

# Towards remote handwriting deficits therapy: a study on the use of a touch-screen in replacing paper

Mario Conci

Fabio Pianesi

Massimo Zancanaro

Fondazione Bruno Kessler, Italy

Rita Capasso

Alessia Monti

Gabriele Miceli

Centre for Mind/Brain Sciences, Italy

ECCE 2010

Cognitive Engineering for Technology in Mental Health Care and Rehabilitation

# Outline

- Background
  - Aphasia Therapy
  - Motivation for the study
- The study
  - Methodology
  - Results
  - Conclusions
- Implication for design

# Aphasia

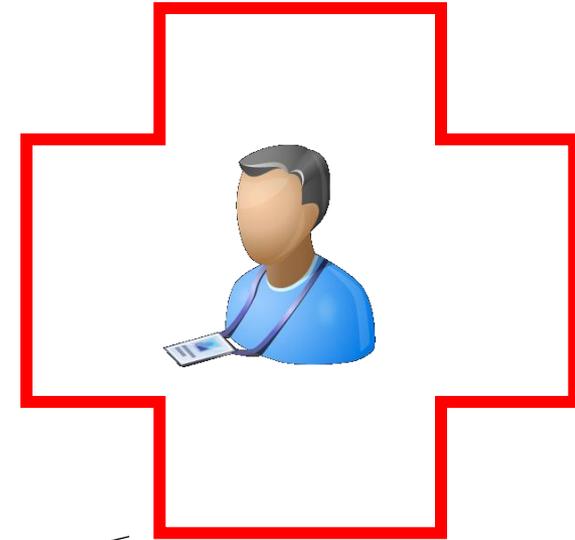
- Aphasia is an acquired communication disorder that impairs a person's ability to process language
  - Speaking, understanding, reading and writing.
- Causes: stroke, head injury, brain tumor or other neurological diseases

# Aphasia therapy

- An EFFECTIVE rehabilitation program should:
  - start as soon as possible
  - be intensive
  - be carried out during the recovery phase
- Intensity and regularity are critical
  - patients SHOULD attend the rehabilitation centre on a daily basis

# Obstacles and Difficulties

Mobility and transport are the most impacting obstacles

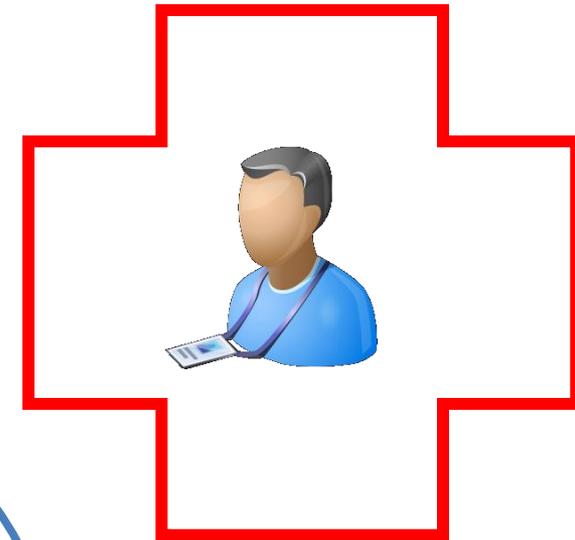


- Relying on relatives' help
- Impact on caregivers' life

# ICT Solutions

For the patient:

- autonomously practice tasks at home



For the therapist:

- opportunity for improving the efficacy of job
- follow several patients simultaneously
- better data storage and analysis

