

## PROCESSING STRATEGIES IN BILINGUAL SPELLERS<sup>1</sup>

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0. *Introduction.* This study and the study on which it is based (Luelsdorff and Bloor (1981)) deviate in four major respects from the norm for the study of spelling errors. First, they are studies of target-language, rather than native-language, spelling errors. Secondly, they are based on not only an inquiry into the number of misspellings and the number of different forms of misspelling, but also an investigation of types of misspelling and their causes. Third, the corpus consists of words misspelled to dictation of sentences at grade-level, rather than above grade-level. Fourth, they are rooted in in-depth, single-subject investigations which yield a misspelling profile for a single informant, rather than characteristics of the misspelling behavior of a group, grounded in the notion that the locus of language is the individual (Luelsdorff 1982), rather than the community, although the two intricately interact.

This paper presents a summary statement of the major, but by no means only, processing strategies which are held to underlie and explain the 977 vowel and consonant "substitution" errors — excluding those found in the conduits d'approche (cf. Chapter VII) — detected in 6,162 words of English dictation administered over a 14-month period to a 12-year-old male second-year student of English in a German Hauptschule in Regensburg, the capital of the Upper-Palatinate in Bavaria. Bernhard and I met once, sometimes twice a week for a period of from 1/2 to 3/4 of an hour, with lessons focusing on dictation from his first and second year English textbooks *English H 1* and *English H 2* (Friedrichs 1970, 1971) and composition, in this case writing letters to a pen-friend in the United States, Lisa, from Tusculumbia, Alabama, age 14. Bernhard was failing English, although he was doing very well in

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<sup>1</sup> This paper is Chapter VIII of my *Constraints on error variables in grammar: Bilingual misspelling orthographies*. Amsterdam: John Benjamins, 1984.

most of his other subjects, especially math, and was referred to me by his parents for remedial work. His main problem with English seemed to me to be his inability to concentrate, although others remarked that he could concentrate if he wanted to. My own experience with Bernhard was that he was often distracted, forgetting pens, pencils, books, notebooks, and appointments, and insofar as his dictations were concerned, frustratingly absent-minded, often forgetting to do his homework, which typically consisted in reading the passage to be dictated and writing 5–50 times words which he had misspelled. Especially exasperating was Bernhard's tendency to persist in misspelling words which he had just written, sometimes as many as 5–50 times. The dictation procedure followed the recommendations of Deyes (1972), namely, reading the text three times:

- (1) When the dictation is given, the pupil should listen in order to get a general idea of its content without writing;
- (2) When the dictation is to be written, the teacher should divide the text into convenient groups of four or five words each. They must be read, however, as connected groups and not as separate words;
- (3) The teacher has to be careful to use the weak forms of *can*, *to*, *at*, *of*, etc., when the context calls for them;
- (4) The third reading should be done at the same speed as the first reading, but with breaks at the end of every sentence or two sentences. In this case the students have time to correct a sentence just read without being distracted by the need to listen to the next sentence at the same time.

Since my interest was not only in helping Bernhard overcome his deficiencies in English orthography but also in ascertaining the causes of these deficiencies, Deyes' further recommendation of a fourth reading with the students' having a copy of the correct text in hand was not adopted, since this fourth step would have obviously led to the staggering of the statistics on the conduits d'approche.

The study of vowel and consonant "substitution" (see below) errors is a major part of a larger study of putative "transpositions", errors of addition and omission errors of anticipation and perseveration and orthographic conduits d'approche. The fundamental distinction between errors of substitution, on the one hand, and errors of displacement, transposition, addition and omission, on the other, justifies their being the exclusive subject of discussion in this summary statement of processing strategies, where segments are subordinated to strategies, rather than strategies to segments. Compared with the results of studies of the spelling performance of different categories of monolingual and bilingual learners conducted within an identical framework, the conclusions drawn in these investigations could be used to determine those error types which are characteristic of the class of German learners

of English as a whole, could serve as a basis for a general typology of orthographic errors in English made by foreign learners, could contribute to a general theory of orthographic error, take a step in the direction of the study of the acquisition of spelling skills by Germans and bilinguals in general, and as a basis for the development of materials for teaching the structure of English orthography to Germans and others designed to prevent and remediate errors potential and actual (cf. the several recommendations made throughout this study).

