

Cognitive load and spelling performance in a word dictation task: Contributions of the TBRS model

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Context

- Many variables have an impact on spelling performance
- Is the time variable a factor to be considered?
- Time as a cognitive resource

Spelling performance factors

- Type of practice (Ouellette, 2010; Pérez, Giraudo & Tricot, 2012)
- Frequency of word encounter (Bégin, Saint Laurent & Giasson, 2010)
- Spelling consistency (Fayol, Bonin & Collay, 2008)
- Graphical fluency (Fayol & Miret, 2005)
- Working memory capacity and cognitive load (Benton, Kraft, Glover & Plake, 1984; Fayol & Largy, 1992)

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- Time is considered as the main source of forgetting and chunks held active in working memory have to be refreshed periodically to prevent forgetting
- We have tested the robustness of this model in school learning situations (Puma et al., 2018)
- We have shown its compatibility with cognitive load theory (Puma & Tricot, 2019)

Questions and hypotheses

- Is time having an effect on spelling performance?
- Does a better temporal management of the attentional resources :
 - reduce cognitive load?
 - increase performance?
- Hypotheses
 - Increasing the pause time between words increases performance by reducing cognitive load.
 - This effect is greater for novices than for experts.

Experiment 1

Variables
<ul style="list-style-type: none">• Time to write: 18"/9"• Dictation: A/B• Grade: 3, 4, 5• Order

Participants
<ul style="list-style-type: none">• 28 grade 5• 26 grade 4• 19 grade 3

Materials
<ul style="list-style-type: none">• Pre-recorded dictations• Paas' scale• Paper/pencil

Mesures
<ul style="list-style-type: none">• Spelling performance• Cognitive load

Procedure

Paired measures

	dictation A		dictation B	
	1sr half	2nd half	1sr half	2nd half
day 1	18"	9"	18"	9"
day 2	9"	18"	9"	18"

Materials

Dictée pré-test

suspendre
raquette
guirlande
abricot
confiture
campagne
accordéon
photographe
injustice
grenouille

Dictée A

apprendre
recette
fatigue
abriter
canapé
champagne
atlantique
accorder
visible
téléphone
aviatrice
écureuil

Dictée B

comprendre
fillette
guitare
aborder
caméra
champignon
pacifique
accuser
jetable
pharmacie
directrice
feuillage

Echelle de Paas

Faire cette tâche m'a demandé un effort mental.

Très très faible *très faible* *plutôt faible* *faible* *moyen* *élevé* *plutôt élevé* *très élevé* *très très élevé*

