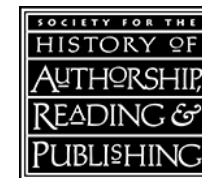


HandSpy

A New Tool to Study Text Production in the Digital Humanities

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E-Read + SHARP Conference

Vilnius, 29.09.17

Why is it important to study writing in real time?

- * One thousand and one reasons!
 - We get a glimpse of the process.
- * If we know the process; if we have accurate descriptions of it; reproducible conditions under which it occurs, then perhaps we can teach it better.
- * Hayes & Flower (1980), cognitive processes in writing:
 - Planning
 - Translating
 - Revising



Other Tools to Log Writing

- * Eye and Pen (Alamargot et al., 2006)
- * Ductus (Guinet & Kandel, 2010)
- * ScriptLog (Strömqvist et al., 2006)
- * InputLog (Leijten & Van Waes, 2006)

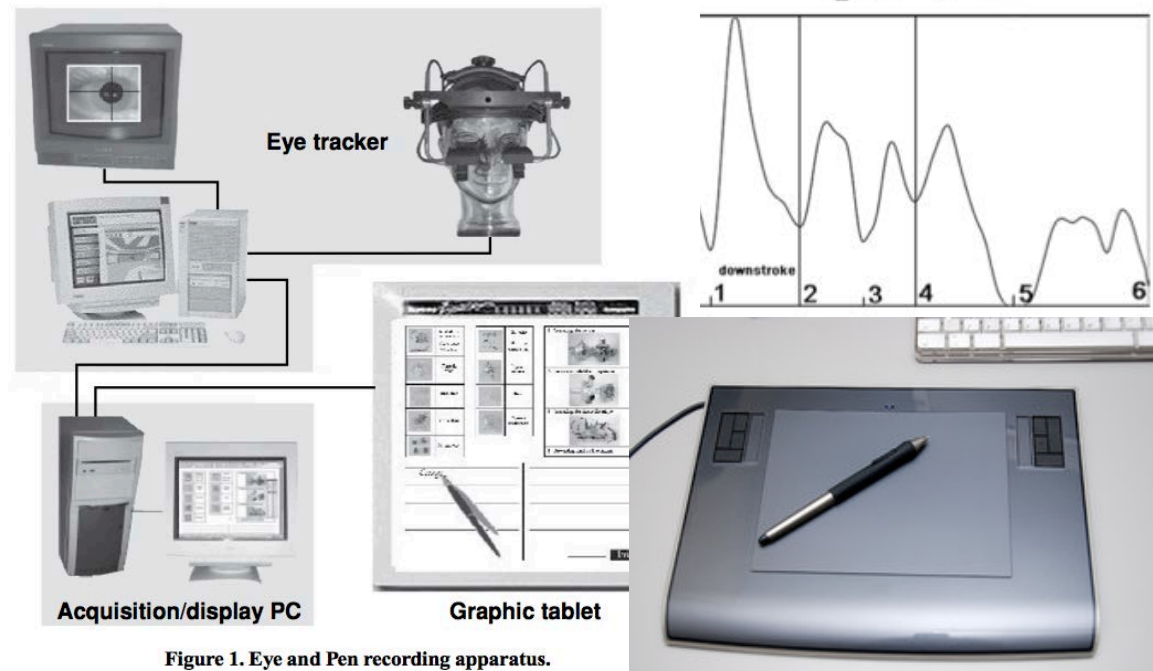
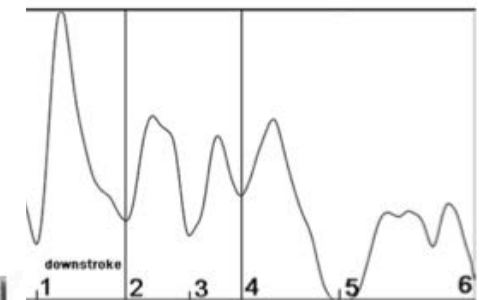
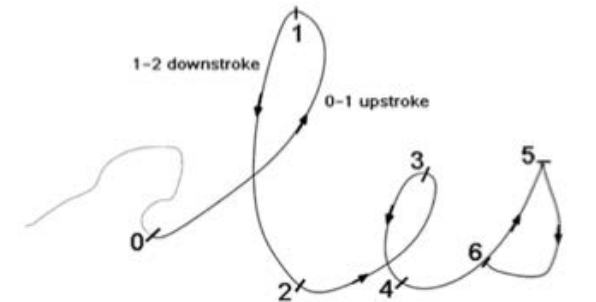


Figure 1. Eye and Pen recording apparatus.



