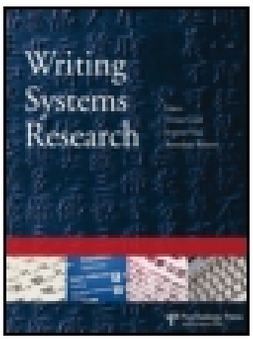

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Spelling patterns of German 4th graders in French vowels: insights into spelling solutions within and across two alphabetic writing systems

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ABSTRACT

Cross-language transfer in vowel spelling is difficult to detect because the relation between a vowel and its grapheme is often ambiguous within a writing system and the interpretation of transfer complex. This study examined French spelling patterns of German fourth graders with French as Foreign language cross-linguistically by applying a fine-grained measure to the differences in spelling, tested with a dictation. The study differentiated between phonologically and graphematically joint vs. unshared vowel graphemes in French and German and the contribution of each category to transfer. Instead of testing orthographic knowledge as in applying the orthographic norm correctly, it used the model of the 'graphematic solution space' [Neef, M. (2015). Writing systems as modular objects: Proposals for theory design in grapholinguistics. *Open Linguistics*, 1(1), 708–721.] that takes into account spelling that is graphematically licensed within the involved writing system. The analysis distinguished between poor and good German spellers to get insights on the relation of the pupils' competence in the German and French spelling. Results showed an influence of the phonological and graphematic overlap in the spelling patterns, but also inconsistencies with both writing systems. The findings challenge statistical learning in multilingual contexts as the produced graphotactic patterns are rather French-like than French.

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Evaluations of spelling are oriented, in general, to the orthographic norm. A spelling is, hence, correct or incorrect. However, the orthographic norm is not always the appropriate benchmark for the evaluation of spelling. A learner's writing, for example, can show spelling competencies even if the written word is not spelled correctly (Pacton, Borchardt, Treiman, Lété, & Fayol, 2014; Treiman & Bourassa, 2000; Treiman & Kessler, 2006). Indeed, a learner's spelling indicates which phonological or orthographic features are salient for him or her at a particular stage of spelling acquisition (Bahr, Silliman, Berninger, & Dow, 2012). What follows is a brief overview of the study of cross-language transfer in spelling. The focus lies on the differentiation between transfer across two language systems of multilingual learners, first and second language (L1, L2), in contrast, to transfer across two written languages. The latter focuses on the difference between the writing system in which a learner learnt to read and write (WL1) and a second writing system s/he learns subsequently (WL2). This paper argues that learners use the WL1 system in order to spell the WL2.

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The study of crosslanguage transfer in spelling

So called 'invented spelling' is one of the most heuristic research methodologies in the field of early spelling (Fijalkow, 2007). It includes the spelling of children, mostly preschoolers, who have been asked to write down words and sentences that they have never been taught (Ferreiro & Teberosky, 1982; Morin, 2007; Treiman & Bourassa, 2000). General results of recent research show that longer exposure of graphotactic constraints of a particular writing system enhances incidental learning of statistical regularities (Samara & Caravolas, 2014). Statistical learning, the unintentional sensitivity to graphotactic forms, plays an important role, as the frequency of the letters in the spelled language and children's exposure to letter sequences seem to be related to the letters used in their spelling (Pacton, Sobaco, Fayol, & Treiman, 2013; Pollo, Kessler, & Treiman, 2005; Samara & Caravolas, 2014).

Several authors have suggested, accordingly, that 'orthographic learning' (Tucker, Castles, Laroche, & Deacon, 2016, p. 80) is not limited to alphabetic decoding but describes a more general sensitivity to the regularities of a written language, such as the frequency of occurrence of letters and letter sequences as well as the regularity of particular spelling patterns (Samara & Caravolas, 2014). Sensitivity to graphotactic conventions refers to lexical and sublexical orthographic units, the latter referring to orthographic patterns such as identity and position of double consonants and vowels, composition of letters in onset and coda positions, and morphemes. The quality of graphotactic sensitivity has been studied, for instance, in French (Casalis & Colé, 2018; Pacton, Fayol, & Perruchet, 2002) and in English (Treiman & Kessler, 2006). Even in a relatively shallow writing system such as German, graphotactic sensitivity implies not only phoneme-grapheme relationship but also prosody such as the graphematic foot. One foot is a bisyllabic sequence with a trochaic structure, such as *shouter*, /ˈʃaʊ.tɐ/ with the syllable sequence stressed–unstressed (Evertz & Primus, 2013, p. 2). The same intonation pattern is valid in German, such as *Hunde* /ˈhʊn.də/ ('dogs'). The intonation pattern is represented as the graphematic foot in orthography.

Learning to spell in a first or second writing system

Learners who become literate in their first language (L1) use spelling that is characterised by the complex relationship between phonological and prosodic patterns within this language (L1) as well as its representation in the corresponding writing system (WL1) (Cook & Bassetti, 2005; Dahmen & Weth, 2018; Jaffré, 1997). Many learners become literate in a language they are less familiar with. This language (L2) may contain phonological and/or morphological information that exists also in the first language. If so, this information is already present in the learners' mind for spelling the newly acquired language (L2). Note that the L2 might be learned, in a second or a foreign language context, at the same time as the spelling of this language (WL1). The main difference between becoming literate in a writing system (learning WL1) or learning to read and write in an additional language (WL2) is that learners of a WL2 are already familiar with the visual sign system of a writing system and its references to the linguistic subsystems. If both, WL1 and WL2 are alphabetic writing systems, the learners of WL2 will already have gained experience with general rules about how language structures are encoded in writing. However, they will need to understand the new writing system's structures and its many relationships with the encoded language. Typical foreign language learners acquire spelling of the new writing system (WL2) at the same time as the foreign language (L2) itself. These learners use features from their L1 and their WL1 to acquire the new language structures (L2 and WL2) (Cook, 2005).

Cross-language transfer distinguishes between language-general and language-specific as well as lexical and sublexical aspects of transfer in L2 literacy development (Chung, Chen, & Deacon, 2018; Commissaire, Duncan, & Casalis, 2011; Jared, Cormier, Levy, & Wade-Woolley, 2013). The

Orthographic Distance Effect (Koda, 2005) is discussed when Deacon and colleagues report that first graders who learn to read and write in English and French simultaneously show greater orthographic processing skills to patterns common to both languages than to those that occur only in English or French (Deacon, Commissaire, Chen, & Pasquarella, 2013). Although it does not seem impossible that a learner acquires a second writing system quickly and implicitly, the reason might not lie only in the closely related first system s/he learned (Woore, 2014). No cross-language orthographic transfer was observed between two closely related languages, Dutch and German, when no instruction was given in one of these languages. A study with Dutch pupils, with and without instruction in English as a second language, asked if they would generalise orthographic awareness onto German, an un-instructed language to which the children might have some exposure due to the proximity of the Dutch-German border. The tests of German did not reveal any German-specific orthographic knowledge and awareness (van der Leij, Bekebrede, & Kotterink, 2010).