Drawing on Chomsky and Halle (1965), we sharply distinguish among three levels of adequacy in the study of errors, the observational, the descriptive, and the explanatory. The first, temporally and logically, entails the observation of a set of deviations between the form produced and the community production norm, noting, for example, that the suffix in *appearence* is spelled with an ⟨e⟩<sup>2</sup>, as opposed to the community-normative *appearance*, in which the suffix is spelled with an ⟨a⟩. The second, the description of errors, entails a statement of the correct relationship between the discrepant production and the community norm. In the above example, the second ⟨e⟩ in the deviant production is said to *correspond* to the third ⟨a⟩ in the norm. Notice that it would be incorrect to conceptualize the relationship between deviant ⟨e⟩ and normative ⟨a⟩ as one of *substitution*, since substitution, either conscious or subconscious, implies a processual view according to which normative ⟨a⟩ has been replaced by discrepant ⟨e⟩ which in the instance of a speller unaware of the normative spelling could in principle not be the case. Three reasons occur to us why an analyst might wish to consider an error of the above type an instantiation of a substitution operation. First, observation of the productions in an *independent* corpus in which normative ⟨a⟩ occurs, leading to the norm-centered view that non-normative ⟨e⟩ has been substituted for normative ⟨a⟩. Second, the observation that ⟨e⟩ varies with ⟨a⟩ in the spelling productions of the informant. In the former case, the postulation of ⟨e⟩ as the deviate of ⟨a⟩ violates what has been called the "Independence Principle" (cf. Luelsdorff 1975), resulting in the assignment of a norm-deviate structure, namely ⟨a⟩ → ⟨e⟩, which cannot be justified on the basis of observations of the productions of the informant viewed independently of the community norm. In the latter case, the relationship may be expressed by ⟨a⟩ ~ ⟨e⟩, since the alternation under discussion is to be observed in the

<sup>2</sup> Orthographic representations are enclosed in angle brackets (< >), autonomus (unless otherwise noted) phonemic representations in slashes (/ /), and phonetic representations in square brackets ([ ]). 'GPC' abbreviates grapheme /phoneme correspondence, 'PGC' phoneme/grapheme correspondence, and an asterisc prefixed to either a GPC or a PGC stands for a noncorrespondence in English or German, depending on the case. The letter+number combinations in parentheses refer to the designations of the examples in the corpus which they follow.

protocol for the informant in question. Since our interest in this study is in the nature and causes of deviant productions in the spelling of an incipient German/English bilingual speller who had had exposure to the British English spelling norms of the words he was required to spell in sentences to dictation, i.e. *the mechanisms involved in long- and short-term memory loss*, we view the deviations produced in terms of the processes of the addition, omission, substitution, and displacement of phoneme/grapheme correspondences in the norm as revelatory of the processes of *memory loss*, and in this sense as psychologically real, yielding an insight into the quality and quantity of those processes which should be accorded special attention in programs designed to prevent and remediate spelling errors, without concomitantly claiming that these processes are psychologically real in any sense other than the one intended, for example, that they were still active in the processing of the errors involved at the time the dictations were administered. The complementary, equally viable, approach, is to treat the erroneous products as functions of the application of non-standard GPCs assignable to different sets of processing strategies available to the language user, dispensing entirely, *from this perspective*, with the most misleading labels "substitution", "addition", "omission", "displacement", etc., and the concepts behind them, since, from this latter perspective, the introduction of such notions reflects incredible confusion. The importance of this difference in perspective cannot be overestimated. The third level of adequacy is the explanation of errors, entailing a statement of the cause(s) of the relationships yielded by the descriptive level of adequacy. In English orthography, for example, overgeneralization is fostered by system-internal irregularity such as the one-many phoneme/grapheme correspondence in

$$/w/ \rightarrow \begin{Bmatrix} \langle wh \rangle \\ \langle w \rangle \\ \cdot \\ \cdot \\ \cdot \end{Bmatrix}$$

whose failure to be committed to lexical memory explains why a spelling error of the type  $\langle w \rangle$  for  $\langle wh \rangle$ , as in  $\langle wich \rangle$  for  $\langle which \rangle$ , occurs. The importance of distinguishing between the description of an error and its explanation, between the mechanism by which it occurs and the cause of its occurrence, has been stressed in the most recent error-analytic literature (Cutler 1981), where it is claimed that statements of cause and statements of mechanism are logically independent and suggested (Cutler 1980) that whereas causes of errors might differ across languages, individuals and occasions, error mechanisms ought to be speaker- and language-universal.

1. *Processing strategies*. We proceed with an examination of the major

types of processing strategies underlying the "substitution" errors in our corpus, using "substitution" in the above-qualified sense, as part of our ongoing attempt to specify the entire set of strategies employed by German learners of English.