Using Smartpens to Log Handwriting



Introducing smartpen and microdotted paper

Natural settings Group data collection Unobtrusive Ecological validity

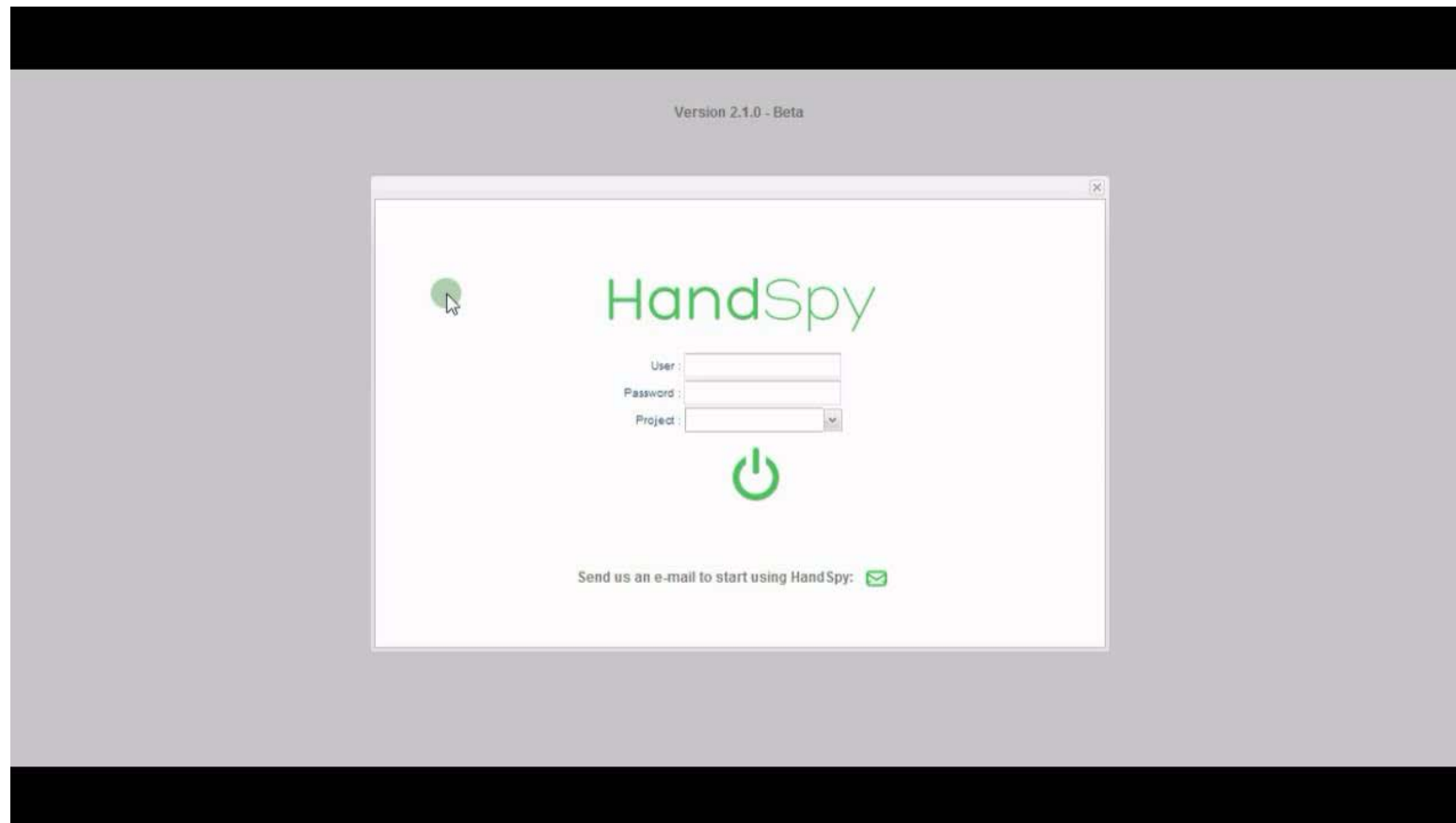
The HandSpy Software

HandSpy

User:
Password:
Project:



- * penlet + web application (<http://daar.up.pt/HandSpy/>)
- * available on the cloud, collaborative, free for research



Using HandSpy

HandSpy

User:
Password:
Project:



- * Key notions: online logging, pause, burst, burst length

Version 2.1.0 - Beta

HandSpy

SKowalsky - Researcher

Project: Writing

Project Upload Analysis

2000 ms Code: 203

#	Burst	Pauses	Burst Size	Distance	Speed	Total Tim	Text
1	573	3894		11059	19.30	0.07	
2	10574	4488		3540	0.33	0.32	
3	12912	13858		9325	0.28	0.77	
4	7875	3077		2621	0.33	0.95	
5	24037	3939		12856	0.53	1.42	
6	13108	2125		4645	0.35	1.67	
7	5892	17462		1864	0.32	2.06	
8	13419	6654		4248	0.32	2.39	
9	6836	4410		6956	1.02	2.58	
10	360	2215		110	0.31	2.62	
11	1650	5475		1011	0.61	2.74	
12	12250	13260		5075	0.41	3.17	
13	11179	2278		3752	0.34	3.39	
14	18825	15968		10211	0.54	3.97	
15	35449	18443		11926	0.34	4.87	
16	2663	2666		5750	2.16	4.96	
17	3583	2494		1391	0.39	5.06	
18	7557	2085		3818	0.51	5.22	
19	14182	15743		3985	0.28	5.72	
20	12120	2506		8866	0.73	5.96	