Regarding spelling, Bahr and colleagues point to the caveat when using the term transfer too generously and argue that usage of the term 'sheds minimal light on the phonological, orthographic, and morphological processes that undergird how students actually misspell' (Bahr, Silliman, Danzak, & Wilkinson, 2015, p. 74). A closer look into non-conform spelling patterns, i.e. spellings that do not comply with orthography, shows that grapheme-phoneme confusion of L2 children might also be an error type in L1 children (Dahmen & Weth, 2018; Escamilla, 2006). Vowel errors represent a substantial proportion of children's spelling errors (Treiman, Kessler, & Bick, 2002; Varnhagen, Boechler, & Steffler, 1999). The often ambiguous relation between a vowel and its grapheme entails misapplication. Moreover, non-accentuated and short vowels are difficult to perceive as their articulation lacks a distinct position. Furthermore, several graphemes might represent one vowel, and one vowel grapheme might represent several vowels. In foreign language learning contexts, English pupils learning French show difficulties in vowel decoding (Erler & Macaro, 2011; Woore, 2014). Regarding real word decoding, a high variety of spellings for the representation of one vowel was observed. These learner decodings show French and English solutions, but also forms that are not consistent with either system.

Statistical learning of graphotactic forms

Given that a large quantity of linguistic information is represented in a child's spelling from the start of literacy acquisition, several authors argue that learning to spell must be, to some extent, unintentional learning. They assert that a child's extraction of pattern skills relies on 'implicit' or 'statistical' learning (Deacon, Conrad, & Pacton, 2008; Pacton et al., 2002; Pollo, Kessler, & Treiman, 2009). The assumption of statistical learning is that children acquire lexical and sublexical forms of a word within the self-teaching hypothesis (Share, 1999). It proposes that orthographic learning depends on a child's frequency of exposure to a particular word and argues that orthographic ability is based on 'typical spelling knowledge' (Share, 1999, p. 98). Pacton and colleagues define this knowledge as being sensitive 'to the distributional or statistical features of the [orthographic] material' (Pacton, Perruchet, Fayol, & Cleeremans, 2001, p. 402). Whether graphemes are detected as functional units in English word recognition tasks has been studied with several groups of English L2 learners with French as their L1 (Commissaire, Duncan, & Casalis, 2014). The rationale behind these experiments was that complex graphemes affect longer latencies than simple graphemes and that the latencies differ between complex graphemes that are specific to L1 and L2 or to L2 only. The results showed that even beginners of L2 English decoded the complex grapheme as a functional unit in L2 visual word recognition. This access to orthographic processing also contributes to spelling (Chung et al., 2018).

Although the sensitivity for orthographic analogies seems to exist across all learners, the degree of orthographic learning and transfer depends on the learner's capacity to decode novel words

within a story (Tucker et al., 2016). Differences in good and poor writing learners apply also for spelling (Holmes, Malone, & Redenbach, 2008; Richards, Berninger, & Fayol, 2009).

In summary, substantial evidence supports the potential of bilingual learners drawing on learning experiences in their first written language to spell new words. They might also draw on certain graphotactic forms in the yet untaught second language writing system. The literature also supports the possibility that good and poor spellers in their first written language might perform differently in spelling the second language writing system.

Research question and rationale for the methodological approach

The present study investigates sublexical orthographic transfer in a manner that is sensitive to phoneme-grapheme relations that overlap, or do not, in German and French. In contrast to other studies on cross-linguistic orthographic transfer and orthographic processing, this study does not test orthographic knowledge related to the orthographic norm. Instead, it uses the model of the 'graphematic solution space' (Neef, 2015) as analytical framework. This model does not follow orthographic correctness but takes into account spelling that is graphematically licensed within the respective writing system. More precisely, it defines the set of possible spellings for a word with a specific phonological representation. For instance, the French word *jupe* ('skirt') is the orthographically correct form for /ʒyp/. However, graphematically, more spellings are possible, such as < jûpe, juppe, jype, jyppe>. On this level, the 'graphematic solution space' describes the consistency of a writing system. In this paper, the model is adapted for the acquisition of a second writing system. To do so, the graphematic solution space of the WL1 German for the wordform of the target language and WL2 French is also integrated. Several problems can occur: First, not all phonemes in German and French are identical; second, identical phonemes might be represented with different graphemes. In the case of the phonological form /ʒyp/, possible spellings in German would be < Schüpp, Dschuep>. The given examples show that the rhyme of the word and the initial capital letter clearly fit into the German graphematic system. The transcription of the initial consonant /ʒ/, however, allows as an approximate solution only (<sch> for /ʃ/ , <dsch > for /dʒ/), as /ʒ/ is not part of the German phonological system. Concerning the French spelling, German pupils are expected to apply a mix of both graphematic systems. It is also expected that poor spellers in German produce different spelling patterns for French than good spellers in German.

The fine-grained analysis of French vowel spelling of German pupils gives insights in the production of sublexical graphemes. Vowels represent a substantial proportion of spelling errors as the phonological category of vowels and its relation to a grapheme is often difficult to comprehend. Concretely examined is the direct contribution of joint vs. unshared vowels, monophthongs only, in German (WL1) and French (WL2) on spelling in the WL2 French. German vowels are represented, in general with monographs such as <a>, <e>, <i>. Some vowels are systematically represented with a digraph such as /iː/ <ie > and /ɐ/<er>. Diacritics exist as trema in the graphemes <ä>, <ö>, <ü> (Dahmen & Weth, 2018). French vowels may be represented with simple or complex graphemes, composed by up to four letters. Characteristic for this writing system are the high number of digraphs, however (i.e. <ou > for /u/, nasal vowels composed by a vowel letter plus the letter 'n'). Diacritic markers can also be use, such as <é>, <è> (Sprenger-Charolles, 2013). The study asks how German fourth-graders learning French for four years represent French vowels. It examines, first, the direct contribution of joint vs. unshared sublexical graphemes on transfer. To reach this first aim, the vowels are differentiated into the following categories.

(1) French vowels that share phonologic and orthographic overlap with German (F==G).[1]
(2) French vowels that share phonologic but not orthographic overlap with German (F=≠G).
(3) French vowels that share neither phonologic nor orthographic overlap with German (F≠≠G).

For instance, case (1) (F==G) represents /a/ transcribed as <a > in German and French. It also applies to the Schwa transcribed with <e > in both writing systems. Phonologically equal, the phonetic realisation of the French Schwa corresponds, however, slightly more to /ø/ or /œ/ in German (Delattre, 1964). Case (2) (F=≠G) represents /y/, transcribed <u > in French and in German, and /u/, transcribed <ou > in French and <u > in German. Case (3) (F≠≠G) represents French graphemes that do not exist in German, such as nasal vowels (/ɛ̃/, /ɑ̃/, /ɔ̃/). In general, these vowels are transcribed as digraph with vowel letter and the letter 'n' (i.e. <in>, <an>, <on>), when followed by a bilabial consonant with 'm' (i.e. <im> as in <impair>).