1.1 *Letter-naming*. Recapitulating Luelsdorff (1984), letter-naming, i.e. pronouncing the names of the letters of the alphabet, e.g. English  $\langle a \rangle = [ei]$ ,  $\langle e \rangle = [Ii]$ ,  $\langle i \rangle = [ai]$ ,  $\langle o \rangle = [oU]$ ,  $\langle u \rangle = [jUu]$ , or German  $\langle a \rangle = [a:]$ ,  $\langle e \rangle = [e:]$ ,  $\langle i \rangle = [i:]$ ,  $\langle o \rangle = [o:]$ ,  $\langle u \rangle = [u:]$  has been described as one of the devices characteristic of the invented spelling of young children (Read (1971), Schreiber and Read (1980), Cook (1981)) where letter symbols are generated on the basis of preliterate children's phonetic analysis of the spoken word and their knowledge of the written alphabet and letter-names.

We place three conditions on a theory of letter-naming used as a strategy for spelling: (1) that the informant know the names of the letters; (2) that the names of the letters be either identical with, closely approximate, or contain the sounds of the words they are used to represent; and (3) that the letters not correspond to those used in the standard spelling. (If the letters do correspond to those in the standard spelling, it is clearly impossible to distinguish between letter-naming used as a spelling strategy, on the one hand, and letter-sounding used as a spelling strategy, on the other). We view this phenomenon as an overgeneralization of those instances where the names of the letters partially resemble the sounds the letters are used to legitimately represent, hence the abilities to (1) letter name and (2) use letter-naming as a spelling strategy as constituent components of the spelling competence of the normal, fluent writer. Since this relationship is one of similarity between the sound of the letter name and the sound of the words the letter-name or the sequence of letter-names is used to represent, it is echoic. Were this relationship completely regular, whereby the names of the letters were identical with the constituent sounds of the words, or the sounds of the words predictably derivable from the names of the letters, such as appears to be the case, or nearly the case, in Japanese *kana*, the orthography would be optimally echoic.

Clear examples of English letter-naming in the Bernhard corpus include the vowels  $\langle a \rangle$ ,  $\langle e \rangle$ ,  $\langle i \rangle$ , and  $\langle u \rangle$ :

Table 1 English Letter-Naming

Vowel	Target	Attempt	Page
$\langle a \rangle$	paints	pans	A 2 (2)
$\langle e \rangle$	Here	Her	A 6, A 9 (2)
	jeans	jens	A 75
$\langle i \rangle$	likes	liks	A 5
	nine	nin	A 9
$\langle u \rangle$	juice	just	A 20

Unambiguous examples of German letter-naming include the letters <a>, <e>, <i> and <u>:

Table 2 German Letter-Naming

Vowel	Target	Attempt	Page
<a>	John	Jan	A 14
<e>	cornflakes	cornfleks	A 2
	eighth	egth	A 11
<i>	evening	ivening	A 1
	sleeps	shlips	A 5
<u>	to	tu	A 9
	soup	sup	A 49

Apparently interpretable as examples of either English or German letter-naming are English or German <o>, which were pronounced virtually the same by the person administering the dictations:

<o>	Toast	Tost	A 6
	bones	Bons	A 49

Lax /ɛ/ is misrepresented in 69% of the error tokens by either <a> or <e>. The high frequency of <a> appears all the more enigmatic, since \*<a> → /ɛ/ is not a regular GPC in either English or German. We find a plausible explanation for <a> → /ɛ/ in an *extended* use of the concept of letter-name. Ordinarily, when one speaks of letter-naming used as a spelling strategy (cf. above) one refers to using a letter to represent a sound which is identical to the sound of the name of the letter, justifying the assertion that this phenomenon is based on the equation use=mention, where use is the letter-sound and mention is the letter-name, as in attempt: <spek> for target: <speak> or attempt: <spik> for target: <spike>. Were we now to center upon just those articulatory features which the name of the letter <a>, i.e. /e/, has in common with the target vowel /ɛ/, i.e. the intersection of the set of features defining /e/ with the set of features defining /ɛ/, thereby arriving at the archisegment /E/, we would find that /ɛ/ would be just as likely to be represented by <a> as would /e/, under a spelling strategy based on letter-naming. We do in fact find <a> → /ɛ/, letter-naming used as a spelling strategy for /e/ (cf. Table 1 above). Succinctly stated, the data (cf. attempt: <whan> for target: <when> (A 78), attempt: <allrady> for target: <already> (A 89), attempt: <thar> for target: <there> (A 19), attempt: <sad> for target: <said> (A 96), attempt: <thar> for target: <their> (A 8) dictate introducing in bilingual contexts the notion of *the place of articulation of a letter-name* as the basis of a spelling strategy

in addition to letter-naming proper. This is not to claim that the informant perceptually identifies /ɛ/ with /e/, but that he judges them articulatorily sufficiently similar to assign them identical representations under a letter-naming strategy. It is also to claim that vowel similarity judgments assign priority to *place of articulation* (in this case not central) over manner of articulation (in this case tense/lax), yielding the prediction that /e/, for example, will be judged more similar to /ɛ/ than to either /i/ or /I/, a prediction borne out by the fact that <a> is not among the 21 types of misrepresentation of /i/ and /I/, with the sole exception of the lone example <a> → /i/ in attempt: <plase> for target: <please> which we analyzed as a slip of the pen (cf. Chapter III, English /i/).

