# Letter Position Dysgraphia

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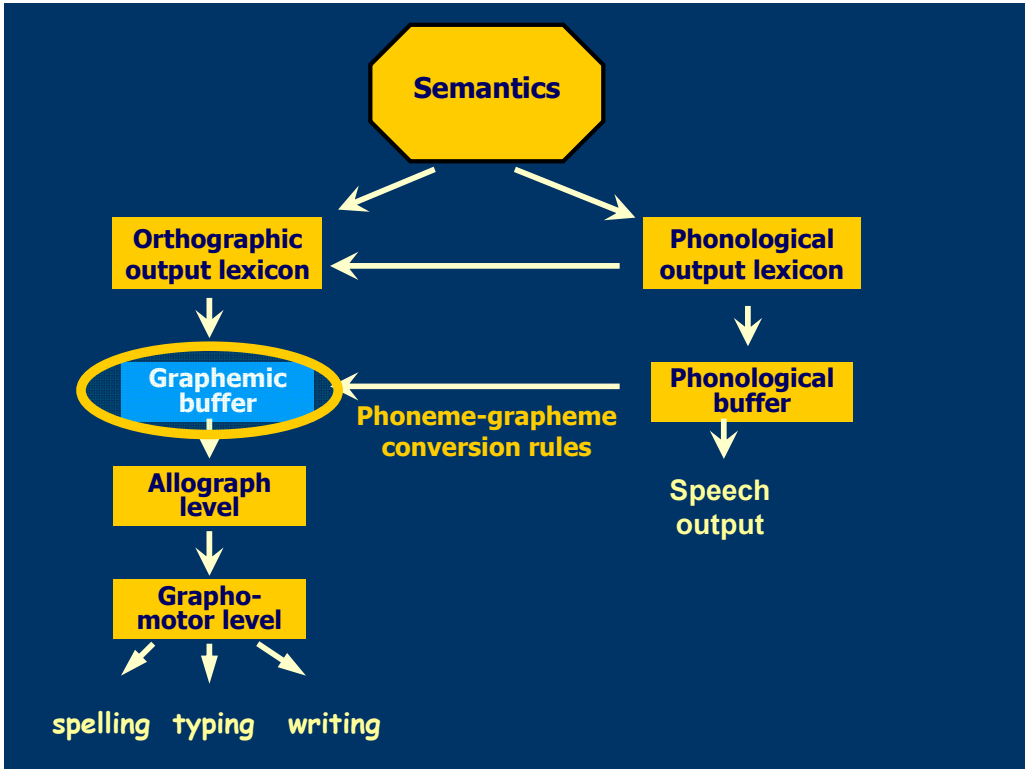



## Graphemic buffer functions

- A short-term orthographic memory store
- A shared post-lexical stage for the lexical and sub-lexical routes.
- Shared by the various spelling outputs
- A multi-dimensional structure which specifies gemination, orthographic–syllabic structure, consonant-vowel status (Caramazza, Miceli, Villa & Romani, 1987; Caramazza & Miceli, 1990)

## Graphemic buffer dysgraphia

- Letter substitutions, omissions, additions and transpositions in real and nonwords
- Word length effect
- No semantic or lexical effects
- Involves all orthographic output modalities

Annoni, Lemay, Pimenta & Lecours (1998); Blanken, Schafer, Tucha & Lange (1999); Buchwald & Rapp (2003, 2004); Caramazza, Miceli, Villa & Romani (1987); Caramazza & Miceli (1990); Cotelli, Abutalebi, Zorzi & Cappa (2003); Cubelli (1991); Kobubo, Suzuki, Yamadori & Satu (2001); Miceli, Capasso, Ivella & Caramazza (1997); Posteraro, Zinelli & Mazzucchi (1988); Rapp & Kong (2002); Sage & Ellis (2004); Schiller, Greenhall, Shelton & Caramazza (2001); Tainturier & Rapp (2004); Miceli & Capasso (2006) for a review

# Graphemic buffer: two main functions

(Buchwald & Rapp, 2004; Rapp & Kong, 2002)

◈**Activation** of the graphemes constituting the word. **Sensitive to lexical frequency**.