1

2

3

4

5

6

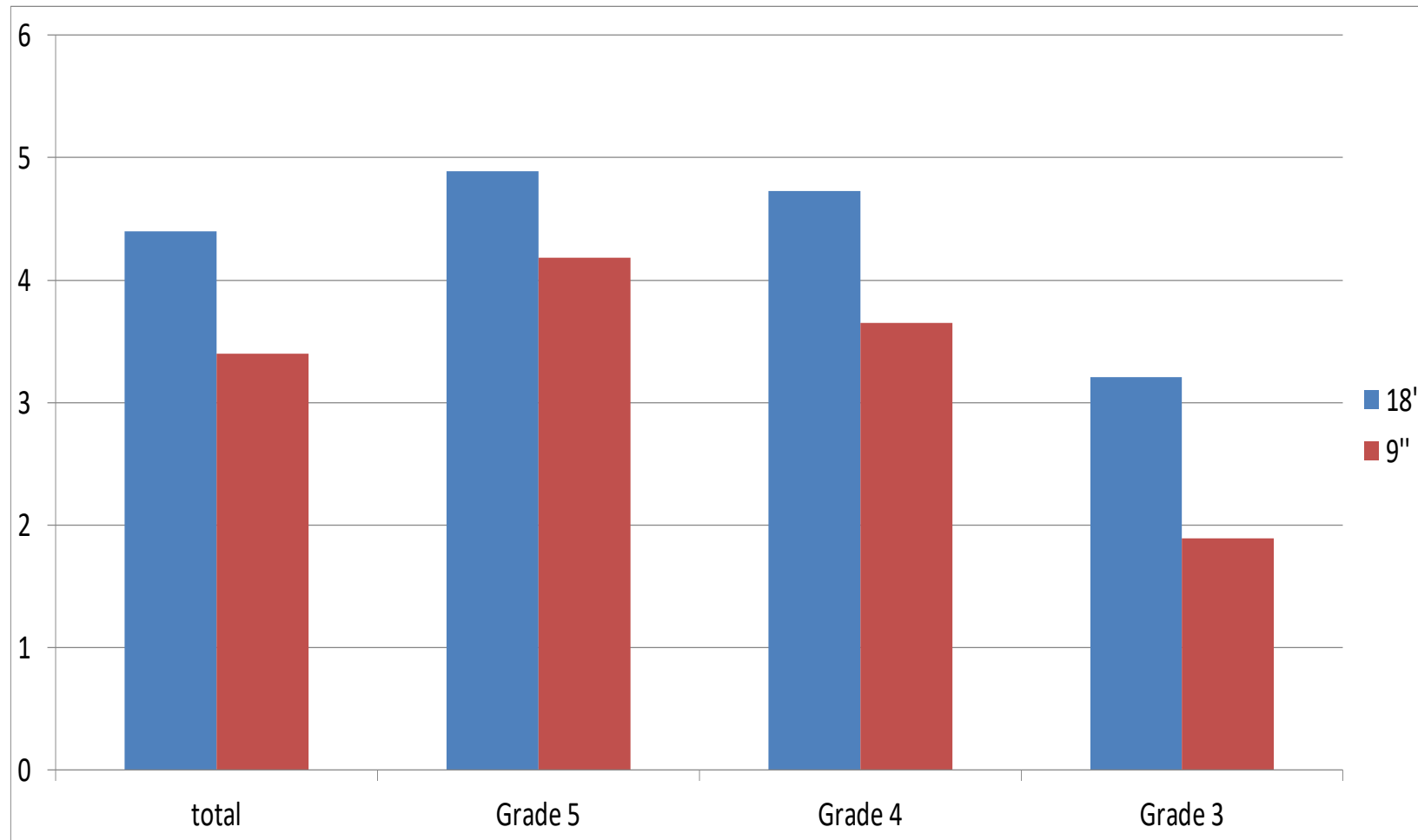
7

8

9

Results

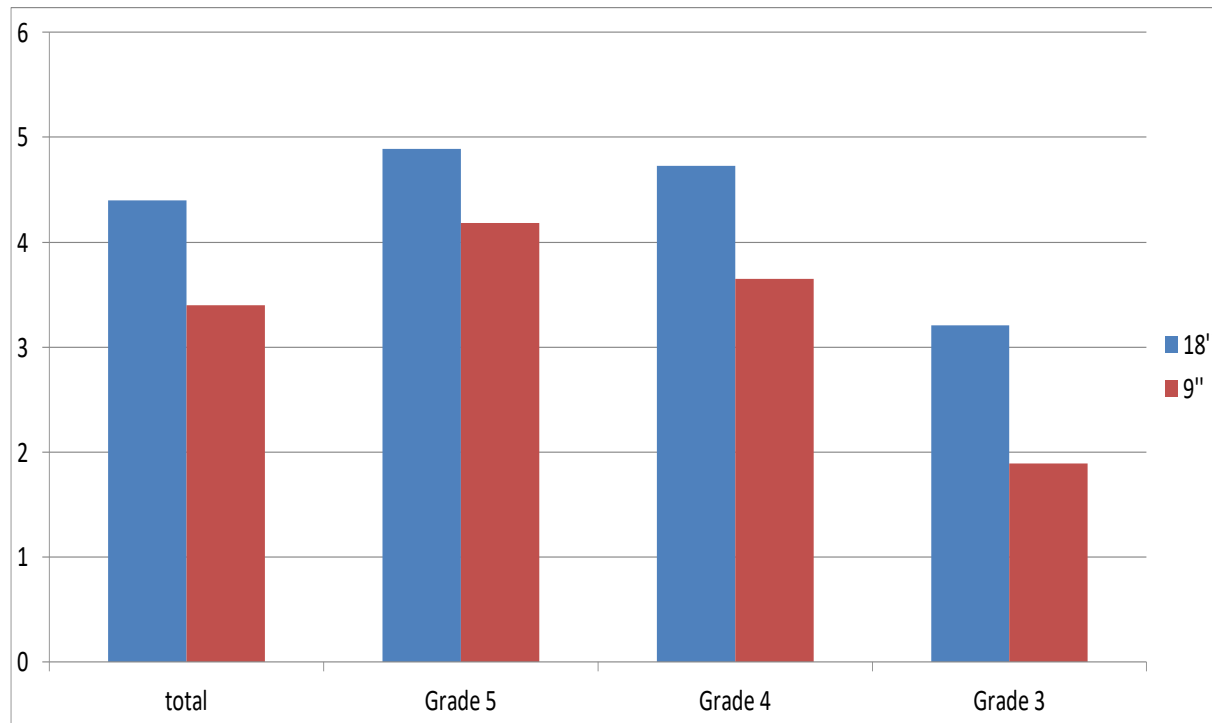
1. Significant grade main effect
2. No effect of time, nor expertise