nguhana cantinho

X

Era uma vó, uma maninha que se chamava Arcana.
E tinha a sala, tinha o caminho para casa, tinha o jardim,
tinha o barbeiro, tinha o barbeiro muito alto, tinha o do
e tinha a casa para a casa, que nunca se esquecia de casa.
Então a vó que se viu lá, quis ser na rua, e descobriu
aparece a sua casa e viu o barbeiro a lavar, e depois
e disse tu agora já minha, mas a dona disse não, e não
já já minha casa e chamam vó.

Some more screenshots

The screenshot displays the HandSpy software interface. The top bar shows the user 'Bruce - Administrator' and the project 'Tutoring'. Below the top bar are tabs for 'Project', 'Upload', and 'Analysis'. A toolbar contains various icons for search, settings, and playback, along with a '2000 ms' timer and a 'Code: 101' dropdown. The main area is split into a table on the left and a handwritten text sample on the right.

#	Burst (ms)	Pauses (ms)	Burst Length	Distance (mm)	Speed	Text
1	3894					
2	10574	4486	3	92	0.23	Era uma vez
3	12912	13858	3	98	0.20	uma menina que
4	7875	3077	2	85	0.29	se chamava
5	24037	3939	6	245	0.27	Ariana e perdeu a sua ca
6	13108	2125	3	155	0.31	pelo caminho para
7	5892	17462	1	55	0.25	casa
8	13419	6654	3	127	0.25	e um ladrão
9	6836	4410	1	84	0.33	roubou-o
10	1650	5476	1	29	0.47	ela
11	12250	13260	3	152	0.33	ladrava muito alto
12	11179	2278	3	94	0.23	e já estava-lhe
13	18825	15968	4	155	0.22	a doer a cabeça
14	35449	18443	9	332	0.25	poça para a cadela que n
15	2663	2666	1	44	0.44	estou
16	3583	2494	1	37	0.27	a ver
17	7557	2085		107	0.38	
18	14182	15743		123	0.23	
19	12120	2506		148	0.33	
20	6618	55968		73	0.30	
21	2181	2160		23	0.28	
22	7641	2708		98	0.34	
23	17899	6674		186	0.28	
24	3885	2069		44	0.31	
25	7309	7440		70	0.26	
26	27415	2189		264	0.26	
28	312063	236367	44	3200	7.89	

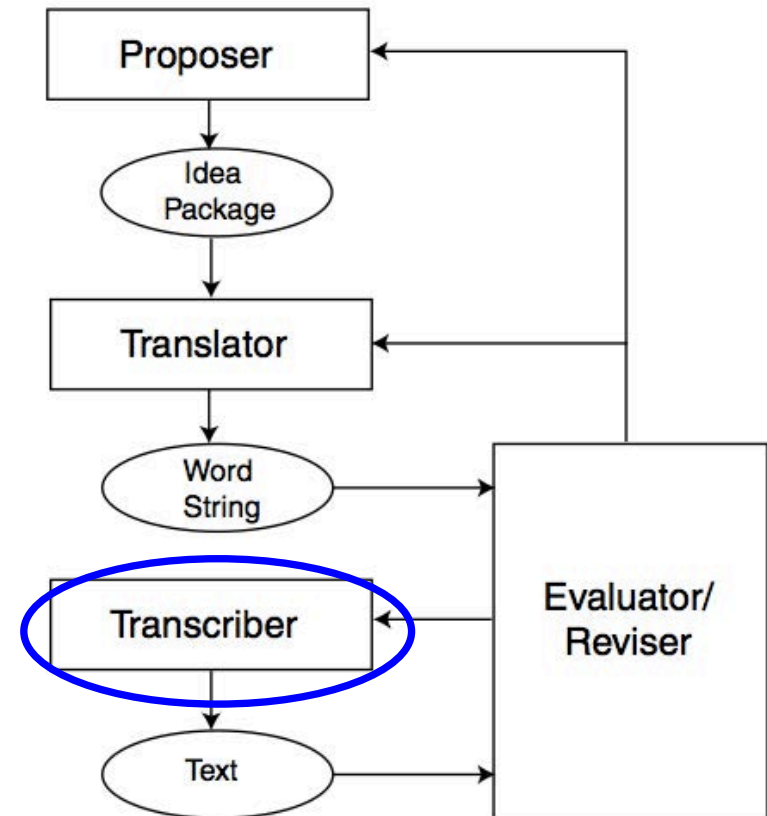
The handwritten text on the right is a Portuguese story snippet: 'Era uma vez uma menina que se chamava Ariana e perdeu a sua caçula pelo caminho para casa e um ladrão roubou-o e já estava-lhe a doer a cabeça poça para a cadela que não estou a ver'. The text is annotated with red 'P' markers indicating detected words or phrases.

