

# EFFECT OF DIFFERENT TYPES OF AUGMENTED FEEDBACK IN STROKE REHABILITATION TRAINING: A SYSTEMATIC REVIEW

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## 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

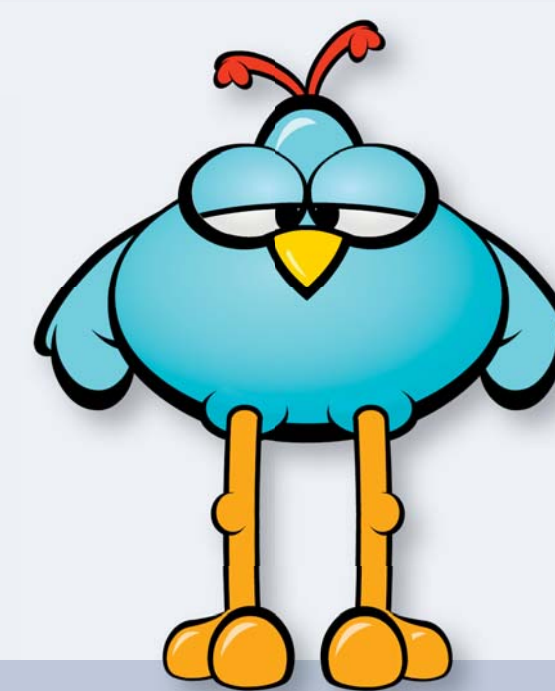
By using assistive technologies, such as robotics and virtual reality, many possibilities exist for the implementation of augmented feedback types (visual, auditory, sensory), which potentially increase the functional ability of stroke survivors.

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

STUDY EFFECT (# OF STUDIES)	+	+/-	0
VISUAL	1	1	1
AUDITORY & VISUAL	1	3	0
SENSORY & VISUAL	4	1	1
AUDITORY & SENSORY & VISUAL	1	1	1

## 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.



Figure 1  
Three different types of augmented feedback: auditory, sensory and visual.

