

# SPELLING DEVELOPMENT IN ALPHABETIC ORTHOGRAPHIES OF VARYING CONSISTENCY: MEASUREMENT MATTERS

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# Acknowledgements

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# Background

- Learning to spell is a relatively difficult skill.
- In alphabetic orthographies, almost invariably, some spellings deviate from the alphabetic principle.
- Deviations may reflect morphophonological, morphological, and supraphonological processes, etymological artefacts – e.g., graphotactic constraints, exceptions --, loan words, etc.
- The extent to which these occur in an orthography determines its system-wide P-G and G-P consistency.
- **Notably, even very consistent orthographies contain *some* P-G inconsistency.**
  - ▣ **How does this affect children's spelling development?**

# Some important facts

- **Impacts of orthographic consistency:**
  - Learning a High Consistency (HC) orthography promotes *faster rate* of reading and spelling development than learning a Low Consistency (LC) orthography.
    - Cross-sectional, cross-linguistic evidence (e.g., Caravolas & Bruck, 1993; Seymour et al., 2003; Wimmer & Landerl, 1997).
  - Longitudinal cross-linguistic studies of *reading* (few) show the benefit of consistency is most evident in *first grade growth spurt*; i.e., period of code learning.
    - e.g., Caravolas et al., 2013.
  - Longitudinal cross-linguistic studies of *spelling* are lacking.
    - Methodological challenges.
- **Main phases of spelling development:**
  - Phonological recoding (invented spelling) is initial, dominant spelling strategy (e.g., Caravolas et al., 2001; Treiman, 1993)
  - Conventional spelling is acquired progressively, over the primary years (e.g., Ehri, 1997; Frith, 1985)
  - Assume these learning phases apply across all alphabetic orthographies (e.g., Share, 2008)
    - But empirical cross-linguistic details are scarce.

# Questions and Aims

- In a direct, longitudinal, 5-language, cross-linguistic comparison:
  - ▣ Determine whether, as in reading development, the *rate* of spelling development varies as a function of orthographic consistency.
  - ▣ Does the method of measurement matter? Binary vs. Non-binary.
  - ▣ If system-wide consistency is influential, does it impact the rate of learning of both phonological recoding and conventional spelling (of orthographically and/or linguistically conditioned patterns)?

# Methods

## 5-Language, Longitudinal Comparison

### Participants:

Group	N	Age (T1)	NVIQ (T1)	VIQ (T1)
English	182	72.20	10.13	9.56
French	145	80.10	9.65	9.43
Spanish	188	78.76	11.78	9.16
Czech	137	84.00	10.39	10.30
Slovak	177	83.98	10.25	10.06

- **Demographics** – Primarily urban centres, regular primary schools.
- English group younger, but 1 year schooling advantage.
- TD samples (Caravolas et al. 2012, 2013).



Consistency	English	French	Spanish	Czech	Slovak
G→P	.68	.89	.93	.89	.90
P→G	.65	.60	.87	.91	.91

# Spelling to Dictation Measures

- Parallel design, appx. 35 words selected from children's lexical corpora – presented in sentence contexts -- including 7-9 items/category
- Repeated administration (6 x primer words; 4 x 'inconsistent' words)
- **Items equated across languages on:**

✓ **Word Length** - Letters and syllables

✓ **Word Frequency:** Token and lemma

✓ **CV structure** – consonant clusters/word

✓ **Type of inconsistency**

Examples	English	French	Spanish	Czech	Slovak
Primer Words	mum, in , to	maman, le, sur	mamá, en, por	máma, po, ale	mama, do, ale
Graphotactic	kettle	guidon	guiño	chyba	chyba
Morphophonol.	vinegar	gourmand	proteja	holub	holub
Morphological	baked	poulette	soñaba	podkova	podkova
Lexical (Etymol.)	wrist	faon	hada	mýdlo	mydlo
P-G Probability	0.625	0.580	0.830	0.888	0.894
Reliability $\alpha$	.87	.76	.93	.92	.91