Precisely this abstract sense of letter-naming as a spelling strategy has been attested in studies of children's acquisition of their native orthographies. In an investigation of developmental strategies of spelling competence in primary school children, Beers (1980, pp. 38 - 39), for example, notes three and two stages in the acquisition of short <e>=/ɛ/ and short <i>=/I/, respectively:

- A. Short <e> as in <met>
  - (1.) <a> for <e> — <gat> for <get>
  - (2.) <i> for <e> — <wint> for <went>
  - (3.) correct form
- B. Short <i> as in <sit>
  - (1.) <e> for <i> — <mes> for <miss>
  - (2.) correct form

where (A1.) and (B1.) confirm place of articulation of letternames as a spelling strategy, which we have referred to above as "abstract" in the sense that its effective utilization entails abstracting away from the tenseness vs. laxness which phonetically differentiates these vowels. Note that (A2.), <wint> for <went>, might have constituted a counterexample, since the features distinguishing the letter-name of <i> (= /ay/) and /ɛ/ include that of place of articulation, were it not for our suspicion that <went> is typically pronounced [wɪnt] and not [wɛnt] in this part of the States, i.e. Laurel, Maryland, bordering on the south. Our suspicion is strengthened by the author's report that <many> was spelled <mene>, <e> by the author's own account (see above) constituting the first step in the acquisition of the correct orthographic representation for short <i> (= /I/), cf. <mes> for <miss>.

Finally, we introduce the notion of a sequence of letternames as a spelling strategy. Not predicted by the interlinguistic transfer theory of error is the representation <ou> for English /ow/, amply in evidence in the error data and exemplified by:

Error Type	Frequency	Target	Attempt	Page
<ou> for <oa>	3x	<Goal>	<Goul>	A 66 (2)
<o>	3x	<cold>	<could>	A 76
<ow>	2x	<showed>	<shoud>	A 75 (2)
<oCe>	1x	<clothes>	<couse>	A 78

The transfer theory of error must be modified accordingly so as to include the principle that a native-language grapheme *sequence* may be used to represent a target-language sound even in the presence of native-language single graphemes corresponding to native-language phonemes similar to the target-language single phonemes to be represented should the combined phonetic effect of articulating the names of the graphemes in such a sequence be similar to the target-language sound under representation. Here by "native-language grapheme sequence" we do not mean only a sequence of graphemes adhering to the graphotactic conventions of the native language, such as German <ei, ai>, as in <Meister> 'master' and <Kaiser>, but also grapheme sequences, impermissible in the native language, whose composite pronunciation is similar to the foreign language sound under representation such as \*<ou> in native German vocabulary used as an invented spelling for English [oU], "invented" because although the informant had been exposed to some of the major and minor correspondences of the English secondary vowel pattern <ou/ow>, for example, [aU] : <mountain>, [ʌ] : <cousin>, [U] : <could>, he had no introduction to the correspondence [oU] as in <cantaloup>, <shoulder>, <poultice>, <soul>, <thorough>, etc.

1.2 *Overgeneralization*. If <X> → /Y/ and <Z> → /Y/ in the standard orthography, where <X> ≠ <Z>, the use of <X> for <Z> constitutes an overgeneralization. Attempt: <Mery> for target: <Mary> (A 80) is an overgeneralization of the regular pattern for the representation of the checked alternate of English <e> to environments which intersect with those in which <e> regularly represents /i/. <or> → /ɜ̃/, evidenced in attempt: <borstey> for target: <birthday> (A 9 (2)), must be an overgeneralization of unstressed <or> → /ɜ̃/, such as the agentive, to stressed syllables since the exceptional <or> → /ɜ̃/ in stressed syllables is found in words which were not part of the informant's vocabulary, e.g., <borough>, <thorough>, and <worry>. Negative transfer from German is ruled out as a possible explanation for the use of <o> for either <a> or <oh>, as in attempt: <wont> for target: <want> (A 6) and attempt: <Jon> for target: <John> (A 14 (2)) because there is no \*<o> → /a/ GPC in German; the errors involved are attributable rather to the overgeneralization of the predictable major pattern for the checked alternate of English <o>, as in <conic>, <rob>, <possible>, etc., to cases which are unpredictable. Inasmuch as the misspellings exemplifying the use of <o> for either <a> or <oh> recur, and in the instance of attempt: <wont> for target: <want>