# A touch-screen...

Already used in tele-rehabilitation studies  
mostly for speech disorders

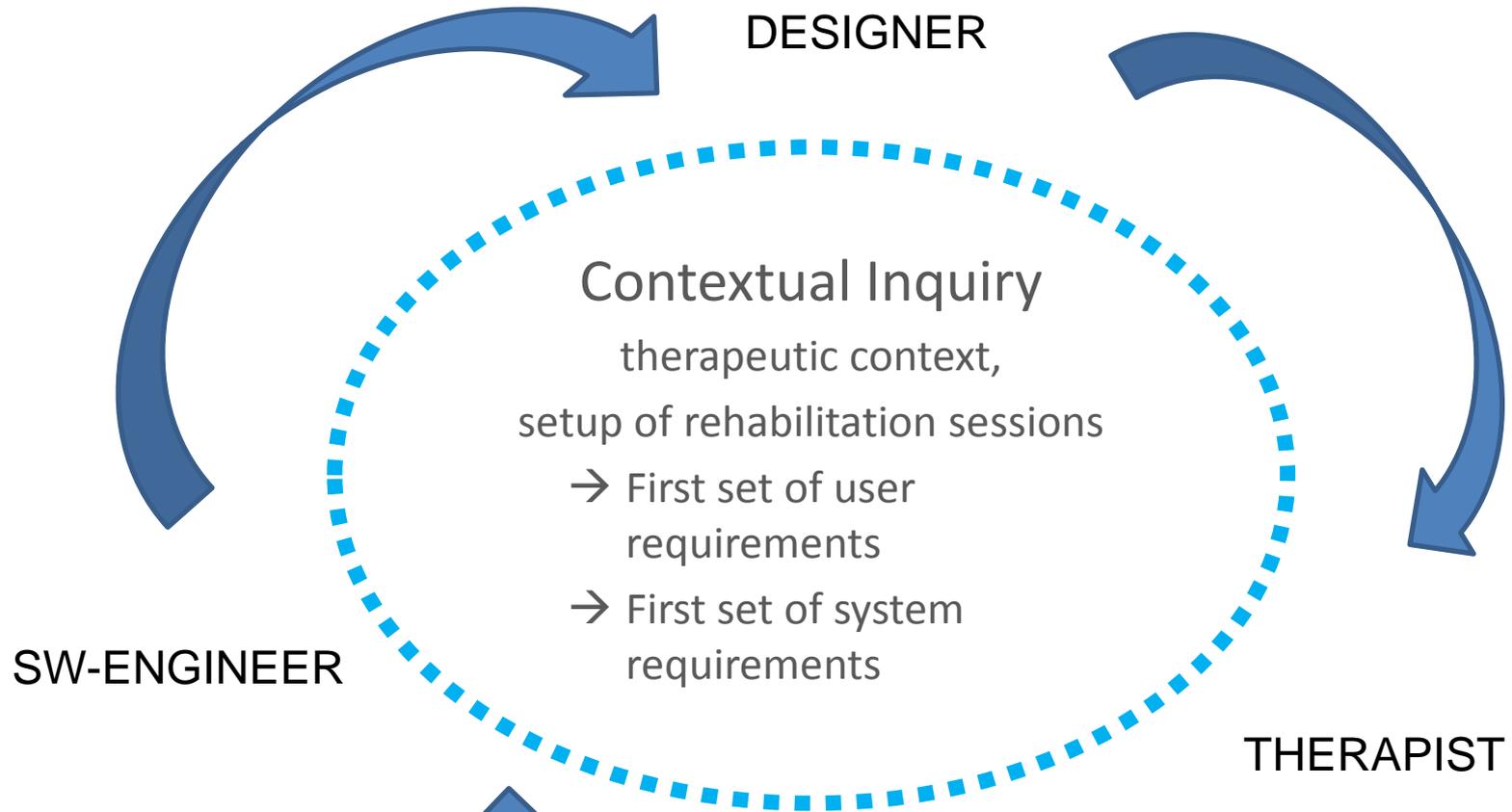
What is known about its usefulness in the  
case of writing disorders?



# THE STUDY | objectives

- Investigate the effects of a touch-screen device in the context of dysgraphia treatment:
  - focus on the therapist and patient's attitude towards the touch-screen
  - touch-screen's efficacy and benefits for therapy
- Implications for a tele-rehabilitation system of handwriting deficits.