Next version of HandSpy (3.0)

- Manuscript, video and annotated viewing modes
- Integration of an Emotional Lexicon Analyzer (Emotaix.pt + EmoSpell; Costa, 2012; Maia, 2017)
- Full support for Neo N2 smartpens with automatic cloud synchronization
- Synchronization of handwriting production data with sound and psychophysiological data channels (e.g., heart rate, skin conductance)
- Complete new layout redesign

Two studies that used HandSpy

- The role of the transcriber (handwriting + spelling) in text production
- The transcriber might act like a bottleneck
 - Receives input from the translator and it should write it down as fast and accurate as possible
 - If it is not automatic it competes for attentional resources, critically with those required for holding active the translated word string. It will likely take capacity which could be used by other processes
 - if not efficient it is likely to disrupt writing
 - If efficient it will likely promote parallelism and close interaction/recursivity among writing processes



Chenoweth & Hayes (2003, p. 113)

S1: Bursts Throughout Schooling

Participants

249 Portuguese children, grades 2nd to 7th, aged 7 to 12

2nd: n = 28, 7.6; **3rd** : n = 45, 8.5; **4th**: n = 51, 9.4 years

5th: n = 31, 10.5; **6th**: n = 49, 11.6 ; **7th**: n = 45, 12.5 years

Materials

Livescribe smartpens, micro-dotted paper, HandSpy software

Procedure

Between subjects design. Collective data collection. 2 sessions

Alphabet (Berninger et al., 1991), Spelling (Carvalhais & Castro, 2013)

Writing prompts (max composing time 20 min):

Tell a story about a child that lost his/her pet.

Give your opinion about children watching TV whenever and whatever they want.

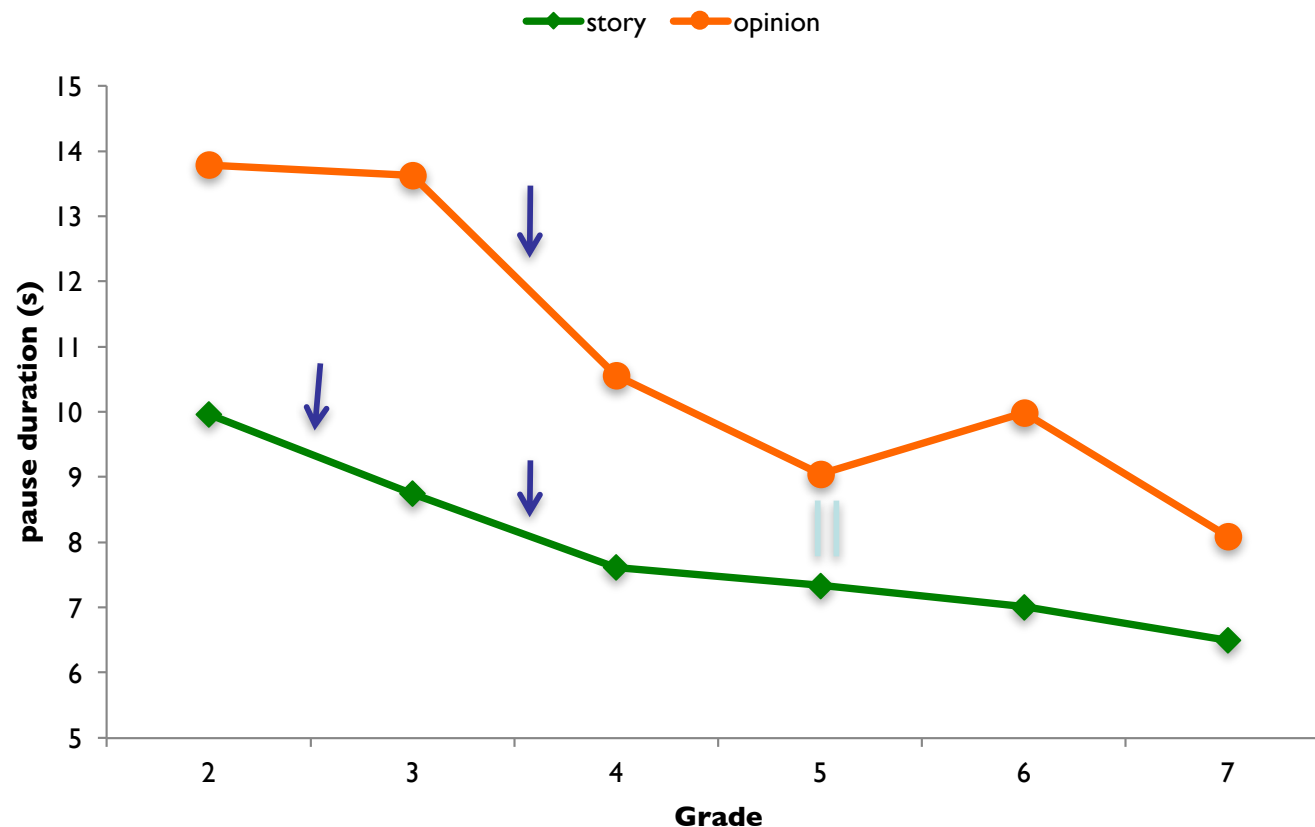
Final texts were typed and corrected for spelling errors. Texts were rated on creativity, coherence, syntax, vocabulary by blind judges.