# Scoring Methods

Scoring Method	Stimulus	Production & Analysis	Penalty	Score
Binary – Conventional Accuracy	wrist	risd	1	0
Levenshtein Letter based Edit distance	wrist	risd w≠∅ r=r i=i s=s t≠d	1 deletion 1 substitution	2
Ponto Phoneme based Edit distance	wrist	risd ɹ→r ɪ→i s→s t→d	0	0



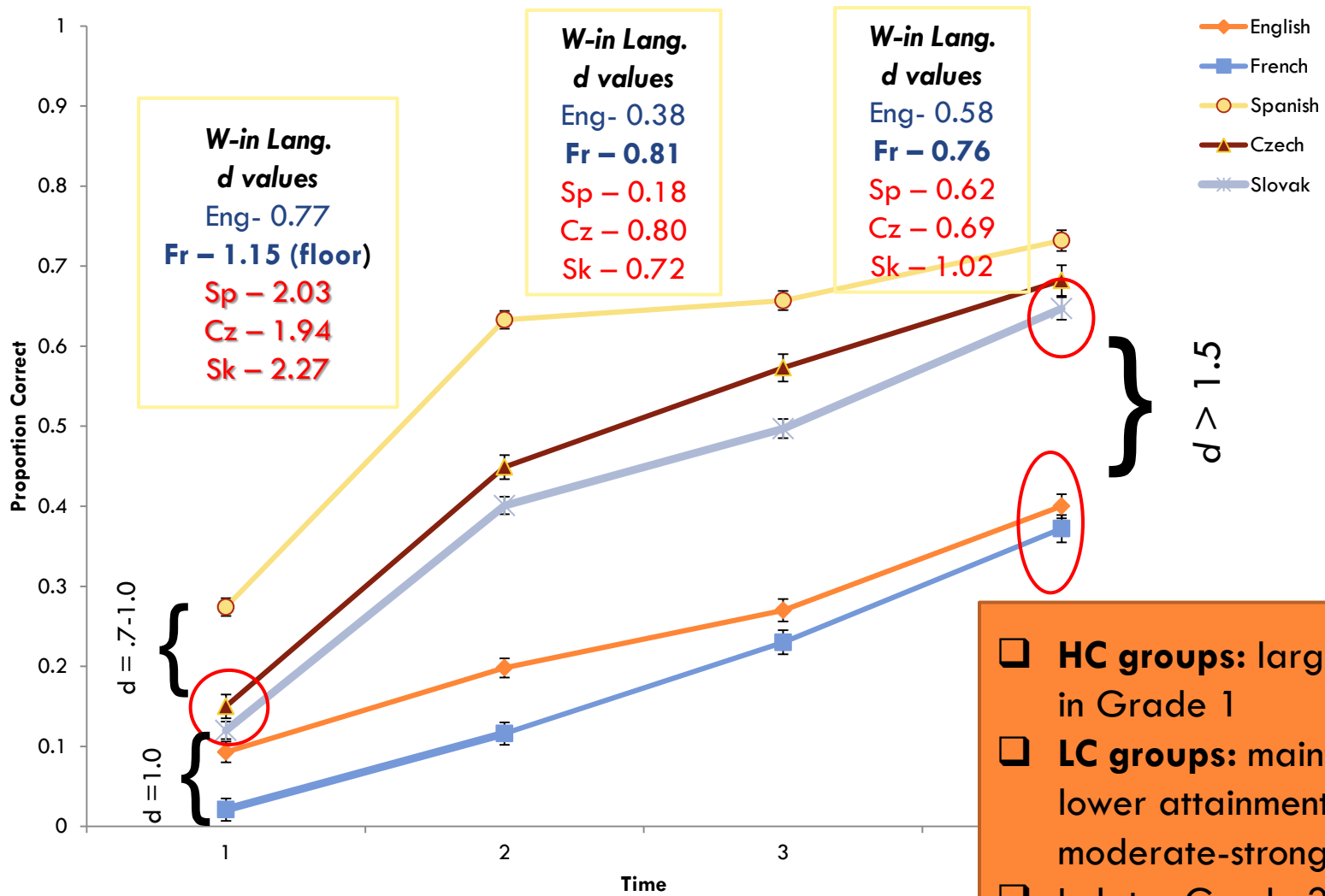
# Question 1 – Do rates and patterns of spelling growth vary as a function of orthographic consistency, when measured by binary conventional accuracy?