# Application | design

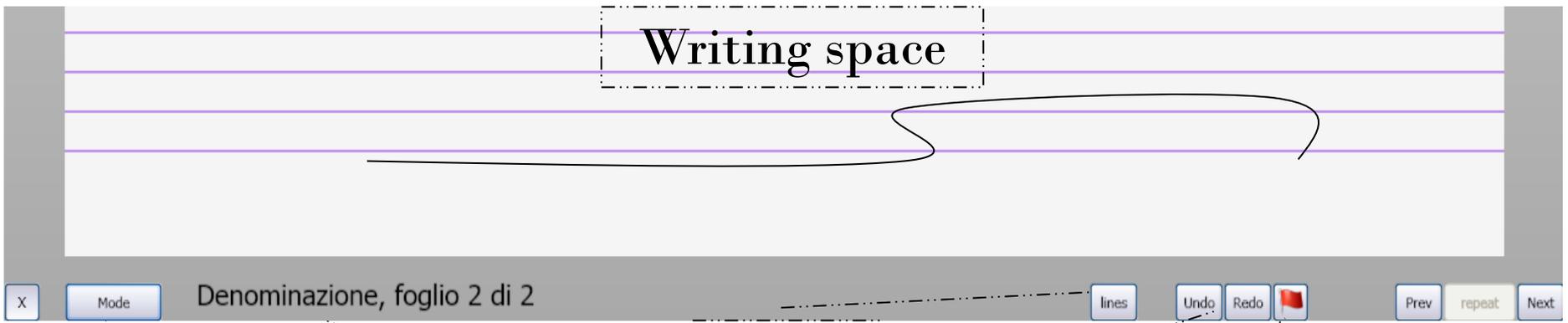


# Application | Tasks

4 typical tasks of the rehabilitation of handwriting deficits

- *Dictation*: write stimuli presented auditorily
- *Naming*: write the name of a pictured object
- *Completion*: write the missing letter(s) in an incomplete stimulus word
- *Verification*: check (and correct) the spelling of a stimulus word

# Application | Functionalities



Writing space

x

Mode

Denominazione, foglio 2 di 2

lines

Undo

Redo



Prev

repeat

Next

State

Lines

Undo/Redo

Flag

Change Tasks

Previous/Next/Repeat

# The Device: Wacom, Cintiq 12WX

sensitive, easy to move, thin and light

Physical Size	16" x 10.5" x .67" (406.4mm x 266.7mm x 17 mm)
Active Area	10.3" W x 6.4" H (261.6mm x 162.6mm)
Weight	4.4 lb with video control unit (2 kg)
Screen Size	12.1" diagonal (307.3mm)
Pressure Levels	1,024 on pen tip and eraser
Native Resolution	WXGA (1280 x 800)
Aspect Ratio	16:10



# Setting

**Patient**



**Therapist**

# Participants



## 2 Patients

- Patient A: 55-yr old woman with a mild handwriting deficit
- Patient B: 40-yr old woman with a moderate dysgraphia
- Patients had already participated in therapy sessions for language disorders



## 2 Therapists

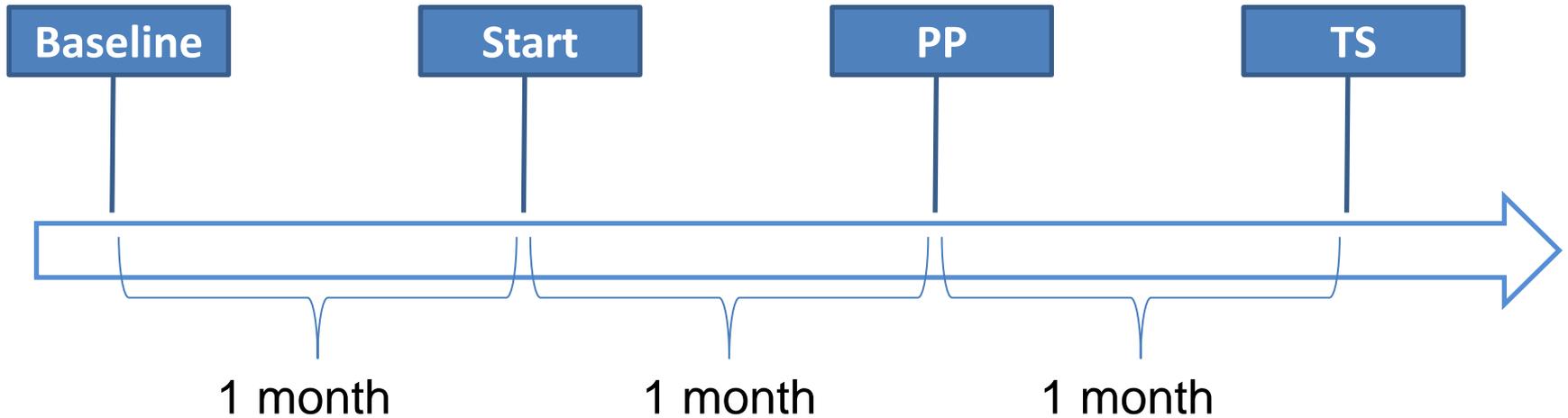
- Both therapists administered the therapy to both patients.

# Method

- Two treatment blocks were designed for both patients:
  - Block\_PP: standard procedure (pencil and paper; PP),
  - Block\_TS: touch-screen and a digital pen (TS).
- Duration: 1 month (each block)
- Stimuli administration: computer loudspeakers

# Data collection | therapy

Number of errors



# Data collection | therapist's questionnaire

- Therapist's Questionnaire (in the middle and at the end of the TS phase):
  - list +/- aspects of the touch-screen
  - assess their level of satisfaction with the TS
  - provide a personal assessment of the involvement and anxiety of the patients.