The study's second aim is to analyze the influence of the pupils' competence in the WL1 German on spelling the WL2 French. Thus, this study compares the spelling patterns in French of pupils that are poor and good spellers in German.

Analyses did not differentiate between spelling with and without diacritica. A spelling with diacritica such as <ú> was counted in the same category as <u>. The rationale of this categorisation are pupils' frequent comments on the produced diacritia as 'strokes' that would make the spelling 'French' (Weth, 2010). The only exception is the categorisation of the spelling of /e/ as <é>. Unlike other diacritics in this paper, <é> is phonologically meaningful as it distinguishes /ɛ/ (<è>) from /ə/ (<e>). Categorisation therefore counted <é> as French, but neglected all other possible diacritica (<è, ê>) subsuming them with <e> as German spelling. An example would be the plural article *les* [le]: Spelled as *<lé>, the word form is conform to the French phonologic recoding [le] and therefore counted as 'French'. Spelled as *<lè> or *<le> however, the French phonologic recoding ([lɛ], [lə]) is not conform to the phonologic recoding of the article *les*, and the graphemes count as 'German', accordingly, without taking into consideration the diacritic.

Method

Participants

Our 97 participants were all at the end of Grade 4 at the time of the study and attended one of the participating six classes in four schools in Southern Germany, close to the French border. 44 pupils (45%) were female. For 54 pupils (56%) German was the first language; the remaining 44% comprise eleven different languages as L1. For none of the pupils French was the first language; the largest group (13%) represent pupils with Russian as L1. All pupils, however, were schooled exclusively in German schools. German was, hence, their first written language (WL1). No one had learned to read and write in French or any other language in a formal educational setting.

In all classes, instruction in French started in Grade 1 in the context of foreign language learning in primary schools (Kierepka, 2010). Instruction was given two hours per week, focusing on oral language learning with the aim of communicative competences in everyday situations (Ministerium für Kultus Jugend und Sport Baden-Württemberg, 2004). Although no systematic literacy instruction was foreseen in French, writing was presented as holistic word representations in vocabulary cards and small texts. Pupils therefore had an opportunity to pick up written words and regularities of French orthography. The instruction methods of teachers and their competences in French varied to a certain extent; however, all classes used the official book for teaching recommended at the time.

Materials and procedure

The study was carried out in June and July 2009. The participants were randomly recruited using informed parental and school consent procedures from the participating schools. Testing was administered collectively, with the whole class, in one French lesson, for the French test, and several days later in one German lesson for the German test. All tests were carried out by the author (CW). All instructions were given in the instruction language, German, to ensure correct

understanding. Administration order was identical for all pupils. The dictated items, of the French and the German dictation, were repeated until all pupils had written down the item. For the French test, the pupils were asked to translate each dictated item into German to ensure the understanding of all pupils. Data processing documented each spelling solution for each vowel. The vowels were then categorised into one of three spelling patterns that represent either solutions within the German graphematic solution space, the French graphematic solution space, or solutions that would fit neither of both.

French spelling

French spelling was assessed using a dictation containing 23 units, comprising 12 noun phrases and 7 sentences (see appendix). Each dictated phrase or sentence contained 2–4 words. All items were taken from the French schoolbook Grade 3. Although all words had been used in the French teaching, the pupils' familiarity with the dictated items might have differed according to family background and the teacher. In order to control possible graphotactic word memorisation effects, the dictation contained 4 pseudoword units. They were introduced as non-existing but possible French words that do not have an orthographic rule yet. As this paper is limited to the spelling analysis of specific vowels, the analysis takes into account content and function words out of 14 dictated units, including 2 pseudowords.

German spelling

German spelling was assessed using the 'Die Hamburger Schreib-Probe 4/5' (HSP 4/5) (May, 2001). It examines the writing strategies of pupils attending the second half of Grade 4 and the first half of Grade 5. The test is paper-pencil based and was administered according to instructions. The analysis of the test was restricted, however, to the count of the raw score of the correct graphemes (277 in total). The raw score ranged from 212 to 277 (median 267, mean 262). For group comparisons, the pupils were divided into four quartiles of poor to strong spellers in German (Q1: $n = 25$, 212–260; Q2: $n = 25$, 261–267, Q3: $n = 23$, 268–271, Q4: $n = 24$, 272–277). Regarding the relation between German spelling and L1, results point towards a small advantage of pupils with German as L1 (Q1: 8 pupils with German as L1 against 17 with another language as L1, Q2: 19 against 6, Q3: 12 against 11, Q4: 15 against 9). The proportion of students with German as L1 and the spelling abilities differ significantly between the quartiles, X^2 (3, $N = 97$) = 10.43, $p < .05$, meaning that students with German as L1 significantly outperform those with another language as L1. This advantage subsists although all pupils were educated exclusively in German schools. For the second aim of the study, only Q1 and Q4 pupils will be considered to ensure clearly distinct groups in regards to the pupils' competence in the WL1 German. Pupils of Q1 are referred to as poor spellers, those of Q4 as good spellers.

Results

Frequencies were analyzed for the spelling of French vowels with and without phonologic and/or orthographic overlap in German. First, the frequencies of all French spellings are reported for all pupils. Then, the French spellings produced by poor and good spellers in German are compared.

In all tables, spelling solutions are presented as written within the German (+G) or French (+F) solution space, or as not entering either solution space (-G/-F). The presentation includes the mean frequency in percentages in each solution category for all pupils and for the 1st and 4th quartile of the pupils according to their spelling performance in German (HSP4/5). In Tables 2, 3, and 4, the spelling solutions are differentiated per vowel. Additionally, the bottom rows (all pupils, Q1/Q4) present the major spelling occurrences within the graphematic solution space including the exact number of occurrences. Only vowels that correspond systematically to a particular grapheme are presented.

Presentation of the spelling frequencies across and within the three categories

The overall results reflect the differences between the three categories, (1) French vowels that share phonologic and orthographic overlap with German (F==G), (2) French vowels that share phonologic but not orthographic overlap with German (F=≠G), and (3) French vowels that share neither phonologic nor orthographic overlap with German (F≠≠G). The results also confirm that the pupils spell the new writing system, i.e. French, differently than German, activating not only their resources in the German writing system but also French spellings. The results are summarised in Tables 1–4, indicating overall means and distinguishing means of poor and good spellers in German. Table 1 gives an overview over all categories. Tables 2–4 show results for vowel spelling within each category and indicate the most frequent grapheme choices.