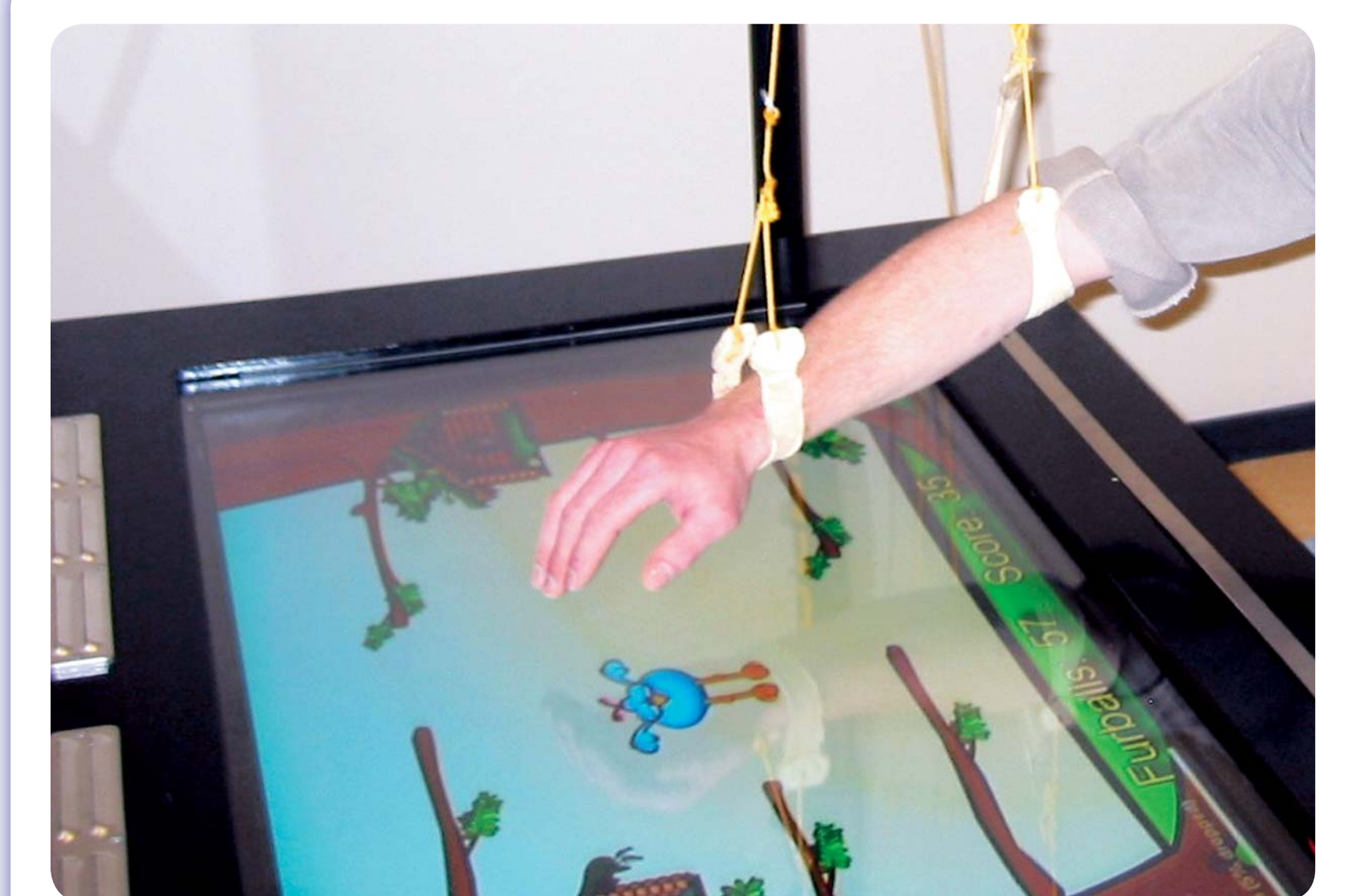


Figure 2  
Rehabilitation therapy by means of augmented auditory and visual feedback during reach and retrieval exercises.



Figure 3  
Rehabilitation therapy by means of augmented sensory feedback in a robot.

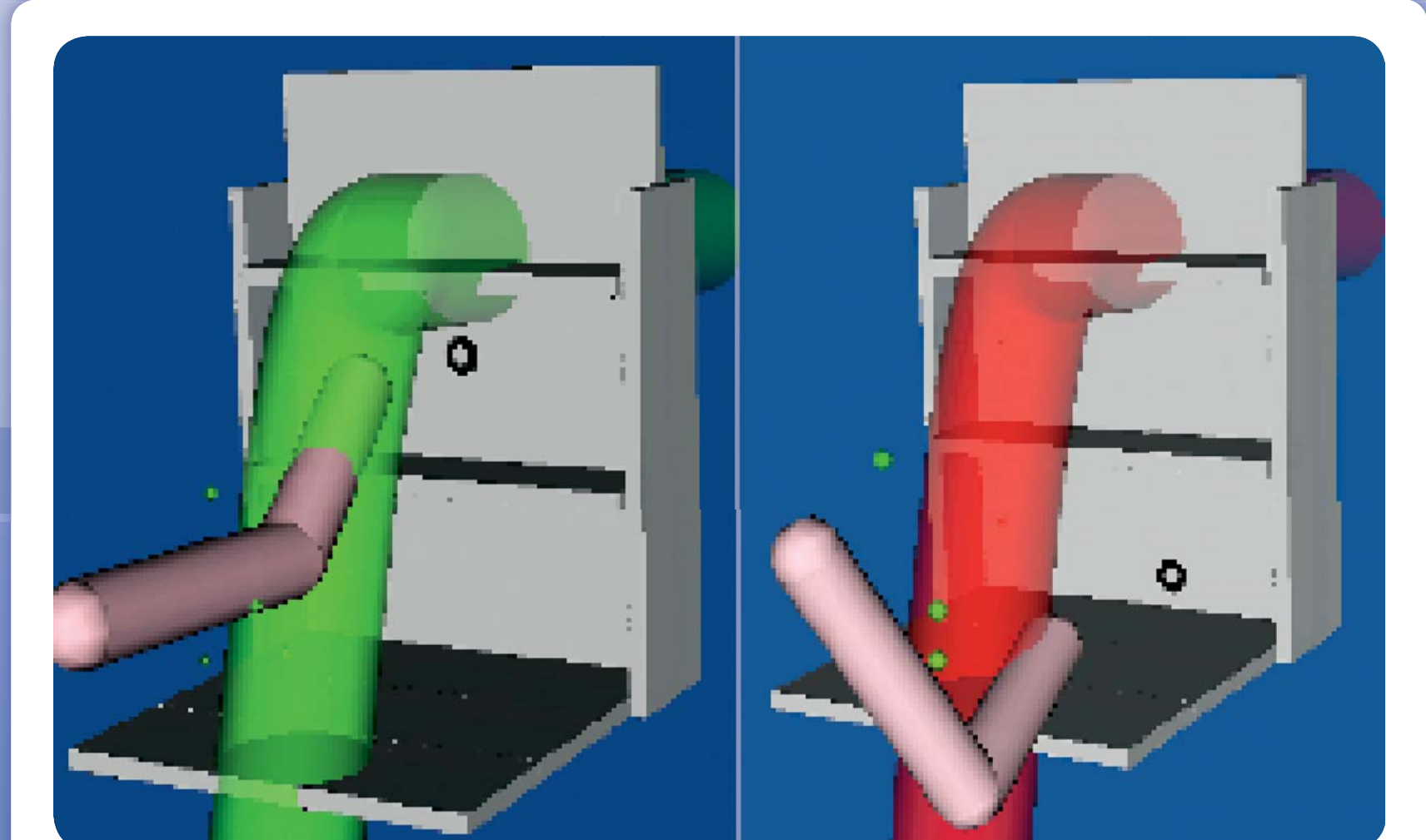


Figure 4  
Rehabilitation therapy by means of a virtual tube used during functional exercises.



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