<< *The therapy session is* >>

Much more satisfying with TS		Equally satisfying		Much more satisfying with PP
------------------------------	--	--------------------	--	------------------------------

# Data collection | patient's questionnaire

- Assess the TS modality
- At the end of the study
- Administered by the therapist

*<< Therapy with the touch-screen is tiring for the hand used for writing >>*

Absolutely not tiring	A bit tiring	I do not know	Tiring enough	Absolutely tiring
--------------------------	--------------	------------------	---------------	----------------------

# Results | therapy

(% of Errors: Words vs Non-words)

	<b>Patient A</b>		<b>Patient B</b>	
	Words	N-Words	Words	N-Words
Baseline	28.3%	64.5%	4.5%	17.3%
After PP session	29.4%	69.1%	2.8%	13.6%
After TS session	23.4%	66.4%	2.1%	9.1%

# Results | therapists

- Therapists reported a high satisfaction and a good attitude towards the touch-screen:
  - Negative judgments regarded specifically the technological side
  - Positive aspects regarded the support-to-work side
- They reported a higher patient's involvement after the TS phase

# Results | patients

from **1: Absolutely not** to **5: Absolutely yes**

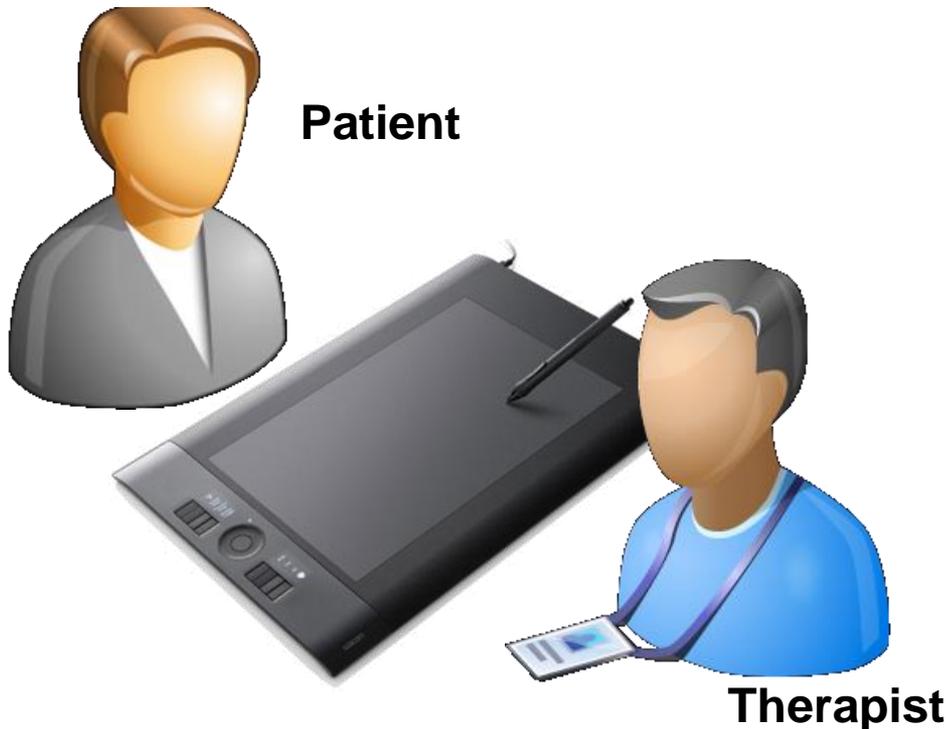
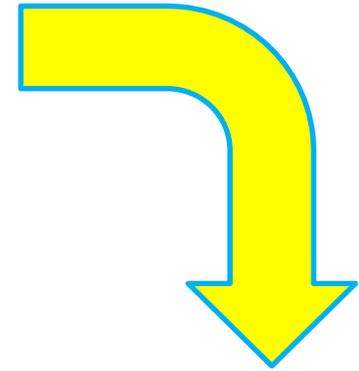
	<b>Pat_A</b>	<b>Pat_B</b>
TS is tiring for the hand used for writing	1	1
With TS the work field is tidier	5	5
TS allows a more natural writing posture	4	2
It is easier to manage the paretic arm	4	5
TS is appropriate for handwriting therapy	4	3

# Conclusions

- The use of the TS did not impact on the therapy outcome.
- The touch-screen was well accepted by patients.
- Therapists were satisfied with the TS because it supported them in session management and data storage and analysis.

# Implications for Remote Therapy

- Important relationship therapist - patient
  - Watching patient's face and hand
    - Eye-contact
    - Emotional support
  - Feedback on performance



Shorten the distance between patient and therapist for the creation of a (virtual) shared space.