Vowels that share phonologic and orthographic overlap in French and German (F==G)

Vowels that share phonologic and orthographic overlap in French and German (F==G) are 79.2% spelled by the vowel shared in French and German (+$F^{=G}$, see Table 2). Within this category, the phoneme /a/ was presented as <a> in 91.6%. Special graphemes of the German writing system that would recode the French phoneme correctly (+$G^{special}$) make up 5.1% of the spelling solutions. Even if only few spellings of /a/ showed a different form than <a>, the non-conform German spellings are worth noting as they used the letter 'r' in order to produce an [a] sound such as the grapheme <er> representing [ɐ] as in *Kater* /katɐ/ ('cat') and <ar> representing a lengthened [aː] as in *Arbeit* /aːbaɪt/ ('work').

The phoneme /ə/ was presented as <e> in 66.9%. Spelling of /ə/ differed here between the occurrence within the determiner *le* with 72.4% of <e> spelling and the occurrence within the adjective *petit* with 59.6% of <e> spelling. Spellings for /ə/ categorised as within the German graphematic solution space used mainly <ö>, a grapheme that corresponds phonologically to the French /ə/ (5.5%). Additionally, 27.6% (19.6% of spelling /ə/ in *le* and 38.3% of spelling /ə/ in *petit*) could not be interpreted within the respective writing systems. Pupils' solutions showed vowel graphemes, mono- or diagraphs, mainly <o, u, ü, i>, but also <ou, es, eu, oi, a, á, à, ò, ó, ù, os, ös, óe, òo, eo, ur, or, an, ès, ie>.

Vowels that share phonologic but not orthographic overlap in French and German (F=≠G)

About 51.5% of the vowels that share phonologic but not orthographic overlap in French and German (F=≠G) are written with the German grapheme (see Table 3). The other half are spelled either with the French grapheme (34.1%) or with a non-conform spelling conforming neither to the German or French graphematic solution space (14.4%).

In the category of vowels that share phonologic but not orthographic overlap with German (F=≠G), the phoneme **/y/** was presented 46.9% with the French monograph <u> (or <ú, ù, û>)

Table 1. Spelling solutions of all vowels within all 3 categories.

	F==G			F=≠G			F≠≠G		
	/a/, /ə/			/y/, /u/			/ɛ̃/, /ɔ̃/, ɑ̃/		
	+$G^{special}$	+$F^{=G}$	-G/-F	+G	+F	-G/-F	+G	+F	-G/-F
Mean all pupils (%)	5.1	79.2	15.7	51.5	34.1	14.4	42.5	41.8	15.8
Mean pupils in Q1 (%)	7.8	69.9	22.3	63.5	25.7	10.8	57.7	30.1	12.1
Mean pupils in Q4 (%)	3.1	90.9	6.0	41.3	42.9	15.8	24.1	57.4	18.0

Notes: All pupils $n = 97$, Q1 $n = 25$, Q4 $n = 24$. Within the category F==G, the default graphemes valid for French and German are represented under the category + $F^{=G}$. Special graphemes of the German writing system that would recode the French phoneme correctly are represented in the category + $G^{special}$.

Table 2. Spelling solutions of all vowels within the first category: French vowels that share phonologic and orthographic overlap with German (F==G) differentiated between /a/ and /ə/.

	F==G					
	/a/ (n = 668)			/ə/ (n = 675)		
	$+G^{special}$	$+F^{=G}$	-G/-F	$+G^{special}$	$+F^{=G}$	-G/-F
Mean all pupils (%)	4.7	91.6	3.8	5.5	66.9	27.6
Mean pupils in Q1 (%)	2.9	93.6	3.5	12.6	46.3	41.1
Mean pupils in Q4 (%)	5.6	92.6	1.9	0.6	89.3	10.1
Spelling occurrences						
All pupils	er (16) ar (12)	a (585) á (20)	o (8) e (6)	ö (31)	e (399) é (36)	o (57) u (29) ü (32) i (23)
Pupils in Q1	er (3) ar (2)	a (153) á (6)	o (1)	ö (19)	e (74) é (5)	o (21) u (10) ü (16) i (6)
Pupils in Q4	er (6) ar (3)	a (145) á (7)	–	ö (1)	e (129) é (11)	o (5) ü (5) i (5)

Note: All pupils n = 97, Q1 n = 25, Q4 n = 24. Within the category F==G, the default graphemes valid for French and German are represented under the category + $F^{=G}$. Particular features that exist in German are represented in the category + $G^{special}$.

and 38% with the German solution <ü, ue> (or <ué>). Although variation occurred within the presented words, the determinant *une*, the noun *jupe*, and the pseudonoun /fyp/, the mean tendency remained stable. The phoneme **/u/**, spelled correctly with digraph in French, showed a different pattern and was transcribed in 71.8% with the German solution <u> and only 15% with the French <ou>.

Relatively few non-conform spellings transcribed /y/ or /u/ in neither the French or the German way with 15.2% 13.2%, respectively. The individual solutions to represent /y/ vary widely. While the grapheme <ou>, followed by, is used most frequently, other solutions are: <eu, ôu, óu, éu, e, é, a, o, ò, oe, au, ua, uo, uoi, uea, eü, oü, ui, euh>. The respective spelling solution for /u/ is mainly <o>, but also <ü, o, au, ua, uo, ue, uè, oua, uou>. The spelling of both vowels indicates an approach to the French orthographic characteristic of di- (or tri-) graphs, including at least one part of the digraph <ou>, the letters 'u' or 'o'.

In order to control for irregular spelling, two more vowels are represented in the data that have phonologic but not orthographic overlap with German. The vowels /ø/ and /e/ are written with a special grapheme that does not refer to regular patterns of representation between a phoneme and a grapheme. The vowel **/ø/** occurs only in the word *deux* (/dø/, 'two'). The frequency of spelling /ø/ within the French graphematic solution space is 35.1%. The French spelling solutions here split into two strategies: One strategy was to use <e>, a grapheme that regularly transcribes /ə/ in French. The rationale behind this might be that the vowels /ə/ and /ø/ were perceived as one category by the German pupils and therefore represented with the same grapheme. The other strategy was to distinguish /ə/ and /ø/, representing the vowel with the graphematically correct digraph <eu> or the full orthographic form in the word *deux*, <eux>. Note that only one word was dictated with /ø/. Only 21.3% of these spellings represent a grapheme within the German graphematic solution space <ö, oe>, and 43.6% show a grapheme without any relation to the French or German graphematic solution space. The graphemes that do not follow the French or German form for /ø/ are <o, ue> as well as <ó, ò, or, ée, ea, u, i, uo, oux>.