(A 6) recur throughout the 14-month dictation period, we are dealing with a conventional error, where we distinguish between (1) *lexical conventional errors* and (2) *rule-governed conventional errors*, the former referring to a consistently incorrect graphemic representation <G<sub>1</sub>> → /P<sub>1</sub>/ whereby there are other representations in the corpus <G<sub>2</sub>> → /P<sub>1</sub>/ where <G<sub>1</sub>> ≠ <G<sub>2</sub>>, the latter referring to the consistently incorrect graphemic representation <G<sub>1</sub>> → /P<sub>1</sub>/ for all occurrences of /P<sub>1</sub>/. The conventional error attempt: <wont> for target: <want> for example, is a lexical conventional error, since /a/ (=P<sub>1</sub>) is represented by <a> (=G<sub>2</sub>) in attempt: <an> for target: <on>. Rule-governed conventional errors are unattested in the author's own field experience, but are in evidence in studies of the early acquisition of native orthographies (cf. Beers 1980 where short <e> (=ɛ/) is consistently incorrectly represented by <a>, as in attempt: <gat> for target: <get>).

Regularization and irregularization are special instances of overgeneralization, the former referring to the over-generalization of the predictable pattern to the unpredictable, the latter to the overgeneralization of the unpredictable pattern to the predictable. The qualitatively and quantitatively most frequent misrepresentation of /I/ in our corpus consists in the use of <i> for <o>, <a>, <e> and <iCe>, as in attempt: <wimen> for target: <women> (A 55), attempt: <sausitches> for target: <sausages> (A 56), attempt: <pritty> for target: <pretty> (A 75 (2)), and attempt: <givs> for target: <gives>. We interpret all of these instances of <i>-representation, with the exception of attempt: <wimen> for target: <women>, as regularizations to the checked alternate representations of the major pattern for the vowel /I/, which, like the remainder of the primary vowel representations, corresponds to its checked alternate when followed by (1) a functionally compound consonant unit, e.g., <x, dg>, (2) a cluster of consonant units, e.g., <-nn, -lth> (<sausitches, pritty>) or (3) a word-final consonant unit or units (<givs>). <women>, analyzable into at least two morphemes, does not follow the pattern for the free alternate pronunciation of a primary spelling unit in monomorphemic words, in which case it would be pronounced [wóUmen], is hence unique in its spelling. The informant's <wimen> is a closer approximation to its pronunciation, and <wimmen> would have been even closer, since, as noted above, the checked pronunciation occurs before wordinternal *clusters*. Remarkable about the total set of misrepresentations of [e] is the fact that they are not restricted to misrepresentations of the unpredictable cases, 1/3, (17/51) misspelling the regular representation <aCe>, for example, attempt: <leate> for target: <late>. We thus note a strong tendency to *irregularize* the regular cases in addition to the intuitively more anticipatable but weaker tendency to *regularize* the irregular cases, for example, attempt: <stake> for target: <steak>. Interestingly enough, this latter strategy is restricted to the regularization of <ea>, suggesting the notion of a regularization-prone orthographic repre-

sensation, but leaving unexplained why some irregular orthographic representations should be more regularization-prone than others. One hypothesis which readily suggests itself is that there is an inverse relationship between regularization-proneness and frequency of irregular spelling-type, but the testing of this hypothesis lies beyond the scope of this study. Suffice it to say, pending detailed investigation of this question, that /e/, together with /ɛ/, is a *minor* correspondence of the secondary vowel pattern <ea>, the major correspondence being /i/, while the major correspondence of both <ei/ey> and <ai/ay> is /e/. The hypothesis predicts that words of the type <break>, <great>, <steak>, and <yea>, containing the minor correspondence <ea> → /e/, will be more frequently regularized to sequences containing <aCe> than words of the type <abeyance>, <obey>, <reign>, and <veil>, on the one hand, and <bait>, <day>, <player>, and <wait>, on the other, containing the major correspondences <ei/ey>, <ai/ay> → /e/, respectively.