Results: Duration of pauses

mix ANOVAs, **ME Grade** $F = 11.34, p < .001, \eta_p^2 = 0.19$

ME Genre $F = 59.00, p < .001, \eta_p^2 = 0.20$

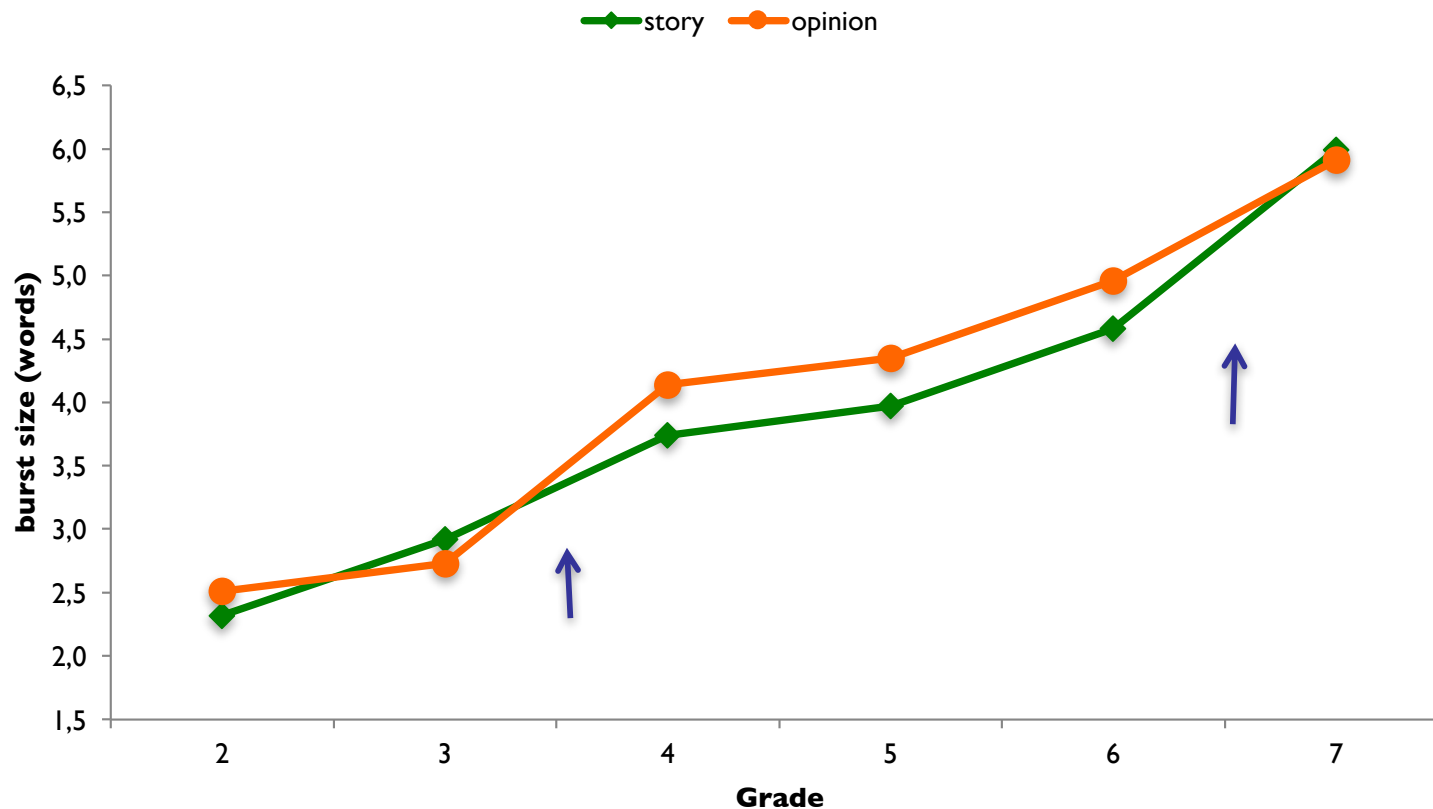
Int $F = 2.48, p = .03, \eta_p^2 = 0.05$