The vowel **/e/** occurred in the determinant *les* and the form *c'est* that merges the demonstrative pronoun (*ce*) and verb (*est*, 3.Sg) into the oral form /se/ ('that is'). 82.4% of the spellings follow the German solution <e, è, ê, eh>. The 15.1% of French solutions consist of either <é> or a digraph including the letter 'e' and a final unpronounced consonant such as <er, es, et>, frequent in the French writing system. Non-conform spelling beyond the French or German graphematic solution

Table 3. Spelling solutions of all vowels within the second category: French vowels that share phonologic but not orthographic overlap with German (F=≠G) differentiated between /y/ /u/ /ø/ and /e/.

	F=≠G											
	/y/ (*n* = 289)			/u/ (*n* = 189)			/ø/ (*n* = 94)			/e/ (*n* = 193)		
	+G	+F	-G/-F	+G	+F	-G/-F	+G	+F	-G/-F	+G	+F	-G/-F
Mean all pupils (%)	38.0	46.9	15.2	71.8	15.0	13.2	21.3	35.1	43.6	82.4	15.1	2.6
Mean pupils in Q1 (%)	54.7	35.8	9.4	76.6	10.5	12.9	29.2	16.7	54.2	87.7	8.2	4.2
Mean pupils in Q4 (%)	27.8	52.8	19.4	61.5	28.1	10.4	12.5	50.0	37.5	75.0	22.9	2.1
Spelling occurrences												
All pupils	ü (103)	u (121)	ou (7)	u (127)	ou (27)	o –(9)	ö (17)	eu (9) eux (11)	o (15) ue (4)	e (142)	é (21)	i (1) ie (1)
Pupils in Q1	ü (40)	u (24)	ou (1)	u (36)	ou (5)	o (4)	ö (6)	eu (1) eux (2)	o(7) ue (1)	e (39)	é(3)	i(1) ie (1)
Pupils in Q4	ü (17)	u (36)	ou (3)	u (26)	ou (12)	o(1)	ö(3)	eu (2)	ue (2)	e (31)	é(8)	–

Note: All pupils *n* = 97, Q1 *n* = 25, Q4 *n* = 24.

Table 4. Spelling solutions of all vowels within the third category: French vowels that do share neither phonologic nor orthographic overlap with German (F≠≠G) differentiated between /ɛ̃/ /ɔ̃/ and /ɑ̃/.

	F≠≠G								
	/ɛ̃/ (*n* = 94)			/ɔ̃/ (*n* = 485)			/ɑ̃/ (*n* = 289)		
	+G	+F	-G/-F	+G	+F	-G/-F	+G	+F	-G/-F
Mean all pupils (%)	28.9	2.1	69.1	45.3	43.3	11.4	42.2	52.6	5.2
Mean pupils in Q1 (%)	36.0	0.0	64.0	63.4	30.1	6.6	55.6	40.3	4.1
Mean pupils in Q4 (%)	20.8	4.2	70.8	19.2	65.8	15.0	33.3	61.1	5.5
Spelling occurrences									
All pupils	e (9) é (9)	in (1) en (1)	on (13) a (17) an (6)	o (177)	on (195)	ou (7) onge (6)	o (64) or (50)	an (52) on (95)	oun (5)
Pupils in Q1	e (2) é (2)	–	on (3) a (4)	o (60)	on (32)	ou (1) onge (2)	o (28) or (11)	an (8) on (20)	–
Pupils in Q4	e (1) é (4)	en (1)	on (5) a (2) an (4)	o (16)	on (76)	ou (5)	o (9) or (11)	an (17) on (27)	oun (2)

Note: All pupils *n* = 97, Q1 *n* = 25, Q4 *n* = 24.

space remain below 5% in the representation of /e/. It is important to emphasise that the rationale of this analysis was that, unlike other diacritics in this analysis, spelling of <é> for /e/ was defined as French, corresponding to the French norm. However, all other diacritics were neglected and, depending on the basic grapheme, subsumed as German or non-conform spelling.

Vowels that do not share phonologic neither orthographic overlap in French and German (F≠≠G)

Nasal vowels are phonemes in French but not in German. Spelling solutions therefore do not only reflect the representation of a given sound but also the identification of this sound as a distinctive category. Nasal vowels were categorised as follows: The French solution space was identified if the vowel quality corresponded approximately to the sound and was represented with an additional letter 'n' or 'm', the sign to represent the nasal quality in French. As the vowel quality for /ɛ̃/ relies on a rather closed vowel, only <in> and <en> were defined as phonologically appropriate. As /ɔ̃/ and /ɑ̃/ are based on rather open vowels, <on>, <an>, but also <un> were defined as phonologically appropriate transcriptions. Accordingly, pupils' solutions within the French graphematic solution space were for /ɛ̃/ <en, in>, for /ɔ̃/ <on, om, an>, and for /ɑ̃/ <an, am, on, un>. Pupils' solutions within the German graphematic solution space for /ɛ̃/ were <e, i, ae>, and for /ɔ̃/ and /ɑ̃/ respectively <o> and <a> (see Table 4).

On average, the nasal vowels **/ɔ̃/** and **/ɑ̃/** were spelled equally within the German system (45.3%; 42.2%) and were mainly represented with <o>, /ɑ̃/ additionally with <or>. Spelling differed within the French graphematic solution space (43.3%; 52.6%). Both vowels were mainly represented with <on>, /ɑ̃/ additionally with <an>. Further, more non-conform spellings exist for /ɔ̃/ (11.4%) than for /ɑ̃/ (5.2%).

While the vowel /ɔ̃/ includes a large variety of non-conform spellings (<oun, in, ên, aon, é, eu, al, or, os, oe, ou, oa, ot, och, onge, one, onn, oin, oie, oene, oné, onns, onne, oon, ote, ouar, òar, ör, iér, ion, io, uar, eug, ué>), /ɑ̃/ produces fewer and less variety (<ouen, oun, oin, os, ou, ol, orn, ourn>).

The vowel **/ɛ̃/** is represented by only one occurrence (*magasin* /magazɛ̃/ 'shop'). Barely any spelling integrated the French graphematic solution space (2.1%), against 28.9% of German and 69.1% non-conform spellings. German spelling consisted of <e> or <é>. Non-conform spelling solutions imitated an oral or nasal vowel, but with an open instead of a closed vowel, such as <on, an, a>. In total, the non-conform spelling of /ɛ̃/ encompasses the variety of <an, on, ion, ang, one, ine, ö, a, à, ä, o, ah, ar, ou, ia, iò, ama, ag, ho, et, eu>.

Although to a different extent, non-conform spellings of each nasal vowel also include spelling with the letter 'r', a form transferred from German. One function of the so-called 'vocalized r' is to represent a lengthening effect. The German pupils might have perceived this vowel lengthening in dictation of the nasal vowel. Not all forms including 'r' are, however, possible in the German writing system.