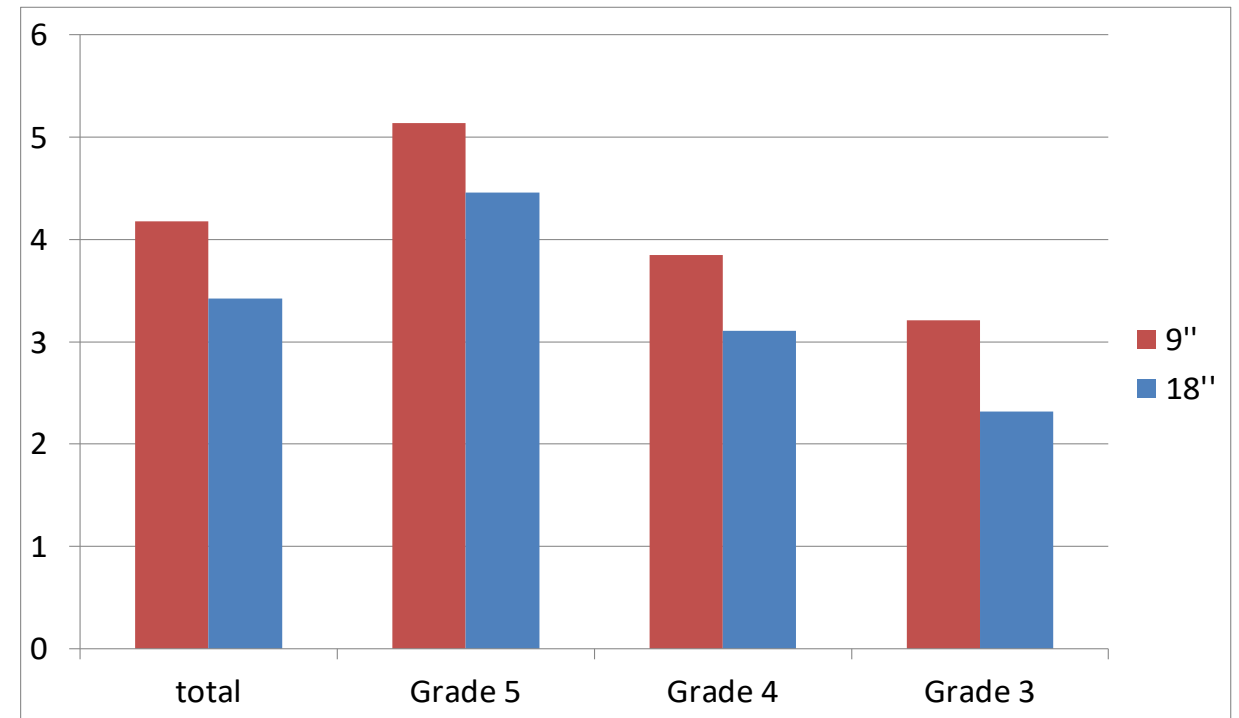
Day 1

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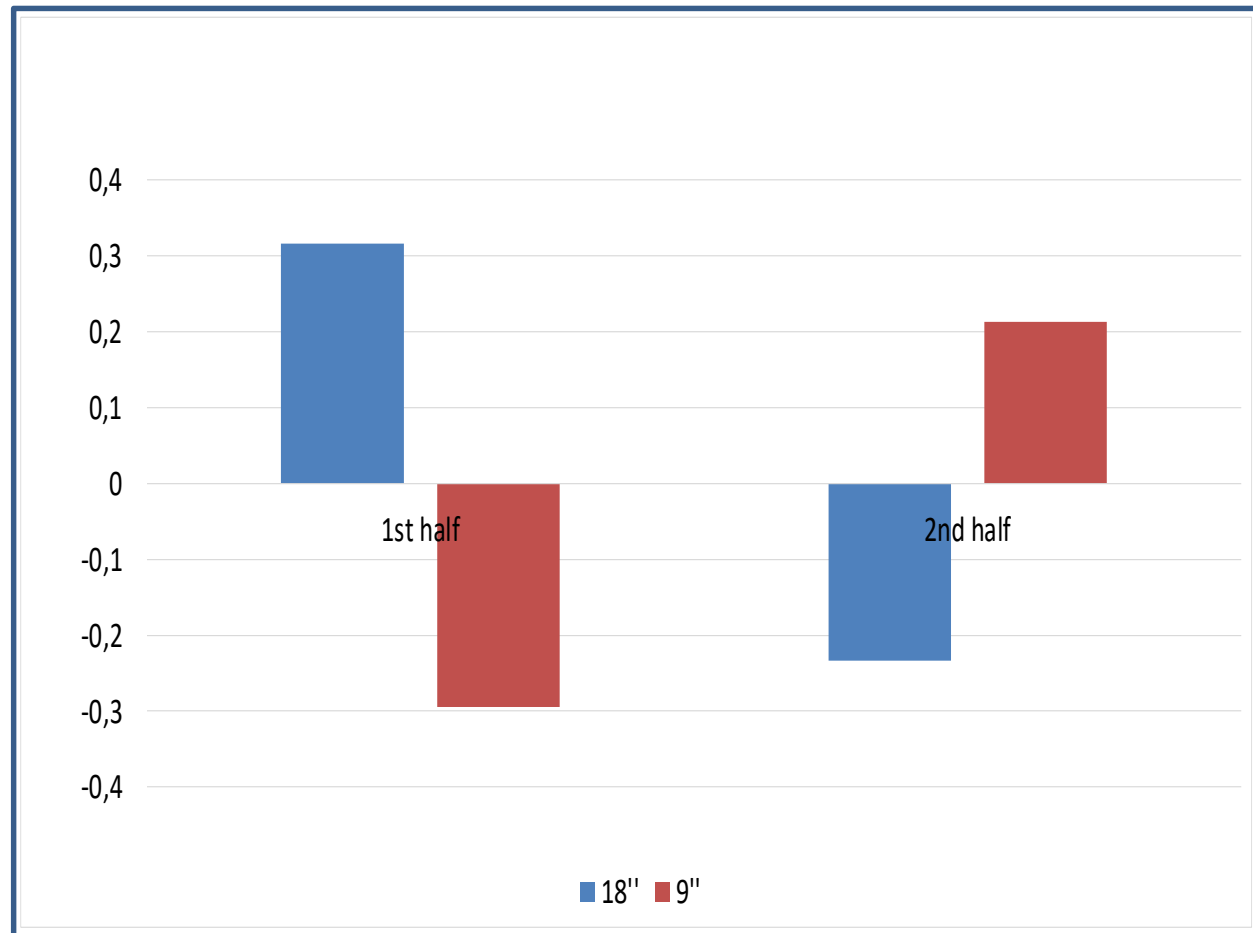
Day 1