## □ Predictions:

- Learners of HC orthographies will experience faster rates of development
- All children will show growth spurt in first grade.
- Growth spurt will be greater in HC orthographies.

# Words with Targetted Inconsistencies

## Proportion Correct - Binary Conventional



**HC groups:** large spurt in Grade 1  
 **LC groups:** maintain lower attainments and moderate-strong growth  
 In later Grade 2, ALL groups developing at ~ similar rate.

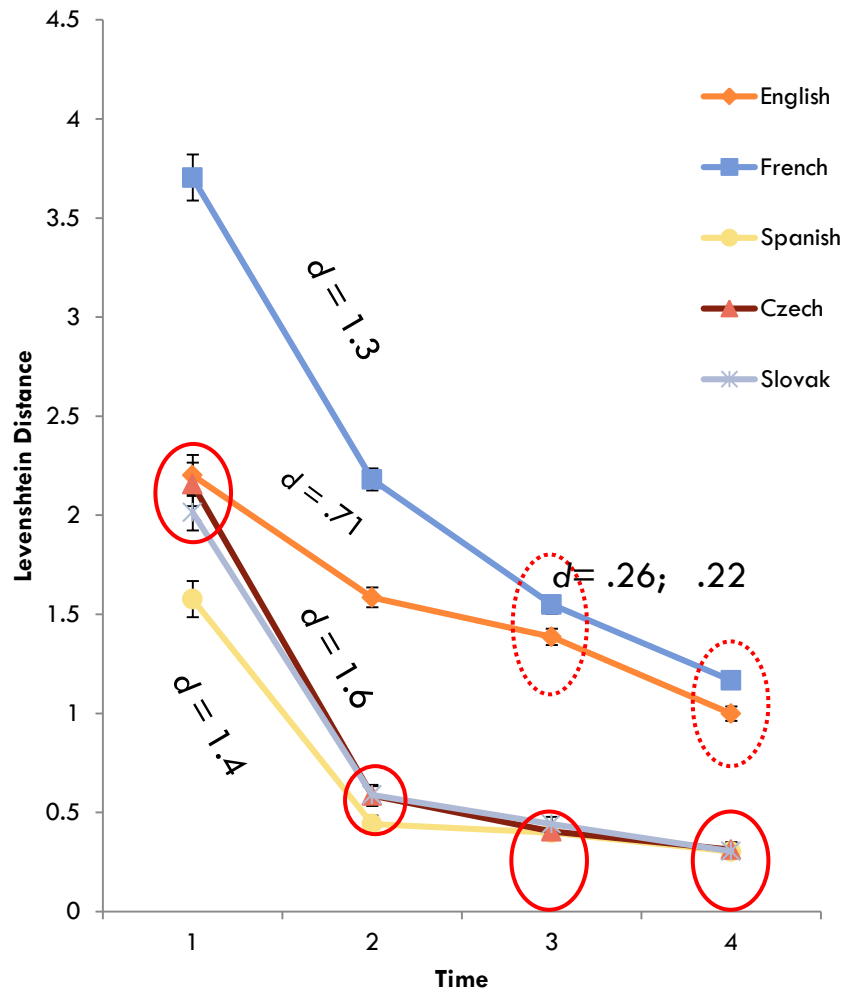
## Question 2 –Does grapheme string edit distance scoring reveal additional information about spelling development across the languages?

- While binary scores tell us the average percentage of correctly spelled words, string edit distance scores show on average how many errors occur per word.
- String edit distance scores should be more revealing of the quality of children's spelling productions.