The spelling of di- (tri- and quadri-) graphs is remarkable for all nasal vowels. 64.6% of all spelling patterns are di- (tri- and quadri-) graphs, with 84 different letter combinations. Interestingly, 23 cases (4%) of these spellings consist of < eng, ong, ang, onge>. This form might refer to a special spelling of the adapted pronunciation of nasal vowels in German foreign words such as the French borrowing *restaurant*, articulated as [ʁəstɔˈʁɑ̃] in French, and [ʁestaʊˈʁaŋ] in German.

Presentation of the spelling frequencies and spelling solutions of poor and good spellers in German of the French phonemes

The spelling results in the German test (HSP 4/5) had a wide range from 212 to 277 points. Spelling variety among the Q4-group ranges from 0 to 5 errors in total. Pupils in the Q1-group varied greatly between 16 and 65 errors. Vowel spelling is a minor issue in German. Nevertheless,

some words are prone to error. Errors occur as vowel omissions and the choice of a wrong grapheme, phonologically or morphologically based. Errors also affect the consonantal context of the vowels, mainly the coda. An example of non-conform spelling in German would be the word *Gießkanne* (/ˈgiːskanə/, 'watering pot') as, for example *<Giskane>, *<Kissganne>. Errors mainly neglect the context-sensitive difference between short and long vowel (/ɪ/:/iː/; /a/:/aː/). Morphological errors would be *<Bletter > instead of *Blätter* (/ˈblɛtɐ/, 'leaves'). Both pupils with German as first and second language produce these spelling.

Group differences in French spelling were found in relation to the spelling results in German. Additionally, differences regarding the missings and the diacritica were observed as well. In total, 1.1% of the dictated vowels were not written down by the pupils (32 out of 3007), half of which were missing in the writing of poor spellers in German. The count of diacritica over all vowels resulted in 242 accents and apostrophes. Frequency differences occur between the Q1 and Q4-groups. Regardless of a correct or even spelling rule-compliant use of accents and apostrophes on vowel graphemes, Q1-pupils spelled 20.4% of the diacritica, while Q4-pupils produced 31.8%. Spelling results of German poor (Q1) and good (Q4) spellers in French are reported in the following by vowel category.

Vowels that share phonologic and orthographic overlap in French and German (F==G)

Vowels that share phonologic and orthographic overlap in French and German (**F==G**) are spelled in 79.2% with a vowel shared in French and German ($+F^{=G}$). This shared grapheme is used for almost all spellings in the Q4-group (91%). About 30% of the Q1-pupils used spelling solutions that are either more strictly marked as German or differ phonologically and graphematically from both writing systems.

A closer look shows that almost all pupils represent **/a/** with the default grapheme <a> in French and German. The word *magasin* triggered most of the non-conform spelling solutions. Here, eight Q4-pupils spelled /a/ with the German-marked grapheme <er, ar> (17.4%) versus two Q1-pupils (4.1%).

For Schwa, **/ə/,** 89.3% Q4-pupils produced the appropriate French vowel grapheme <e>, while this was only the case in 46.3% of the Q1-pupils. Both groups produced more <e> spellings for the article *le* than for the adjective petit. While the non-conform spelling of Q4-pupils consisted of 18.1% for *petit*, it covered 59% of the Q1-pupils with the main variety of <u, u, ü, i>.

Vowels that share phonologic but not orthographic overlap in French and German (F=≠G)

For vowels that share phonologic but not orthographic overlap in French and German (**F=≠G**), the Q4-group employs 41.3% German graphemes compared to 63.5% of German graphemes of the Q1-group. The Q4-group produces equivalent French graphemes (42.9%), compared to only 25.7% in the Q1-group.

A closer look at the category shows that Q4-pupils use mainly the French grapheme and spell **/y/** in the real words *jupe* and *une* in 67% with the French grapheme <u>. Q1-pupils mainly use the German grapheme <ü> (55%). The majority of both groups spelled the pseudoword /fyp/ with the German <ü> (Q4: 50%; Q1: 60%). Interestingly, more Q1 than Q4-pupils spell /fyp/ with French <u> (Q4: 25%; Q1: 36%), and only Q4-pupils showed non-conform spelling solutions with digraphs such as <ou> and <eu>.

Both groups spell **/u/** predominantly with single <u> (Q4: 61.5%; Q1 76.6%). While Q4-pupils represent the vowel in the familiar word *ours* by 47.8%, but the pseudoword /fup/ only with 8.3% with the French digraph <ou>, while the Q1-group remains around 10% for both. The vast majority of both groups represent **/e/** with <e> (Q4 75%; Q1 87.7%).

Vowels that do not share phonologic neither orthographic overlap in French and German (F≠≠G)

Nasal vowels share neither phonologic nor orthographic overlap with German (**F≠≠G**). The overall spelling solutions within the category of nasal vowels differ between good and poor spellers in German. While the Q4-group uses 24.1% of German solutions and 57.4% of French solutions, the Q1-group produces almost the reverse pattern with 57.7% German versus 30.1% French solutions.

Across all nasal vowels, the letter 'r' occurred, transferred from German, probably to represent a lengthening effect. Pupils also used forms such as <eng, ong>, imitating German articulation of nasal vowels. Q1-pupils used both forms more extensively (23'r'-spelling; 10 <eng, ong>) than Q4-pupils (15 'r'-spelling; 3 <eng, ong>).

Q1-group spelled the vowel **/ɔ̃/** in *pantalon* majoritarian as German (68%) versus French (32%). The Q4-group showed the inverted pattern and spelled /ɔ̃/ majoritarian as French (68.8%) versus German (25%). In both groups, the other words including /ɔ̃/ (*garçon*, *bon*, *poisson*) had slightly less spellings in German and in French than non-conform spellings that were classified as being part of neither the German nor the French graphematic solution space.

The pattern of both groups remains the same regarding the vowel **/ɛ̃/.** The Q1-group shows 36% of German spellings but no French spellings. Q4-group shows less German (20.8%) and very few French spellings (4.2%). The frequency of non-conform spellings for /ɛ̃/ is exceptionally high with 64% for Q1-pupils and 70.8% for Q4-pupils. The non-conform solutions vary between the two groups (Q1: <on, ang, ö, a, o, ah, ar, ama>, Q4: <an, on, ine, a, á, ou, ho, et, eu>). However, they differ mainly in the use of (erroneous) nasal vowel graphemes: 9 occurrences in Q4 (<on, an>) versus 3 in Q1 (<on>). Beyond this, Q4-pupils use mainly typical French graphemes (<ou, eu, et>), while Q1-pupils seem to be oriented towards the German system by producing graphemes such as <ar, ah, ang>.

Discussion

The present study examined the spelling of French vowels by German fourth-graders who had learned French for four years during primary school.