Results: Burst length

mix ANOVAs, **ME Grade** $F = 35.23$, $p < .001$, $\eta_p^2 = 0.42$

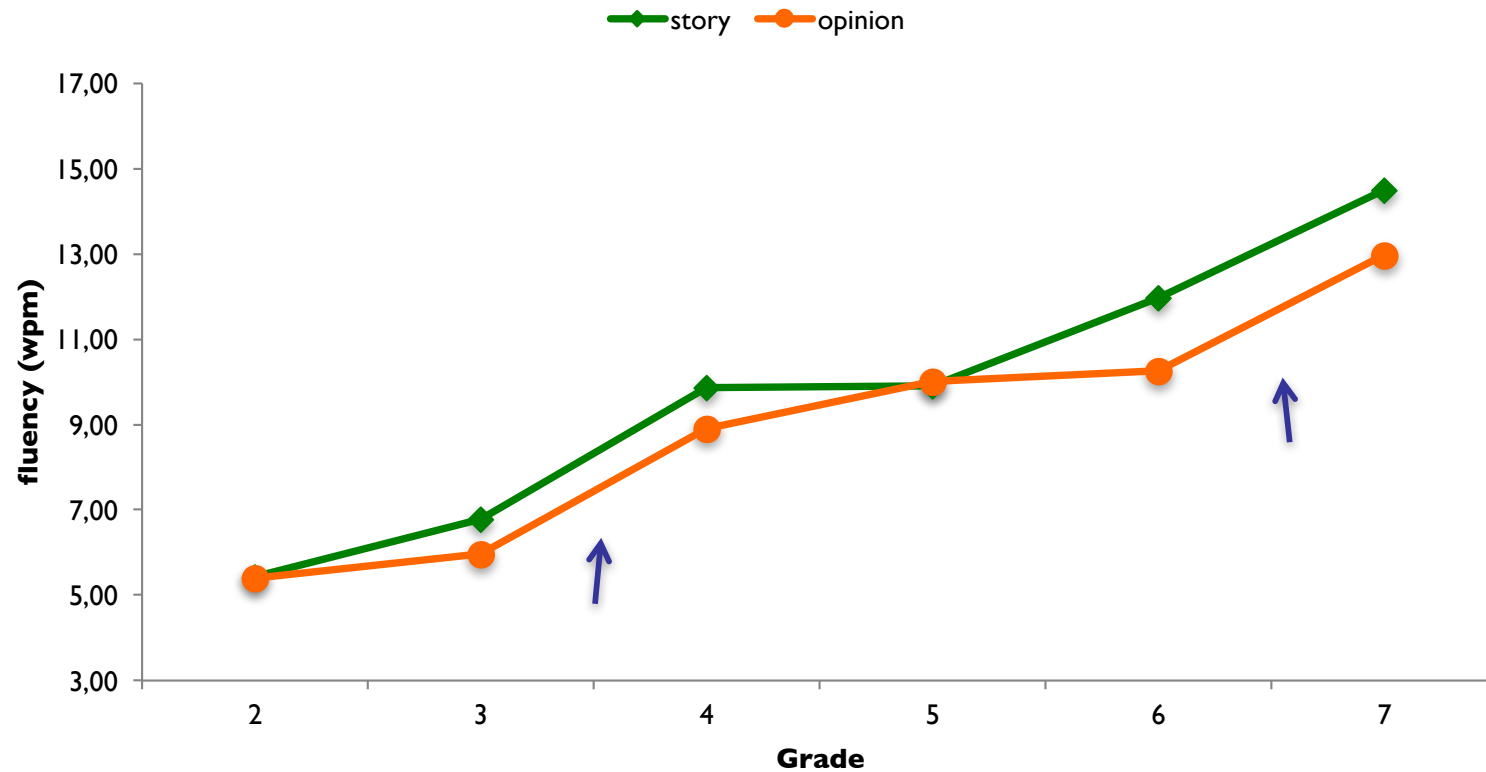
ME Genre $F = 7.93$, $p < .01$, $\eta_p^2 = 0.03$



Results: Fluency

mix ANOVAs, **ME Grade** $F = 49.61$, $p < .001$, $\eta_p^2 = 0.51$

ME Genre $F = 16.77$, $p < .001$, $\eta_p^2 = 0.07$



S2: Training the Transcriber

- **Participants:** 55 students in Grade 2 randomly distributed by 3 conditions
 - **Handwriting condition:** 17 students; $M_{age} = 7.5$ years, $SD =$ (11 girls)
 - **Spelling condition:** 18 students; $M_{age} = 7.5$ years, $SD =$ (10 girls)
 - **Keyboarding condition:** 20 students; $M_{age} = 7.5$ years, $SD =$ (11 girls)
- **Intervention in the three conditions (time equated)**
 - Research assistants delivered interventions to groups of 6 students during **10 weekly units** composed by **4 lessons** of 30 min each (20 hours). Principles of explicit teaching and scaffolded practice were followed (Archer & Hughes, 2011), and all activities took the form of enjoyable games.
 - All groups wrote **8 stories** during the interventions (same prompts across conditions)
- **Handwriting & Spelling instruction**
 - **Lessons 1-3:** practice; 3 activities per lesson: warm-up + 2 practice games
 - **Lesson 4:** story writing (written or visual prompts) during 10 min
- **Keyboarding instruction**
 - Keyboarding practice using the software *Rapid Typing*, *Tux Typing*, *G-Compris*