Two further special cases of overgeneralization we term “simplification” and “complication”, the former referring to the use of a major primary vowel pattern for a major secondary vowel pattern, the latter to the use of a major secondary vowel pattern for a major primary vowel pattern. Note that simplification and complication are not to be equated with regularization and irregularization, respectively, since both simplification and complication are regular, referring as they do to *major* patterns. The major correspondences of the secondary vowel patterns <ui> and <oo> are /i(j)u/ and /u/, respectively. Hence, we interpret attempt: <juse> for target: <juice> (A 30) and attempt: <Pure> for target: <Poor> (A 92) as simplifications consisting in the assimilation of major secondary vowel patterns to a major primary vowel pattern. Of the error types characteristic of the misrepresentations of /ow/ we attribute the use of <oCe> for <oa>, as in attempt: <Prarkrode> (A 32) for target: <Park Road> to the overgeneralization of the major correspondence of the primary vowel pattern to the major correspondence of the secondary vowel pattern, hence to simplification, and the use of <oa> for <oCe>, as in attempt: <cload> for target: <clothes> (A 78) to the converse, i.e., the overgeneralization of the major correspondence of the secondary vowel pattern to the major correspondence of the primary vowel pattern, hence to complication. <f> for <gh>, as in attempt: <laft> for target: <laughed> (A 89), is a simplification — one letter for two — and a regularization — the representation of /f/ by regular <f>, rather than irregular <gh>.

1.3 *Transfer*. Our error corpus is replete with examples which support the transfer theory of error, which we regard as a necessary but by no means sufficient theory of errors encountered in the target language competence and performance of bi- and multilinguals (see below). We present several examples in the domain of vowel and consonant-letter substitution errors which support the transfer theory of error, and an extended example of a consonant error

which does not. Several of the examples are illustrative of the “collaboration”, or, better, “collusion”, of several strategies held to account for the erroneous output.

35% of the misspellings of English /i/, namely, <i> → /i/, as in attempt: <Hi> for target: <He> (A 36), attempt: <wir> for target: <We're> (A 70), attempt: <flds> for target: <fields> (A 7), attempt: <chise> for target: <cheese> (A 49), and attempt: <lori> for target: <lorry> (A 55), we interpret as resulting from the misemployment of the German GPC <i> → /i:/ transfer strategy, as in <dir>: [di:R] ‘to you’ or <mir>: [mi:R] ‘to me’, in English or misemploying the strategy of German letter-naming — the name of the German letter <i> is [i:] — in English, not excluding the possibility of these two strategies conspiring. A further 12% of the misspellings of English /i/, as in attempt: <bie> for target: <be> (A 95) and attempt: <kiep> for target: <keep> (A 34) to the negative transfer of the GPC <ie> → /i:/ from German.

Renderings of <i> by <e> for /I/, as in attempt: <thes> for target: <this> (A 6) and attempt: <sex> for target: <six> (A 17) although very few in number, are of theoretical interest. Since they are related to attempt: <wiesit> for target: <visit> (A 43), they will be discussed together. It is informally widely noted that English orthographic <i> is frequently pronounced [i:] by beginning German learners of English. This we trace to the fact that <i> is pronounced [i:] in a few frequent German monosyllabic words, e.g., <di>: [di:R] and <mir>: [mi:R] glossed as above. Reading English as though it were German thus results in a pronunciation of <this> and <will> containing [i:], and this is indeed the way in which the informant pronounced these words, supporting our repeated observation that spelling errors cannot be understood unless the informants’ actual pronunciations are taken into consideration as opposed to the standard pronunciation norms. Note that there is nothing necessary about the <i> → [i:] pronunciation in German, since <i> is also articulated [I], namely before two consonants, as in <Kinder>: [kɪndəR] ‘children’ and in monosyllables, in fact most monosyllables, as in <mit>: [mIt] ‘with’ and <in>: [In] ‘in’, so that the negative transfer of <i> → [i:] is the exercise of just one of two options. The pronunciations [zi:s] for <this> and [vi:l] for <will> we thus derive from German letter-naming and/or letter-sounding as a pronunciation strategy and the misspellings <thes> and <well> for <this> and <will> from English letter-naming as a spelling strategy. The misspelling attempt: <wiesit> for target: <visit> is relevant inasmuch as it is an unambiguous piece of orthographic evidence for the fact that there exists a German spelling-pronunciation in English words corresponding to the standard pronunciation [I]. The important question of which factors, if any, enable one to predict whether [I] will be correctly spelled, or misspelled as a product of English letter-naming based on German letter-naming/sounding in a given case, must, for lack of an adequate understanding of the processes involved, remain unanswered.