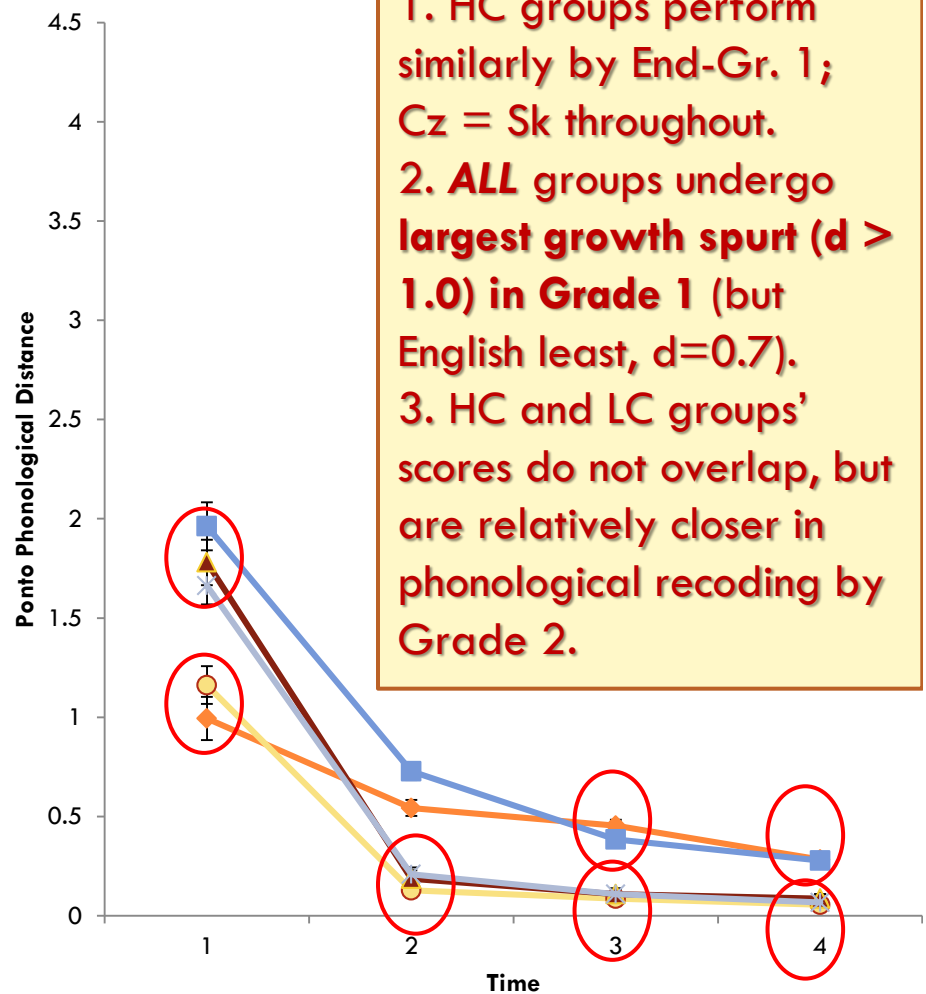
## Question 3 – Do variations in system-wide P-G consistency affect the rate of learning of phonological recoding?

1. If all children initially assume they are learning a HC orthography (Share, 2008), then expect cross-linguistically overlapping patterns of phonologically-based spelling development.
2. If low P-G consistency hinders the development of even this foundational skill, we expect English and French children to show weaker growth.

## All Words Levenshtein Grapheme Distance Score



## All Words Ponto Phonological Distance Score



1. T2 – T4: Clear differences b/w LC and HC groups, range  $d = 1.8 - 1.3$ .
2. French group shows clear spurt in grade 1.
3. English group most moderate growth.

1. T1 - LC groups similar to HC groups!
2. T2 – T4: Differences b/w LC and HC groups remain relatively small, approaching ceiling.

# Summary & Conclusions

1. As in reading development, the *rate* of spelling growth varies as a function of orthographic consistency.
  - i. By mid-grade 1, learners of HC orthographies have a relatively higher starting level of conventional spelling ability, and they progress more quickly through to second grade.
  - ii. All learners undergo a spelling growth spurt in grade 1, but English children less so.
2. Non-binary methods of scoring spellings show streamlining of HC and LC groups earlier in development and more clearly.
  - i. They reveal that LC orthography spellers misspell more words, and their spellings deviate more extensively from targets than do HC orthography spellers.
3. In phonological recoding development, despite similar starting levels across languages, system-wide consistency begins to impact the rate of learning of phonological recoding by the end of grade 1.