Evaluation procedure (pre-post)

- Children were evaluated before and after the interventions in the following tasks:
 - Alphabet task (60 s)
 - Copy task (90 s)
 - *O rouxinol azul fugiu do jardim porque chovia bastante.*
 - The blue nightingale fled the garden because it rained a lot.
 - Dictated spelling task (48 words)
 - 24 consistent words (12 trained, 12 untrained)
 - 24 inconsistent words (12 trained, 12 untrained)
 - Story writing
 - 10 min writing logged with HandSpy

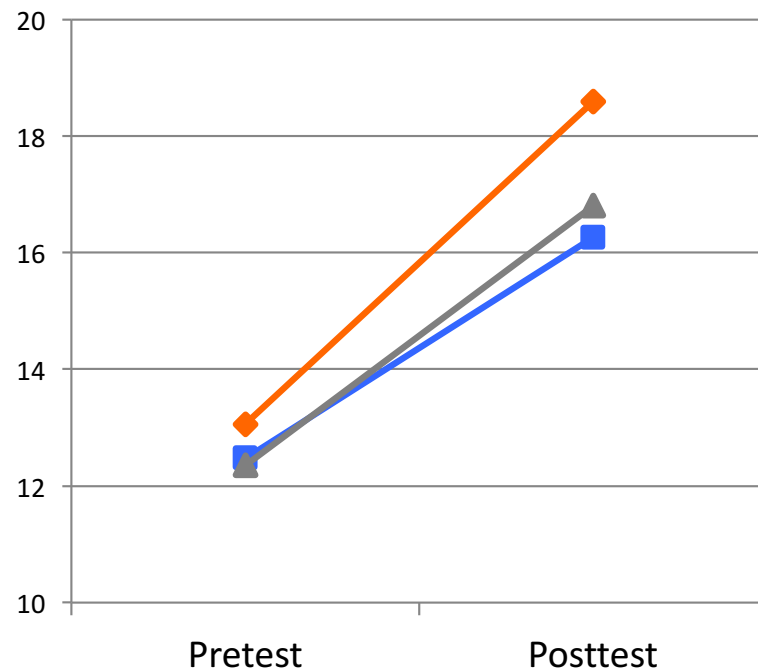
Results: Intervention checks (ANCOVAS)

Handwriting | Spelling | Keyboarding

* $p < .05$. ** $p < .01$. *** $p < .001$

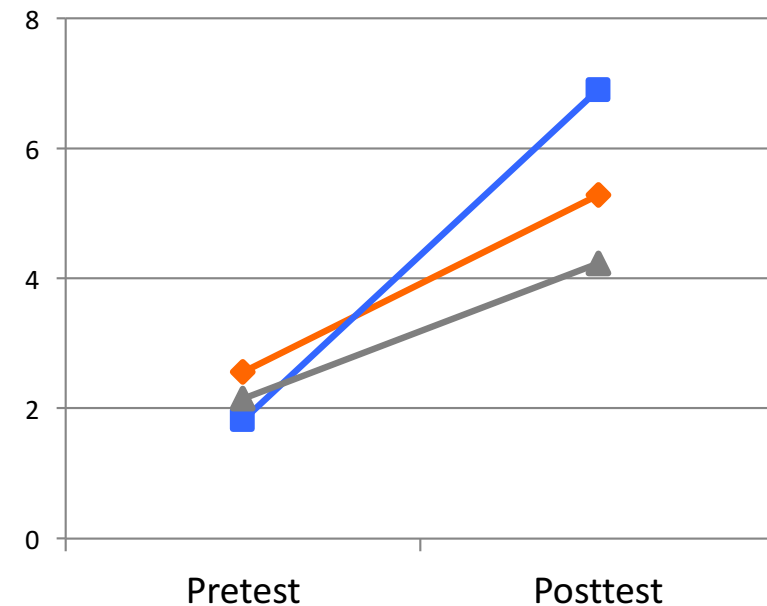
Alves et al., 2016, Journal of Educational Psychology

Copy Task (words in 90 s)



$F(2, 51) = 3.56^*$ $\eta^2_p = 0.12$
Handwriting > Spelling

Dictated Spelling (correct trained inconsistent words)