<t> is most frequently misrepresented by <d>, and then only post-tonically: <gardengad> for <garden gate> (A 9), <jamtords> for <jamtorts> (A 11), <god> for <got> (A 32 (2)), <frond> for <front> (A 44), <mead> for <meat> (A 51), <wrid> for <write> (A 61), etc. We posit the combined effect of two processes in order to explain this all-pervasive post-tonic voicing: (1) the negative transfer of the German rule of syllable-final obstruent devoicing to English and (2) orthographic hypercorrection consisting in the voiced misrepresentation of obstruents which are devoiced in standard. In order to show that the German rule of syllable-final obstruent devoicing is operant in the informant's English, we point to the observations that (1) standard English syllable-final obstruents are often phonetically devoiced and (2) this devoicing is very frequently reflected in the informant's English misspelling of standard voiced obstruents by letters corresponding to voiceless, e.g., <picturekat> for <picture card> (A 9), <fint> for <find> (A 11 (2)), <salet> for <salad> (A 57), <pont> for <pound> (A 51), etc. Representations of the type voiceless consonant for voiced are in fact so frequent that the negative transfer of the German rule of syllable-final obstruent devoicing should be regarded as the primary process underlying the misrepresentation of the English voiced obstruents. The hypercorrection is explained by the informant's accommodating himself to his teacher's corrections of his misrepresentation of voiced consonantism in pronunciation and spelling. It is conceivable that even at least some of the correct representations of the English voiced obstruents originate via this route — devoicing then hypercorrection — resulting in the correct representations for the wrong reasons.

Of those misspellings of the past tense which are most plausible — <Vt>, <d>, and <t> — all are represented in the data:

- <it> for <ed>: <paintit> for <painted> (A 52)
- <d> for <ed>: <colld> for <called> (A 71)
- <t> for <ed>: <laught> for <laughed> (A 75 (2))

The overwhelming majority of these misrepresentations may be accounted for by either phonetic spelling (<Watcht> for <watched> (A 76)) or phonetic spelling subsequent to the negative transfer of the German rule of syllable-final obstruent devoicing (<inveitet> for <invited> (A 78)). It is the rare exception such as <Parkd> for <parked> (A 68) which cannot be completely accounted for by either. <Parkd> reflects only partial application of phonetic spelling, namely the omission of <e> from preterite <-ed>.

We point to a parallel between the misrepresentation of the preterite discussed above and a category of non-standard spelling which frequently appears in the writing of native speakers in kindergarten and the first and second grades, namely the use of <t> to render <ed> in the past tense form of certain verbs, namely just those which undergo vowel deletion and re-

gressive assimilation (cf. Luelsdorff 1969), as in <likt> for <liked>, <lockt> for <looked>, <pikt> for <picked>, etc. (Gentry and Henderson (1980:118)).

Inasmuch as the regular correspondence of <t> and <d> are sounds which are contained in their letter-names, i.e. [t] in [ti:] and [d] in [di:], respectively, the phenomenon referred to above as "phonetic spelling" is also an example of letter-naming — phonetic spelling, letter-naming, and obstruent devoicing conspiring to yield the misrepresenting product.

We proceed to an extended example of a consonant error which the transfer theory of error does not explain, namely, the non-transfer of the German rule of consonant-doubling. In German the shortness of vowels is often designated by the doubling of the following consonant, as in *Pfiff* 'whistle', *Metall* 'metal', *Egge* 'harrow', *Gewitter* 'storm', *Paddel* 'paddle', *Schrott* 'scrap-metal', *Etappe* 'stage', etc. Were this German regularity transferred to English, it would facilitate spellings in which short vowels are followed by geminates and interfere with spellings in which short vowels are followed by single consonants. Since all of the examples of <t> for <tt> involve instances in which <t> is preceded by a *short* vowel, as in <beter> for <better>, <leters> for <letters>, <litel> for <little>, however, we clearly cannot attribute these misspellings to the negative transfer of the German consonant doubling rule. Furthermore, since the misspellings *recur* and *persist* throughout the entire duration of the dictations, they also cannot be considered unmonitored slips of the pen. In view of these latter two features, recurrence and persistence, we relegate them to the category of conventional errors.

If erroneous consonant singling cannot be accounted for by negative transfer of the German rule of consonant-doubling, neither can erroneous consonant-doubling. The 4 cases of <mm> for <m>, e.g., <hamster> for <hamster> (A 5) and <Kammara> for <camera> (A 11 (2)), may not be traced to the transfer of the German rule of consonant-doubling which requires the doubling of a consonant in stems ending in a consonant if the preceding vowel is short and stressed (<Scheffel> 'bushel', <Lappen> 'rag'), except <k> and <z>, which in such cases are written <ck> and <tz>, respectively (<Kuckuck> 'cuckoo', <Schwätzer> 'gossip'), although there are exceptions (cf. Schmidt and Volk (1976:18—19), and even exceptions not among those listed as such (e.g., <Kanne> 'can', <Wanne> 'tub'), because more than one stem consonant follows <m> in <hamster> and <camera> ends in a vowel. As in the case of <mm> for <m>, the instances of <nn> for <n> also cannot be explained by the negative transfer of the consonant-doubling rule from German, since, in addition to cases which meet the structural description of the rule and are doubled (e.g., <runns> for <runs> (A 11)), there are cases which do not meet the structural description of the rule but which are doubled anyway (e.g., <evenning> for <evening> (A 2), <dinning> for <dining> (A 2)) and cases which do meet the structural description of the rule but are not doubled (e.g., <runing> for