Day 2

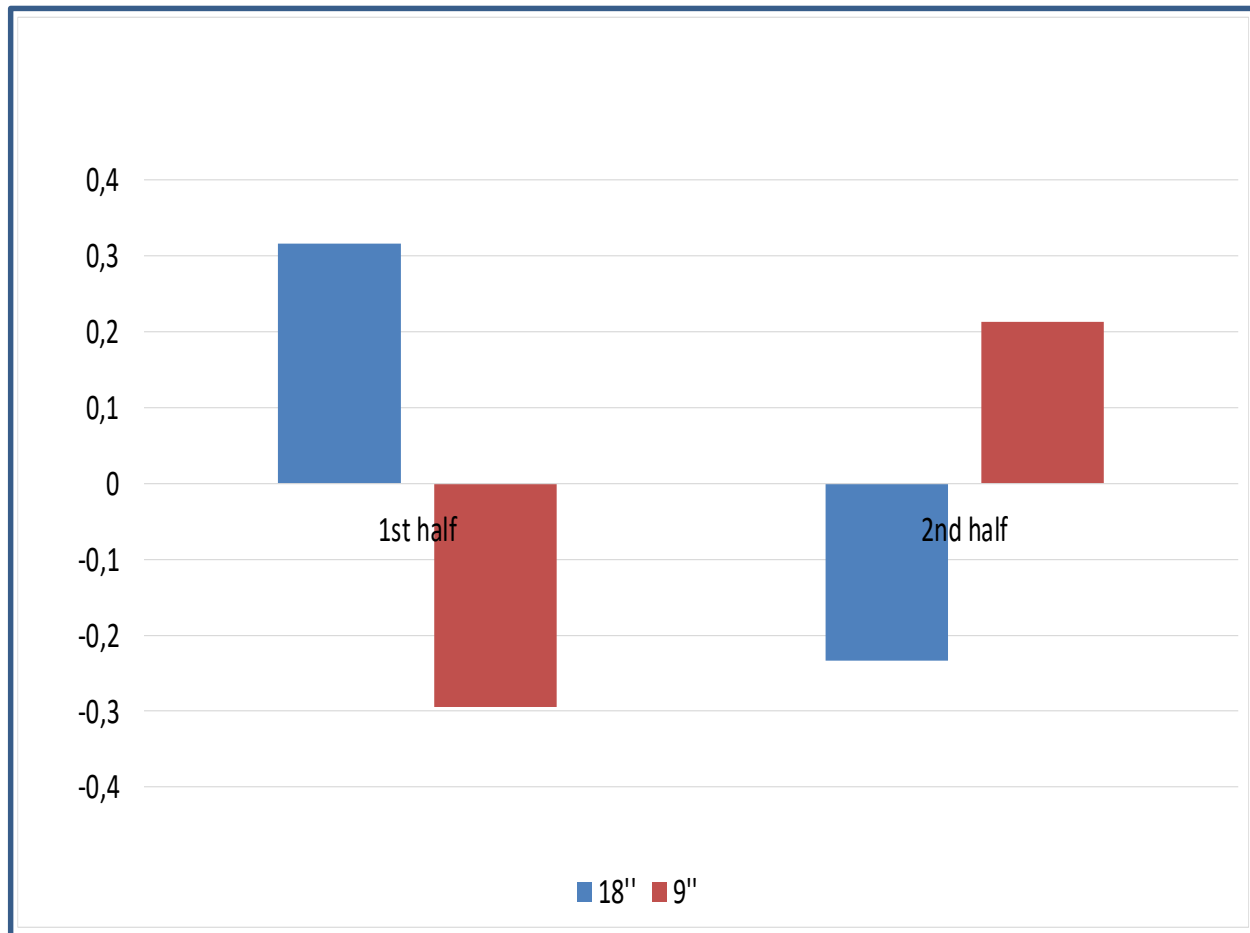
Results

Significant interaction order/time to write

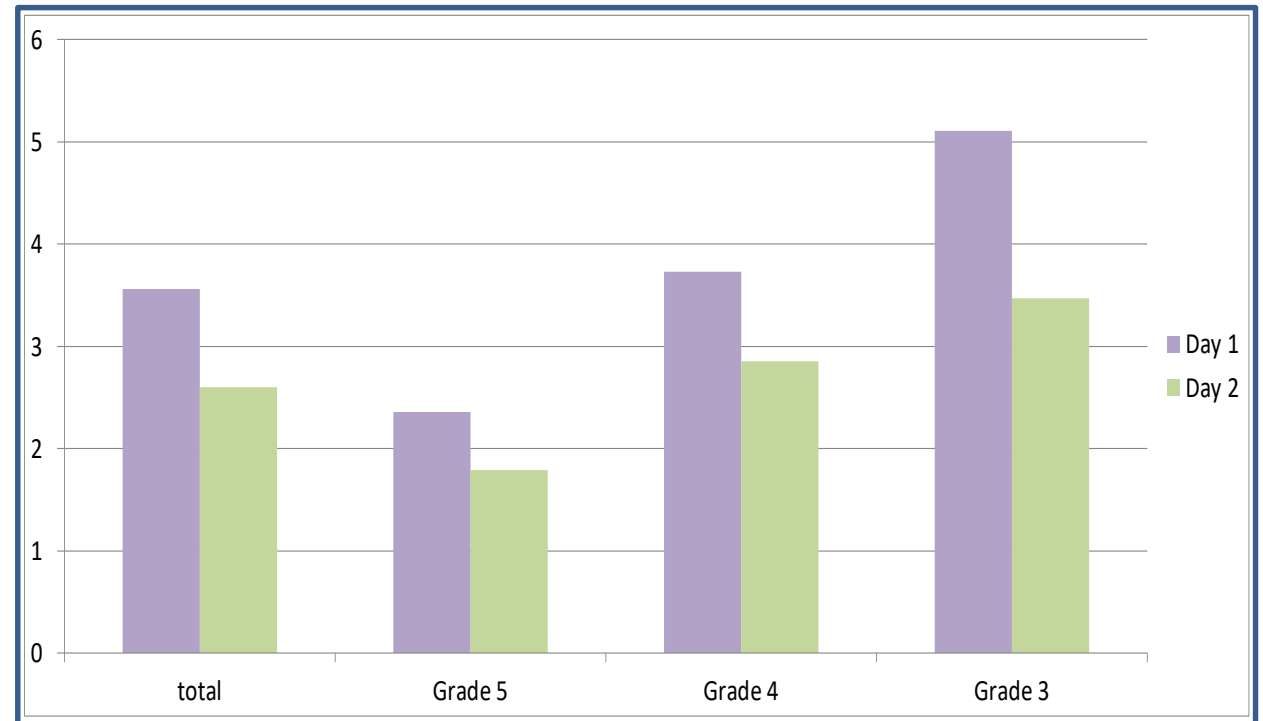


Results

Significant interaction order/time to write



Significant cognitive load effect



Discussion

- Results are not compatibles with TBRS model
- Methodological issue? Repeated measures
- Theoretical issue? TBRS is not relevant because dictation is not a double task

Experiment 2

Variables	Participants	Materials	Measures
<ul style="list-style-type: none"> • Time to write: 18"/9" • Grade: 4, 5 	<ul style="list-style-type: none"> • 436 	<ul style="list-style-type: none"> • Same + <ul style="list-style-type: none"> • Subjective questions 	<ul style="list-style-type: none"> • Same + <ul style="list-style-type: none"> • Motivation, fatigue, difficulty, boredom

