Knowledge of Derivational Morphology in a Second Language Idiolect

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1. Introduction

There has been literally a mountain of research to date on the second-language (L2) acquisition of morphosyntactic inflectional or functional categories (such as finiteness, tense, aspect, agreement, case, etc.) and their associated morphophonological expressions (such as pluralization, past-tense marking, subject-verb agreement marking, etc.). However, there has been very little work on the L2 acquisition of the morphological reflexes associated with the derivation of the primary lexical categories of nouns, verbs and modifiers. The use of derivational morphology is a principal means in many languages (including English) of converting or deriving a word of one syntactic category from another, sometimes with a shift in meaning.

This study was motivated by the frequent observation in both spoken and written L2 case-study data of errors such as those in (1).

(1) a. I tried to *analysis* what kind of a person M. is [written]
b. It must be a huge *relieve* [written]
c. when my father went *bankruptcy* [written]
d. She used to live in uh, *French*, too, Paris [spoken]
e. God try to give us his wisdom and *happy* [spoken]
f. and her sister, who is a physical *therapy* [spoken]

These naturalistic production data come from Patty, a native speaker of Mandarin and Hokkien Chinese who immigrated to the United States at the age of 22 and acquired L2 English as an adult. Patty is highly literate in English, having obtained undergraduate and masters degrees from American universities; I mention this because I think it is possible that degree of literacy and/or educational attainment may be relevant to aspects of knowledge of derivational morphology (as discussed later). Four audio recordings of spoken conversation were taped at different intervals over a 16-year period, and written data—primarily e-mail, although some data were elicited as written answers to written questions—were also collected over a period of approximately six years. Errors such as those in (1) appear to be just as likely to occur in Patty's English writing as in her speaking (unlike some of her inflectional errors for which there is a marked difference between her speaking and writing, with considerably more errors occurring throughout her spoken production; see Lardiere, in press, for more detailed information about Patty's inflectional morphology).

The main research question addressed in this paper is: What is the relation between an L2 learner's mis-selection of a derivationally-related word form and knowledge of the syntactic contextual requirements for that form? Additional interesting questions that arise (but are not resolved) in connection with this study are: Do learners represent derivational morphology differently from inflectional morphology? Are derivational affixes stored separately from roots (vs. whole-word storage)?

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2. The Development of Derivational Morphology

2.1 Aspects of Knowledge of Derivational Morphology

Various aspects of knowledge of derivational morphology may be distinguished and are thought to develop at different rates, at least among the native English-speaking children who have been studied. The following classification is based on the discussion by Tyler and Nagy (1989).

• *Relational knowledge*. This is the knowledge (or perception) that two words are morphologically related to each other; that is, they share a common lexical base (e.g., *argue~argument* as opposed to *off~offer* or *depart~department*). Previous studies have shown that semantic relatedness is a prerequisite for viewing words as derivationally "related." Most previous research on derivational morphology has studied relational knowledge, which has been extensively discussed in the psycholinguistic literature. The usual experimental paradigm involves measuring participants' reaction times in lexical decision tasks. Two words are considered to be derivationally related if the presentation of one word significantly decreases the reaction time of recognizing another, a phenomenon known as a *priming effect*. (See Marslen-Wilson, Tyler, Waksler, & Older, 1994; McQueen & Cutler, 1998; and many references cited therein, for studies of relational knowledge of derivational morphology among native language speakers; Duffield, Curtin, & Sabourin, 1998, is the only comparable SLA study of derivational affixation I am aware of.)

• *Syntactic knowledge*. This is the knowledge that derivational suffixes mark words for syntactic category in English (e.g., X-*ize*$_{V}$; X-*ation*$_{N}$). One of the primary functions of derivational morphology is to change the syntactic category of a word. Even if one doesn't know the lexical stem of the word, the derivational suffix can often provide highly reliable information about its syntactic category. For example, one can reliably guess that *ambiguity* is a noun and *ambiguous* is an adjective even if one does not know the meaning of the stem *ambigu-*.

Because the errors observed in Patty's data are ones involving her producing the wrong category of a word given the syntactic context in which it occurs, as shown earlier in the examples in (1), this is the particular aspect of derivation I focus on in this paper.

• *Selectional knowledge*. This is knowledge of the selectional restrictions on the concatenation of stems and affixes—for example, that the English nominalizing suffix *-ness* attaches to adjectives but not verbs (e.g., *quietness* vs. **playness*). Learners also need to know restrictions on which specific affix(es) to use in the derivation of a particular syntactic category given the morphophonological characteristics of the stem and/or intended function (e.g., *quietness* vs. **quietation*). Tyler and Nagy (1989) refer to this aspect of knowledge as *distributional* and propose that it is developmentally the latest to be acquired.

