# Muscle activation of abnormal coupling of shoulder and elbow torques during reaching after stroke

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| **Ethical review** | Approved WMO |
| **Status** | Recruiting |
| **Health condition type** | Central nervous system vascular disorders |
| **Study type** | Observational non invasive |

## Summary

### ID

NL-OMON30163

**Source**
ToetsingOnline

**Brief title**
Muscle activation during synergistic arm movements after stroke

### Condition

- Central nervous system vascular disorders

**Synonym**
cerebrovascular accident, stroke

**Research involving**
Human

### Sponsors and support

**Primary sponsor:** Revalidatiecentrum Het Roessingh
**Source(s) of monetary or material Support:** susidie door SenterNovem

## Intervention

**Keyword:** muscle activity, stroke, surface EMG, upper extremity

## Outcome measures

### Primary outcome

The intensity of activation of 8 shoulder and elbow muscles is measured (by

surface EMG), to quantify movement control, along with kinematic parameters

(such as velocity and smoothness of movement), to quantify movement execution.

### Secondary outcome

(not applicable)

# Study description

### Background summary

Arm function is often limited after stroke. Research has indicated that abnormal, involuntary coupling between shoulder and elbow torques is involved. Additionally, a proposed theory stated that in each stroke patient a threshold exists, above which abnormal coupling (i.e. synergy) is expressed, related to the extent of exertion. However, the expression of these abnormal synergies in muscle activity and the existence of an intensity-related threshold is not known yet. Furthermore, not much knowledge exists about the behaviour of these synergies with different velocities of movement. Information about these underlying muscle activition will provide a better insight in movement control after stroke, which may offer points of impact for new applications in rehabilitation for recovery of arm function after stroke.

### Study objective

The objectives of this experiment are twofold. First, the muscle activation pattern related to a synergistic movement during reach is investigated, with attention for the existence of a threshold of amount of exertion above which an abnormal synergy manifests. Second, the relationship between iso-metric and iso-kinetic movement executions is determined.

### Study design

Muscle activation during a synergistic movement is compared with a movement without coupling in a cross-sectional experiment of repeated movements. The synergy is provoked by providing resistance against shoulder abduction, during a reaching movement laterally and upward to shoulder height, with 4 different intensities of resistance (with a maximum of 60% of the individually generated maximal torque).
Additionally, isokinetic elbow extensions (at 4 different speeds) are compared to isometric performance. This is repeated 7 times, in which the amount of generated shoulder abduction is varied in equal steps from 0 to 200% of the weight of the arm.

**Study burden and risks**

The risks for the subject are limited to a minimum, since the movement tasks represent functional and familiar arm movements and are performed only within the scope of the subject*s ability. Furthermore, the Dampace device can never provoke movements outside the subject*s range of motion, since it can only resist movement that is generated by the subject and can not move the arm of the subject on its own.

# Contacts

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# Trial sites

## Listed location countries

Netherlands

# Eligibility criteria

**Age**
Adults (18-64 years)
Elderly (65 years and older)

## Inclusion criteria

For both stoke patients and healthy subjects:
-Aged between 25 and 75 years
For stroke patients only:
-Stroke at least 6 months prior to admittance to experiment
-Right upper extremity affected (due to experimental set-up only for right arm)
-Score of 0 or 1 on item AIII-2 of Fugl-Meyer assessment:
= anteflexion of the arm from 0° to 90° with full extension of the elbow and the lower arm midway between pro-/supination; performance must be without elbow flexion immediately at the start of movement
-Having (received) treatment at the Roessingh Centre of Rehabilitation

## Exclusion criteria

For both patients and healthy volunteers:
-Shoulder pain, either in rest or in movement
-Additional neurologic, orthopaedic or rheumatologic disease of right upper extremity, likely to interfere with mobility and/or strength of the arm
-Inability to understand and follow instructions

# Study design

## Design

**Study type:** Observational non invasive

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|---|---|
| Masking: | Open (masking not used) |
| Control: | Uncontrolled |
| Primary purpose: | Other |

## Recruitment

NL

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|---|---|
| Recruitment status: | Recruiting |
| Start date (anticipated): | 12-12-2006 |
| Enrollment: | 20 |
| Type: | Actual |

## Ethics review

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| Approved WMO Date: | 13-06-2006 |
| Application type: | First submission |
| Review commission: | METC Twente (Enschede) |

## Study registrations

### Followed up by the following (possibly more current) registration

No registrations found.

### Other (possibly less up-to-date) registrations in this register

No registrations found.

### In other registers

| Register | ID |
|---|---|
| CCMO | NL12726.080.06 |