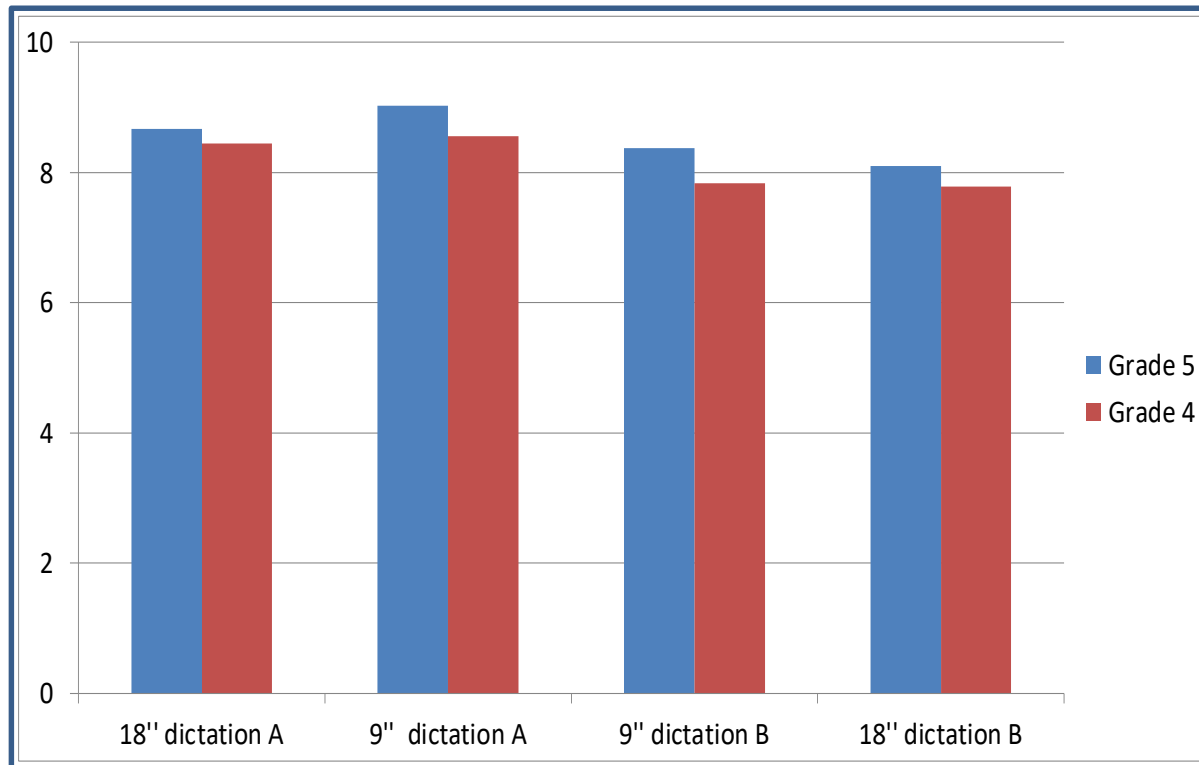
3 experimental conditions

18"	9'	18"
dictation A	dictation A+B	dictation B
227 participants	209 participants	164 participants
124 grade 5	102 grade 5	68 grade 5
103 grade 4	107 grade 4	96 grade 4