Aiming to assemble the entire range of possible spelling solutions of the pupils and to evaluate them not only in reference to the orthographic norm, but to a graphematic plausible solution within a given writing system, the theory of the 'graphematic solution space' (Neef, 2015) was used. This theory describes the possible correspondences between phonemes and graphemes of a given writing system. For this study, the theory was adjusted for the description of spelling solutions across two writing systems, the WL2 French and the WL1 German. To this end, three categories of vowels were established: French vowels that share phonologic and graphematic overlap with German (F==G), French vowels that share phonologic but not graphematic overlap with German (F=≠G), and French vowels that share neither phonologic nor graphematic overlap with German (F≠≠G).

The focus was on vowels, a category of sublexical graphemes that represents a substantial proportion of spelling errors as the phonological category and its relation to a grapheme is often difficult to comprehend. Vowel spelling was assessed using a dictation of short utterances, comprising one to three words, all familiar to the pupils.

First, we studied the direct contribution of joint vs. unshared sublexical graphemes on transfer. Second, we examined the influence of the pupils' competence in the WL1 German on spelling the WL2 French.

Influence of the WL1 German on spelling the WL2 French

The rationale of the first aim was that pupils use their resources in the German writing system when writing French. Additionally, they might have had enough exposure to French writing to

develop orthographic sensitivity towards French in terms of letter frequencies and graphotactic knowledge (Pacton et al., 2013). Additionally, we expected that vowels that share phonologic and graphematic overlap in the two languages and writing systems are processed differently in spelling than those who do not. In relation to evidence found for reading (Casalis, Commissaire, & Duncan, 2015), we expected that French vowels that share phonologic and orthographic overlap with German (F==G) would be spelled with the familiar functional sublexical unit. In contrary, French vowels with or without phonologic but without orthographic overlap with German (F=≠G; F≠≠G) would be less oriented towards German and show a wider range of variance in spelling. Some pupils might not be able to perceive the nasal property of nasal vowels and/or would not be familiar with the French convention of spelling this phonological category. The category without phonological overlap (F≠≠G) was therefore expected to show more oral vowels, i.e. German-oriented spelling, than the category with phonological overlap (F=≠G).

Comparison showed that the category F==G was spelled more homogenously than the categories without orthographic overlap (F=≠G, F≠≠G). Comparisons between F=≠G and F≠≠G showed, however, that the pupils produce more French and less German spelling in the category without phonological nor orthographical overlap than in the category with phonological overlap only. A cautious interpretation is indicated, however, because of the sometimes considerable amount of variance within each category.

Within the category with phonological and orthographical overlap (F==G), /a/ was spelled more frequently with the default French and German basic grapheme <a> than the Schwa /ə/. The high spelling rate of /a/ as <a> was interpreted as high certainty at spelling this vowel. Spelling of /ə/ as <e> seemed to be less familiar. One reason for non-conform solutions might be that French Schwa is more closely related to /ø/ than German Schwa and, therefore, might have been subsumed in one category with /ø/. Another reason might be that young learners have the tendency to repeat the articulation of a dictated word. Being still unfamiliar to the phonological and orthographic structure of the given word, they might skew the vowel quality while repeating. As Schwa is articulated centrally, it is prone to distortion when the word is articulated with the aim to detect the sound-grapheme relation. Spelling solutions differed in the article *le* and the adjective *petit*. Although both are frequently used within the classroom context and both are positioned in an open syllable, le might be more suited for visual memorisation due to its shortness and the placement of /ə/ at the ending as well as the high frequency of the article and its frequent position at the beginning of a sentence.

In the category without phonological or orthographic overlap (F≠≠G), pupils realised approximately half of the spelling with the letter 'n' that indicates the nasal property in a complex grapheme such as <en>. Half of the spelling was indicated without 'n', as an oral vowel. This indicates that half of the pupils picked up the phonological and orthographic specificity of French nasal vowels without any similarity in the German phonology or writing system. The relatively high score of French solutions of nasal vowels could result from the very regular spelling. It could also be triggered by the representation of complex graphemes, that are rather uncommon in German, and therefore, apparently different. By analysing the pupils' spelling, we can assume that they have built up knowledge that nasal vowels must be represented by complex graphemes ending on 'n'.

Spelling patterns differed depending on whether the phoneme to spell consisted in a mono- or digraph. Within the category of phonological but not orthographical overlap (F=≠G), the vowel /y/ was presented almost equally with the French <u> and the German <ü>. The vowels /u/ and /e/ were mainly spelled with the German simple grapheme <u> and <e> instead of the French grapheme <ou> for /u/, or the high variability of spellings for /e/ such as <é, est, es, et, er>. Results indicate that simple graphemes in the WL1 German might be more accessible regarding complex graphemes in the WL2 French. A close look at the spelling reveals, however, many graphemes that consist of two, three or four graphemes. Instead of using the simplest solution of a single grapheme, pupils seem to have adopted the French rule 'use complex graphemes'. This rule is

applied more frequently for phonemes that are, indeed, spelled with a di- or trigraph in French, such as /u/ with <ou> or nasal vowels.

One finding extends the range of expected solutions in French: The German special spelling with the letter 'r'. Di- or Trigraphs including 'r' were present in all spelling solutions except the transcription of /y/ and /u/. The vocalised 'r' in German refers to the representation of diphthongs (<or> /ɔɐ/), a certain lengthening of [a:] (<ar>), and the representation of [ɐ] in the reduced syllable (<er>). The letter might have been used in the French spelling to respond to a lengthening that the pupils may have detected in some French vowels, mainly nasal vowels. Additionally, in absence of knowing the correct French spelling, the rationale of using 'r' for vowel spelling might be the production of complex graphemes, characteristic for French.

Another sporadic spelling relates to the pupils' interpretation of nasal vowels. Some occurrences show the spelling of a German phonetic interpretation of nasal vowels, such as <ong> for /ɔŋ/ instead of <on> for [ɔ̃]. The <ng> spelling is compliant to rules of German orthography for /ŋ/. Pupils might have been guided by the phonetic transcription and, probably, the general characteristics of frequent complex graphemes in French as well as the specific rule of the letter 'n' in the spelling of nasal vowels.

Influence of the pupils' competence in the WL1 German on spelling the WL2 French

The rationale of the second aim was to examine the influence of the pupils' competence in the WL1 German on spelling the WL2 French. The French spelling patterns of pupils that are poor or good spellers in German (Q1 and Q4 in the HSP4/5) were therefore compared. Over all three vowel categories, the comparison between the two groups showed that good spellers produced more French spellings than poor spellers. This might support assumptions that good spellers have more efficient orthographic processing skills than poor spellers (Holmes et al., 2008). It is possible that good spellers' orthographic processing skills acquired in the WL1 German allow them to detect and memorise new orthographic forms and functions in the WL2 French system.