$F(2, 51) = 9.22^{***}$ $\eta^2_p = 0.27$
Spelling > Handwriting = Keyboarding

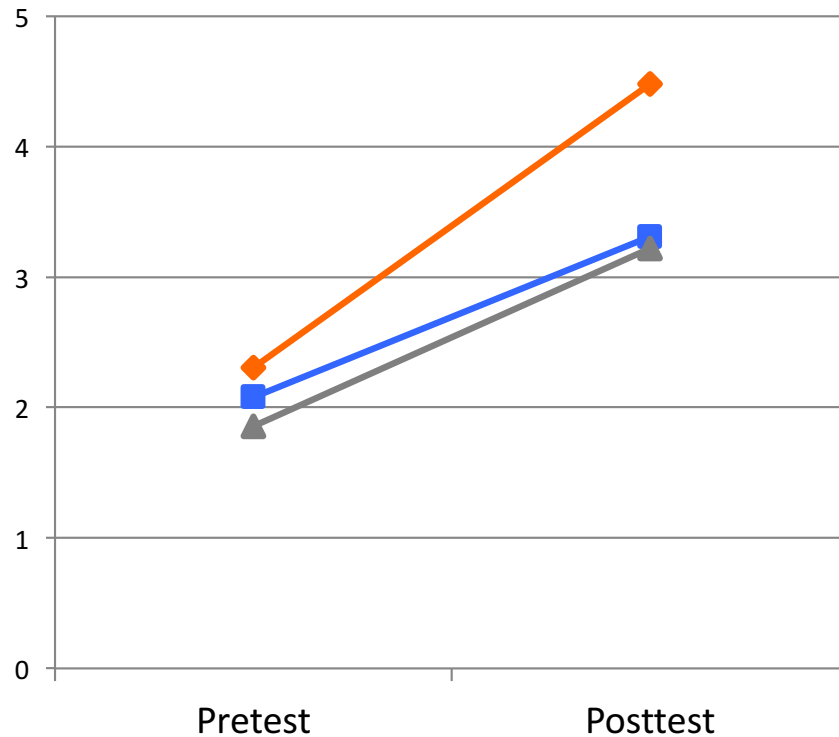
Results: Bursts and Text Quality

Alves et al., 2016, JEP

Handwriting | Spelling | Keyboarding

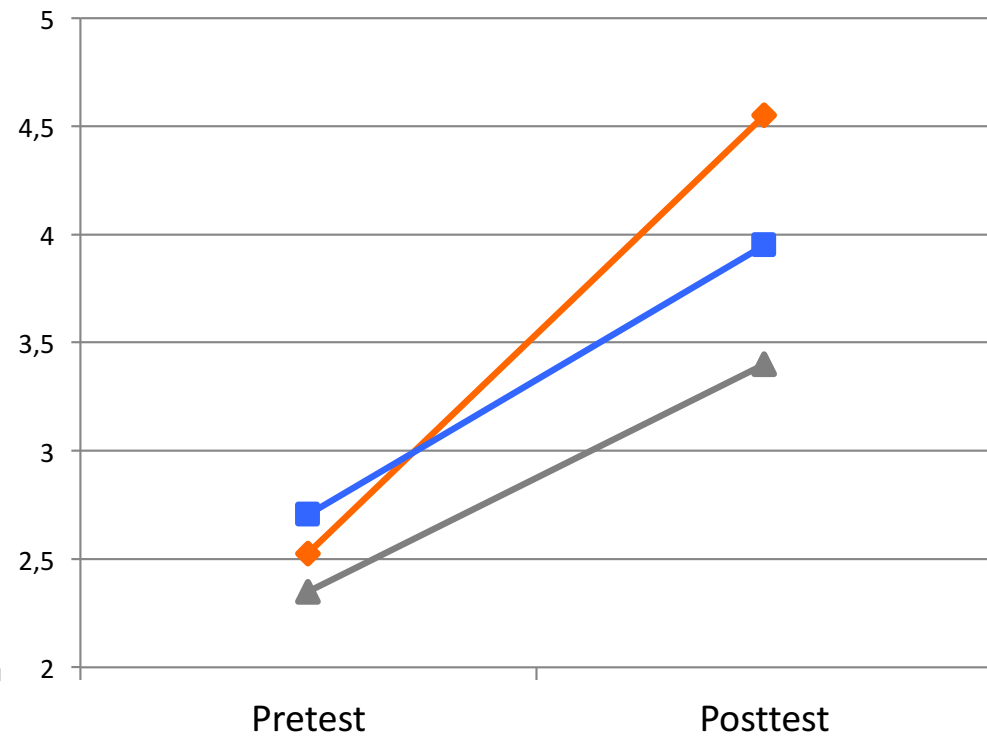
* $p < .05$. ** $p < .01$. *** $p < .001$

Burst Length (words)



$F(2, 51) = 3.77^*$ $\eta^2_p = 0.13$
Handwriting > Keyboarding ($d = 0.62$)

Text Quality (1-7)



$F(2, 51) = 8.05^{***}$ $\eta^2_p = 0.24$
Handwriting > Keyboarding ($d = 1.04$)

Summing up

- Handwriting and generally low-level writing processes are important to produce effective texts.
- Smartpens allow for easy and ecologically valid data collections.
- HandSpy is a new tool for logging and analyzing writing in real time.
- HandSpy is cloud-based, collaborative, and free to use.
- Burst length increases throughout schooling.
- Automating handwriting increases burst length.

Thank you for your attention

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M↔BW Mind-Body
Interactions
in Writing

F U N D A Ç ã O

Bial

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