Independent measures

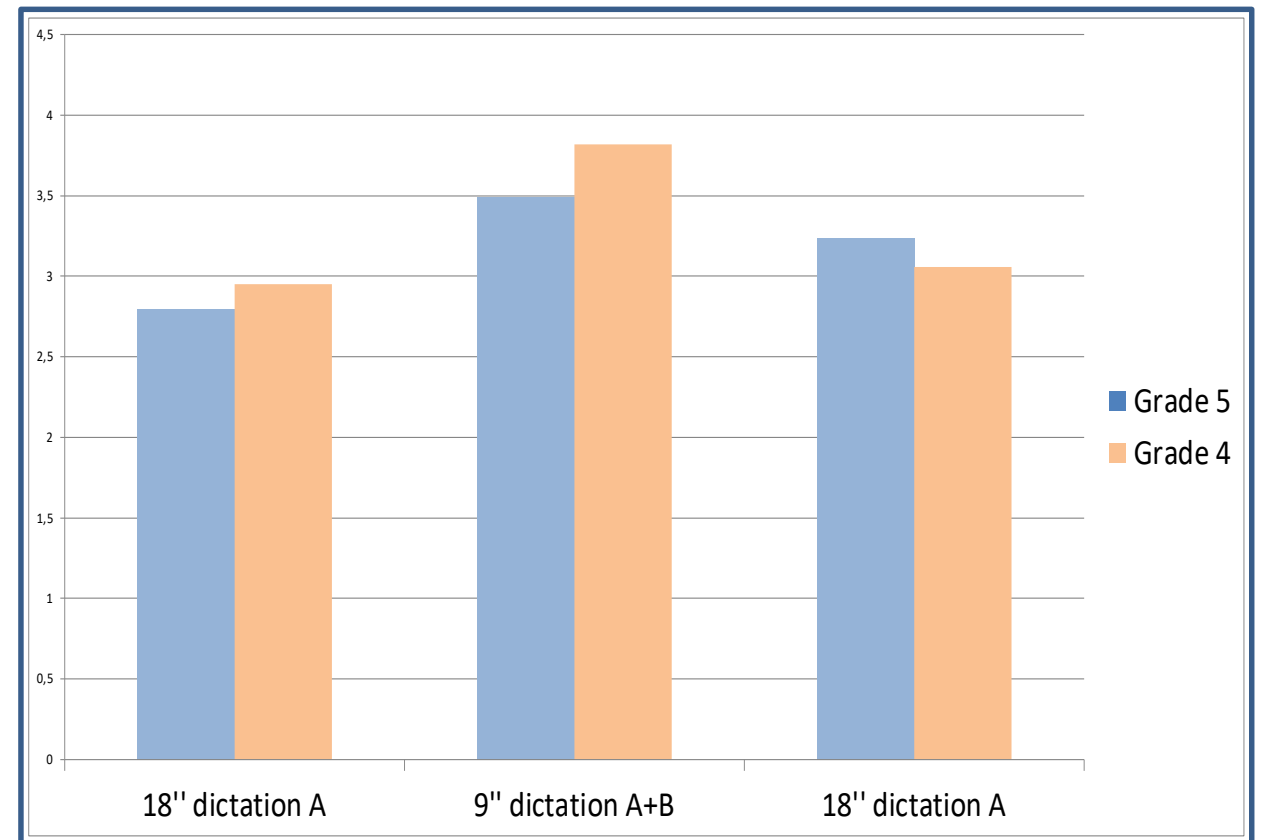
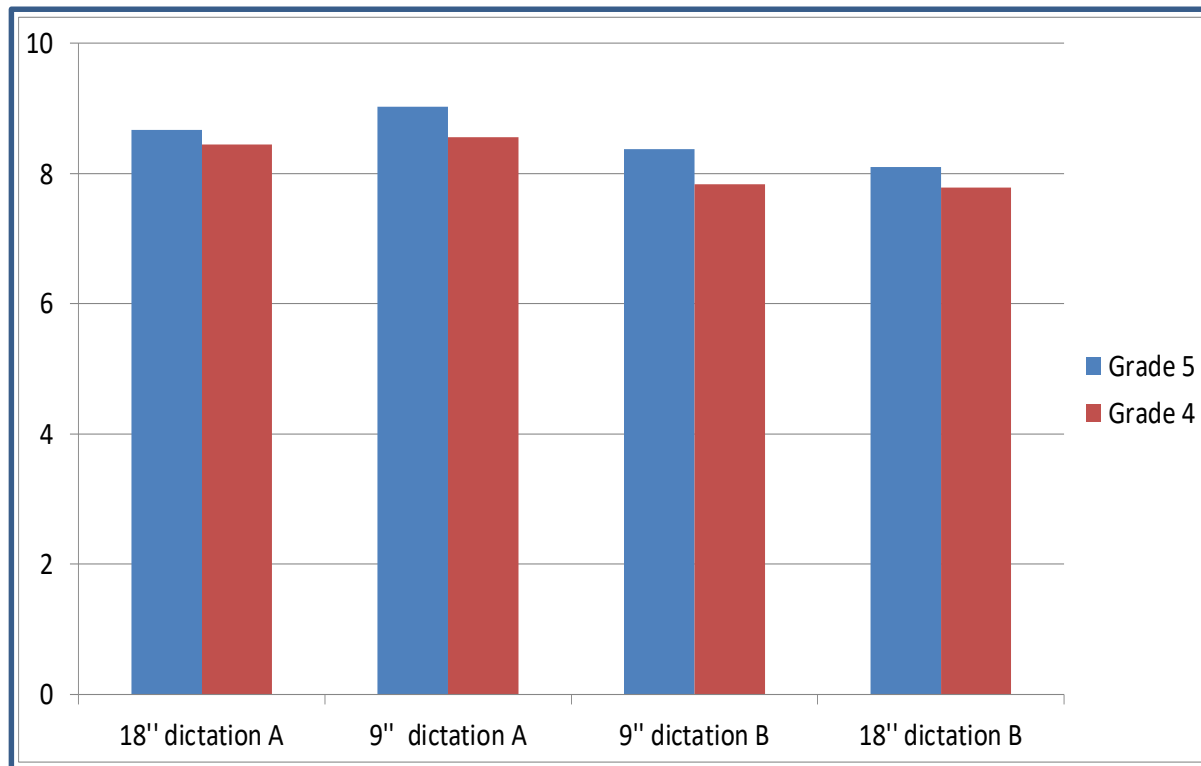
Results