◈**Serial selection** of individual graphemes from the set of active letters. **Not sensitive to lexical frequency**

# Predictions for error types

**A deficit in the activation component= a deficit in letter identity stage:**

**Letter substitutions, additions, omissions**

**A deficit to serial selection:**

**Transposition errors**

**From the literature: selective impairment of the GB as manifested by the error types:**

**Individuals with GB dysgraphia with letter identity and letter transposition errors**

Annoni et al., 1998; Badecker et al., 1990; Buchwald and Rapp, 2003; Caramazza et al., 1987; Caramazza and Miceli, 1990; Cubelli, 1991; Jónsdóttir et al., 1996; McCloskey et al., 1994; Miceli et al., 1997, 2004; Sage and Ellis, 2004; Tainturier and Caramazza, 1996; Tainturier and Rapp, 2004).

**Individuals with GB dysgraphia with predominantly identity errors (deletions or substitutions) without transpositions**

Cotelli et al., 2003; Kay and Hanley, 1994; Kobubo et al., 2001; Posteraro et al., 1988; Shallice et al., 2000)

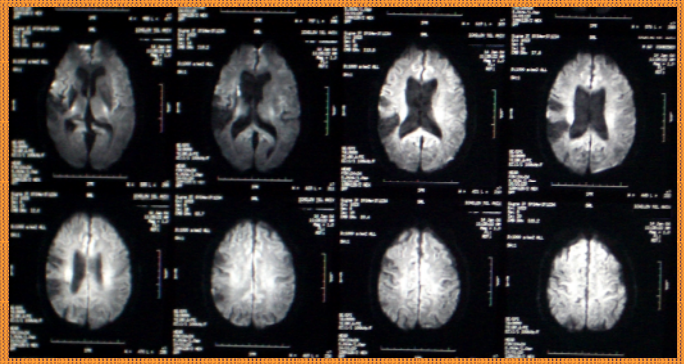
**One individual with GB dysgraphia with predominantly transposition errors (only 2% other errors) but also with a relatively small error rate (2-8%) of transposition errors.**

Blanken et al., 1999

## A single case study:

AE, 61 years old, an agrammatic aphasic following a right temporo-parietal hemorrhagic lesion.

A journalist with 13 years of education.

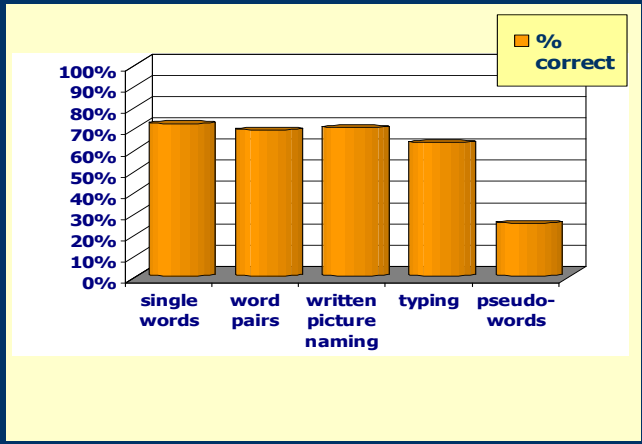


T1 MRI scan

## Characterization of AE's writing:

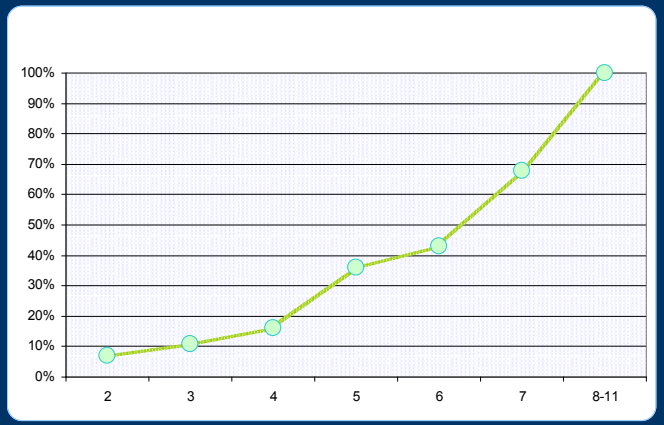
**Errors across tasks, in real and pseudo-words**

- No frequency effect
- No imageability effect
- No regularity effect
- No grammatical category effect




