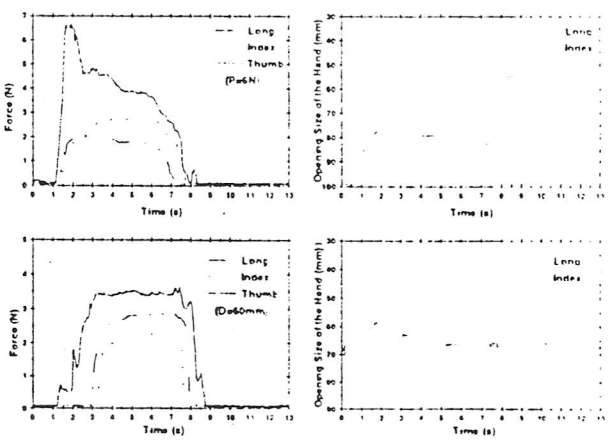
Material and methods

Aiming at acquiring sensorial information about the artificial grasp to be used by a closed-loop control, custom made gloves instrumented with force and position transducers were used. Several cylinders with different diameters were presented to the subject as well as a glass filled with different weights. Each subject had to hold and manipulate every object mimicking a drinking activity.
The artificial movement was achieved by using a microcomputer controlled stimulator configured for palmar grasp.



Results

Grasp force patterns looked similar to those previously obtained with normal subjects, in spite of different sensor position and lack of repeatability.
Larger forces were exerted by the thumb following by index or long finger. Regarding the shape of the force curves, it was common to find force peaks associated with the instant of grasping.
Finger position was quite constant during object manipulation.
Sensor output signal was linearly proportional to object diameter, indicating the opening size of the hand during the movement range.



Conclusions

The instrumented gloves exhibited an adequate behavior in providing force and position feedback towards cylindrical grasp.

The transducers presented let us attain a useful system, due to the optimization between stimulation parameters, joint angle and grasp force.

Acknowledgement

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