INTRODUCTION
Augmented feedback plays an essential role in rehabilitation therapy of stroke survivors. Also the way augmented feedback is provided might play an essential role in stroke rehabilitation:

AUDITORY FEEDBACK: verbal encouragements and sound beeps
SENSORY FEEDBACK: force, tactile and position feedback
VISUAL FEEDBACK: vision of own body, virtual reality, or a score on a screen

By using assistive technologies, such as robotics and virtual reality, many possibilities exist for the implementation of augmented feedback types (visual, auditory, sensory), which potentially increase the functional ability of stroke survivors.

Also different aspects of the provided augmented feedback might play an essential role in stroke rehabilitation, such as:

NATURE: knowledge of results or knowledge of performance
TIMING: concurrent or terminal
FREQUENCY: summary or faded

GOAL
The goal of this systematic review is to study whether different types of augmented feedback (alone or combined) in stroke rehabilitation therapy lead to an increased functional ability.

METHODS
An extensive systematic search of the scientific literature was performed in the Pubmed database from 1975 till June 2008. The search was performed using the following key words (and their synonyms): stroke, upper arm, auditory, sensory, and visual feedback.

RESULTS

<table>
<thead>
<tr>
<th>STUDY EFFECT (# OF STUDIES)</th>
<th>+</th>
<th>±/−</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>VISUAL</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>AUDITORY &amp; VISUAL</td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>SENSORY &amp; VISUAL</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>AUDITORY &amp; SENSORY &amp; VISUAL</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

CONCLUSIONS
All studies used augmented visual feedback, alone or in combination with augmented auditory or sensory feedback. A beneficial effect of combined sensory and visual augmented feedback on functional ability seems to be present.

No clear evidence for the most effectiveness of a certain type of augmented feedback was found. More research into the effectiveness of the nature, timing and frequency of the provided feedback to the effect on the functional ability is essential.

Birgit Molier

+31 (0)53 487 5739
b.molier@rrd.nl