## Characterization of AE's writing:

### A marked length effect

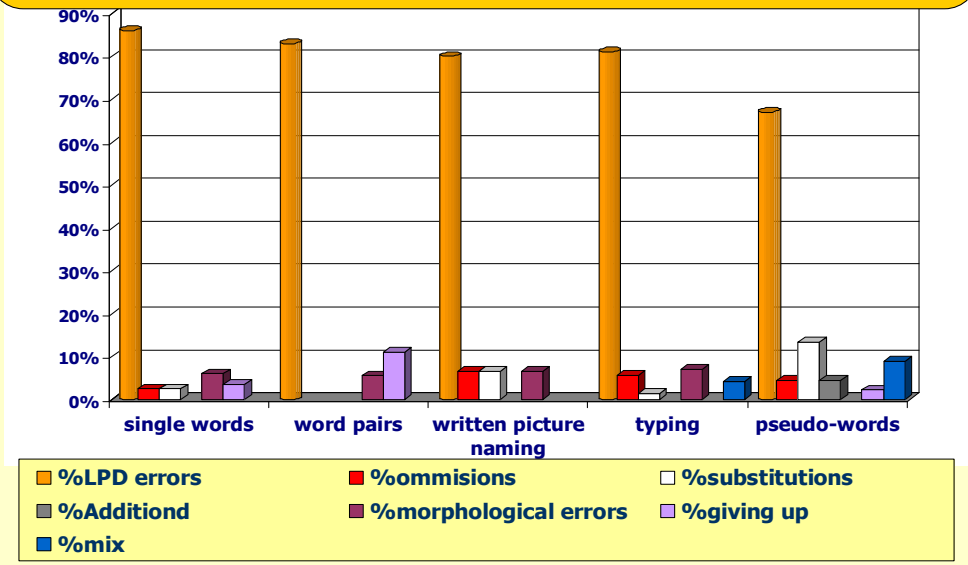



$r = 0.96, p < .0001$

## AE's errors in writing:

### Mainly letter position errors (LPD) of middle letters

across tasks and orthographic outputs

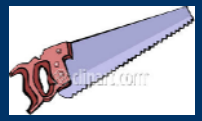


## Written picture naming (AE)

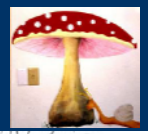
אשכולית

עפרון

מגהץ



מסור



פטריה

מכבש

FORM from

FINGR E finger

PL EO people

F OORL floor

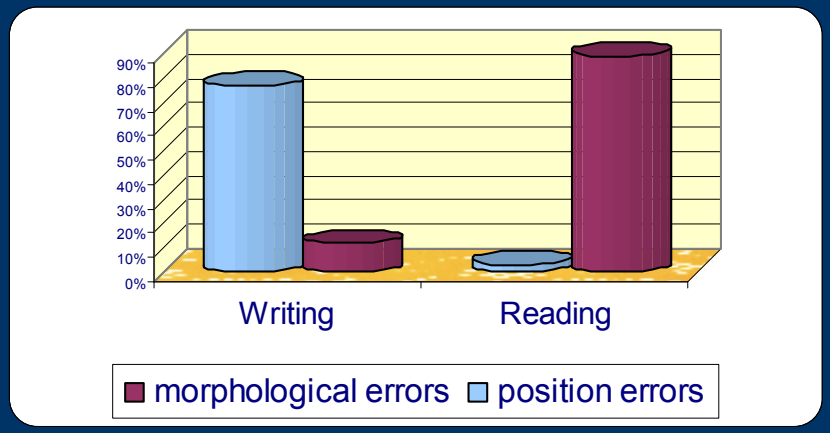
## Is there a lexical constraint on AE's writing?

- Words in which a serial order error may result in an existing word (form-from; beard-bread) did not induce more errors compared to other words (table).
- Furthermore- in words that had a potential for lexical transposition, AE did not necessarily choose the lexical transposition.

## Do letter position errors occur in reading as well?

- Do reading and writing make use of the same graphemic buffering process? If so – we would expect letter position errors in reading too.
- If encoding of letter position in reading occurs in the visual-orthographic analysis system, and serial selection of letters in writing occurs in a separate output graphemic buffer than AE's reading would not necessarily include letter position errors.

## AE's reading and writing show dissociable patterns




## Conclusions:

- Letter position dysgraphia is a sub-type of graphemic buffer dysgraphia, with mainly transpositions of middle letters.
- The letter position deficit appeared only in writing.
- These data support the existence of serial letter order selection as a separate function in the graphemic buffer, which is dissociable from letter identity and from position encoding in reading.

# Thank you

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