<running> (A 72). The examples of <nn> for <n> do however amply evidence total cognatization (see below), e.g. <winn> for <win> (A 65), cf. German *gewinnen* 'win', <beginn> for <begin>, cf. German *beginnen* 'begin', <Kann> for <can>, cf. German *kann* 'can', and the identification of English <when> with German <wenn> 'if', even though they differ in meaning.

By orthographic "cognatization" we understand the partial or total orthographic assimilation of a target cognate to the corresponding native language cognate. The 4 occurrences of <ch> for <gh> in <lauchs> for <laughs> exemplify partial cognatization where the misrepresentation of the target is a partial recapitulation of the spelling of the corresponding native-language cognate cf. German <laucht> 'laughs'. The 2 occurrences <shwans> for <swans> (A 76) and <schwam> for <swam> (A 89 (2)) exhibit at once partial cognatization, with the English spelling <sh> of /š/ in the German initial cluster /šv/ and negative transfer of the German initial cluster /šv/, there being no initial /šw/-cluster in German. <Dezember> for <December> (A 66), on the other hand, instantiates total cognatization, cf. German *Dezember* 'December' as does <Preis> for <Prize>, cf. German *Preis* 'prize' (A 17). <ä> in attempt: <Bäter> for target: <better> clearly reflects negative transfer from German, where <ä> → /ɛ:/, as in *Bär* 'bear'. We do not regard <Bäter> as an instance of cognatization of English <better> to German <besser>, however, since (1) adjectives are not capitalized in German unless they are substantivized or occur in sentence-initial position, (2) German <besser> is written with an <e> in the stressed syllable, not an <ä>, and (3) cognatization would have entailed a representation with <-s-> or <-ss-> for English <-tt->. On the contrary, it rather dramatically illustrates what might be termed "decognatization", reflecting as it does a dissimilation of the standard representations of the respective cognates, and instantiates transfer only insofar as it contains the German vowel <ä>. The case of attempt: <prais> for target: <prize> (A 14 (2)), where the vowel spelling in <prais> is the vowel spelling of neither the native nor the target representation, while the final consonant is that of the native, underscores the gradient, rather than categorical nature of cognatization as a processing strategy.

2. *Summary and conclusion.* Both orthography and the study of orthographic error have been grossly neglected in the linguistic literature, possibly traceable to the unjustified absence of an orthographic component in the more popular theories of grammar.

The major processing strategies are grouped as follows where A=Attempt and T=Target and ::=corresponds to:

#### Transfer

##### I Intralinguistic

###### A. English Letter Naming

1. Articulation of English Letter Name:  
A: <Her>:: T: <Here>.
2. Place of Articulation of an English Letter Name:  
A: <mess>:: T: <miss>
3. Sequence of English Letter Names:  
A: <could>:: T: <cold>
- B. Regularization: A: <pritty>:: T: <pretty>
- C. Irregularization: A: <leate>:: T: <late>
- D. Simplification: A: <juse>:: T: <juice>
- E. Complication: A: <cload>:: T: <clothes>

##### II Interlinguistic

###### A. German Letter Naming

1. Articulation of German Letter Name:  
A: <cornfleks>:: T: <cornflakes>
2. Place of articulation of German Letter Name:  
A: <Jam>:: T: <John>
- B. German GPCs: A: <steschen>:: T: <station>
- C. Cognatization
  1. Partial: A: <preis>:: T: <prize>
  2. Total: A: <mußt>:: T: <must>
- D. Decognatization: A: <schlips>:: T: <sleeps>

Although the corpus is replete with examples which support the transfer theory of error, which is thus a necessary subtheory of the theory of constraints on bi- and multilingual spelling errors, it is by no means sufficient.

Prideaux (to appear) develops the thesis that a set of factors has emerged within psycholinguistics which reflects and highlights the earlier Praguian concern with functional considerations, in particular, that the Prague School notion of "cooperation of means" has developed independently within psycholinguistics, and "that such 'means' as the psychological analogues of communicative dynamism, the role of context, and the importance of grammatical structure, along with specific processing heuristics, all interact as the language user goes about tasks of language comprehension and production". In the above, we have cited several independently motivated examples of how spelling strategies and strategies related to spelling conspire in written bilingual production, confirming the Praguian functionalist credo of the cooperation of means, the functional unity of orthographic rules.

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