Considering the vowel category F==G, all pupils produce mainly the grapheme shared in the French and German writing systems. Beyond the correct spelling, more good spellers than poor spellers use the German marked special grapheme <er, ar> to spell [a] in the unfamiliar WL2. In addition, more good spellers than poor spellers use the grapheme <e> to represent [ə]. The differences between the two groups are salient in the bisyllabic word *petit*.

Poor spellers frequently spell the central vowel in [pəti] with <u> and . The reason for this strategy might be a higher insecurity in spelling in general. Pupils might still apply over-articulation, a frequent strategy in early spelling. Some German spellings confirm this interpretation.

Considering the vowel category F=≠G, both groups use more German spelling overall. Spelling of the pseudowords /fyp/ and /fup/ and the abundant use of German <e> to represent /e/ in French confirm this strategy. Differences occur between the vowels, however. Both groups spell /e/ mainly with the German grapheme <e>.

The vowel /u/ is spelled more frequently with the German grapheme <u> than with the French digraph <ou> in both groups. The vowel /y/ produces different spelling patterns between the groups. In real words, German and French spelling are equally distributed in good spellers, and German spelling is more frequent in poor spellers. Concerning /y/ in the pseudoword /fyp/, Poor spellers seem to produce more French spellings than good spellers. The reason for an increased French spelling of /y/ among poor spellers might be a negligence of the umlaut, however. Instead of opting for the French vowel <u>, they might have neglected to write the diaresis on the German umlaut <ü>. German spellings confirm this practice. In the same pseudowords, good spellers produced non-conform spellings of digraphs, <eu, ou>, that they did not use in real words. These forms might be a hyper-corrective use of digraphs, a salient visual feature of the French writing system.

Considering the vowel category F≠≠G, the groups clearly show different spelling patterns. While good spellers produce more French than German spellings, poor spellers show the opposite pattern. Moreover, the non-conform patterns in poor spellers also show more oral vowels and therefore rely on German, while non-conform patterns in good spellers show more representation of nasal vowels that relies on French.

Conclusion

Taken together, the results confirm that a wide range of solutions are decoded and produced in L2 vowel spelling, that a number of errors occur due to transfer of the WL1, and that these difficulties persist over several years of foreign language teaching (Erler & Macaro, 2011; Woore, 2014). Our results also confirm the Orthographic Distance Effect (Koda, 2005), as spelling patterns of vowels with phonological and/or orthographic overlap in the respective languages differ. The observations challenge the concept of cross-language transfer, however. They reveal that transfer from WL1 is indeed important when spelling a WL2. Nevertheless, learners do not always transfer graphemes that might seem evident for experienced readers in the respective languages. An example is the use of the German special spelling <er> for /a/ instead of the default grapheme <a>. Pupils also produce German graphemes that represent an apparently misconceived phonetic perception of the WL2 French such as *<ö, ü, i> for /ə/, represented with <e> in French and German. We found another aspect of transfer in the use of German special graphemes such as the letter 'r' that represents nasal vowels with a digraph such as <er> or <ar>. Transfer could be seen here as the attempt to use an additional grapheme in order to represent the new, special WL2 French. A broader, more general aspect of transfer involves the learners' perception of particularly salient aspects of the WL2, such as complex graphemes in French. From the perspective of learners with WL1 German, spelling vowels in the WL2 French might induce false graphemes, because the pupils might try to meet the criteria of this apparent main feature of the WL2.

In order to incorporate these new insights into the concept of transfer, the present study analyzed the spelling solutions not in an orthographic, normative framework but within the graphematic solution space (Neef, 2015) and across three vowel categories with different overlaps between WL1 German and WL2 French (F==G; F=≠G, F≠≠G).

Beyond the perception of the WL2 system in the light of general experiences in the WL1, the aspect of spelling skills in the given WL1 also seems to make a difference. The comparison between good and poor spellers in the German WL1 revealed differences in spelling the WL2 French. Poor pupils' spelling attests to insecurity in spelling in general, including slow and often misleading articulation when searching for the correct sound-grapheme relation. Errors of good spellers in German, in contrast, often originate in hypercorrection.

While the French spelling of good and poor spellers are both anchored in the WL1 German, differences exist between the groups. Good spellers use more French graphemes and more hypercorrection in line with French characteristics such as complex graphemes. French spelling of poor spellers is more oriented towards the WL1 German.

The observations of this study also challenge the statistical learning perspective and the self-teaching hypothesis. Even if pupils spelled some French graphemes correctly, almost no pupil spelled the vowels in all words correctly. After four years of foreign language instruction, pupils do show a certain degree of orthographic processing in the WL2 French, indeed, and especially good spellers in German noticed French spelling patterns due to written language exposure. However, these patterns resemble rather French-like vowel patterns instead of French vowels. Hence, the writing system seems to remain opaque even at this relatively shallow level of phoneme-grapheme-relations.

As the study reported frequencies, caution is advised for causal interpretations of the results. At present, there is no indication that good spellers produce French vowels better than poor spellers because of their German spelling skills. This should be tested experimentally. Furthermore, as

pupils attended different classes, we cannot control for the different input the pupils received in French, although they pursued the same educational plan. We acknowledge that the amount of dictated items for each grapheme and within each vowel category varies and is sometimes very small in this study (see annex). The reason for this is that vowel spelling was only one rationale at the time of data collection. Future studies should represent all vowels equally.

However, our findings show that pupils draw on multiple resources to spell the WL2 that go beyond the orthographic norm and the current understanding of cross-linguistic transfer. The findings of the present study reinforce the need for continuing research into the question of the multiple aspects that might influence transfer. It also highlights the need to continue investigating the un/ease of learners to acquire a WL2, depending on their spelling skills in the WL1.

Note

1. While F stands for French and G for German, the first = stands for phonological and the second = stands for orthographic overlap, i.e., ≠ stands for no phonological or orthographic overlap depending on the position. The second category scheme should be read such as: French (F) vowels that share phonologic (=) but not orthographic (≠) overlap with German (G), resulting in F=≠G.

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Appendix: Analysed items out of the dictation.

dictated units	/a/	/ə/	/y/	/u/	/ø/	/e/	/ɛ̃/	/ɔ̃/	/ɑ̃/
le magasin	magasin magasin	le					magasin		
un garçon	garçon							garçon	
une petite fille		petite	une						
deux bananes	bananes bananes				deux				
les pantalons	pantalons					les		pantalons	pantalons
elle mange									mange
le soir		le							
c'est bon						c'est		bon	
la jupe	la		jupe						
le petit pantalon		le petite						pantalon	pantalon
le poisson		le						poisson	
un petit ours		petite		ours					
Pseudonouns									
Fup			fup						
foupe				foupe					
occurrences	7	7	3	2	1	2	1	5	3

Note: Depending on the number of vowel occurrences, the number of underlying spellings differ, e.g. /a/ occurred 7 times resulting in 697 spelling cases (7 occurrences*97 pupils).