1. No effect of grade (no difference in pre-test means)
2. No effect of time to write on performance
3. Significant effect on cognitive load
4. Effect on difficulty/fatigue $18'' < 9'$ and on boredom $18'' > 9'$



Results

1. No effect of grade (no difference in pre-test means)
2. No effect of time to write on performance
3. Significant effect on cognitive load
4. Effect on difficulty/fatigue $18'' < 9'$ and on boredom $18'' > 9'$



Experiment 3: replication + recall task more « TBRS » compatible

Variables	Participants	Materials	Measures
<ul style="list-style-type: none"> • Time to write: 18"/9" • Grade: 4, 5 	<ul style="list-style-type: none"> • 436 	<ul style="list-style-type: none"> • Same + <ul style="list-style-type: none"> • Subjective questions • 4 word recall 	<ul style="list-style-type: none"> • Same + <ul style="list-style-type: none"> • Motivation, fatigue, difficulty, boredom • recall

2 experimental conditions

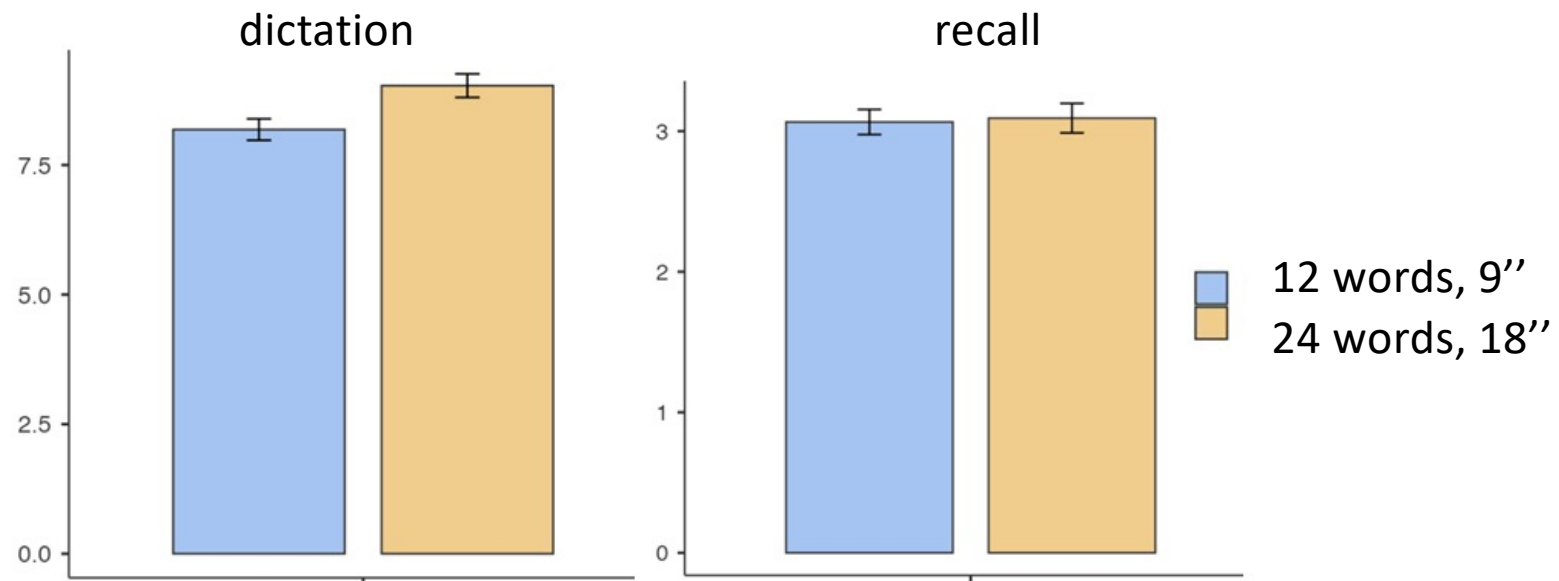
18''	9'
dictation A	dictation A+B
168 participants	148 participants
99 grade 5	102 grade 5
69 grade 4	46 grade 4

Independantes measure

Results

pre-test means significantly different at pre-test !

1. Effect of grade level CM2 > CM1
2. Effect of time to write on performance 9'' > 18'' but not on recall



3. No effect on cognitive load and other measures
4. No effect on recall (comparison of experiments 2 and 3)

Conclusion

- Easy to implement, ecological experimental design, new.
- Surprising results, not compatible or partially compatible with the TBRS model?
- Boredom effect at 18" which could perhaps explain it?
- WM resource depletion?

Thank you!