There is no evidence from Patty's production data that she violates selectional restrictions on English derivational affixation. Thus, I have little to say about it here, although it would be interesting for future research to devise a task that could test her (tacit) L2 knowledge of such restrictions.[1]

2.2 Previous Studies of Native English-speaking Schoolchildren

Although, as mentioned, we encounter fairly slim pickings in terms of derivational morphology studies in the SLA literature, there have been quite a few studies conducted with children, primarily schoolchildren. Again, most of these studies investigated relational knowledge. Previous research involving native English-speaking schoolchildren had shown that, although children are able to

[1] Tyler and Nagy (1989) argue that such distributional errors in derivational morphology would manifest as overgeneralization in the production or acceptance of neutral-suffixed words, such as **repeatize* or **spyer*, because a child had not yet learned exceptions to otherwise productive rules. Putting aside some other complex issues raised by this assumption, I note only that Patty very rarely overgeneralizes inflectional affixation (her errors mainly consist of omitting inflectional affixes where required) and there are no instances in the data of overgeneralized derivational affixation.

recognize a familiar stem in a derivate—for example, the word *guitar* in *guitarist*—by 3rd or 4th grade, their knowledge of the syntactic and selectional properties of derivational word forms increases only gradually through the 8th grade. Even then it is still incomplete, particularly for derived words involving novel stems. (An exception here seems to be for the agentive *-er* affix, which is acquired and used productively at very early ages.) A brief summary of these results is presented below (see Tyler & Nagy, 1989, for an overview).

• Third-graders consistently recognized the relationship between familiar words such as *argue* and *argument* (relational knowledge) (Condry, 1979);

• "Above-average" 5th-graders but not "average" 8th-graders were able to make use of morphological relatedness of nonce words (relational knowledge) (Freyd & Baron, 1982);

• Among 4th-, 6th-, and 8th-graders taught the meanings of infrequent words such as *stipulate*, only the 8th-graders reliably recognized the relationship with suffixed derivates such as *stipulation*, and only for one-third of these derivates (relational knowledge) (Wysocki & Jenkins, 1987);

• Fourth-graders can already recognize base morphemes in an unfamiliar derivate (Tyler & Nagy, 1989);

• Relational knowledge of agentive *-er* (but not *-ian*) affixation is acquired very early (by preschool children) (Clark & Cohen, 1984; Clark & Hecht, 1982);

• Sixth-graders were "sometimes" able to produce novel forms that were contextually appropriate (syntactic knowledge) (Sterling, 1982);

• Among 4th-, 6th-, and 8th-graders tested on their choice of the correct derivational form of both familiar and nonce words in particular syntactic contexts (syntactic knowledge), students at all grade levels have "some" knowledge of the lexical categories associated with both neutral and nonneutral suffixes; in all grades, students did significantly better with real word items than with nonce word items (there was no effect for suffix type; Tyler & Nagy, 1989). See Table 1 below, based on Tyler and Nagy (1989, p. 657, their Table 6).

	Mean % of items answered correctly			
	Real-word items		Nonce-word items	
Grade	Neutral	Nonneutral	Neutral	Nonneutral
4	.49	.41	.07	.14
6	.76	.82	.34	.32
8	.96	.96	.52	.58

Table 1. Results of task requiring the choice of appropriately-suffixed words (Tyler & Nagy, 1989)

Perhaps the most interesting result of this prior research involves the ability (or rather, the striking inability) of children to select the appropriate derivational forms of nonce-word items from a multiple-choice list, as shown in Table 1. The addition of nonce words is necessary as a control since children could conceivably know that a particular derived word has a particular part-of-speech category without noticing or attributing any particular lexical properties to the suffix. In other words, they could be treating these words as unanalyzed units. A more stringent test of recognizing the categorial properties of suffixes would involve the use of novel stems with a variety of suffixes indicating different parts of speech, such as the task used by Tyler and Nagy (1989).

2.3 More on Patty's Naturalistic Production Data

Despite the errors one finds in the data such as those shown earlier in (1), Patty's production data also show that she is often aware of the syntactic categorial requirements for one form of word as opposed to another, since she also often correctly produces these contrasting forms, as shown in (2).

(2) a. … to do *gardening* [written]
or learn to be a great *gardener* [written]

b. A. is … so *generous* to my family and friends [written]
[he] has *generosity* [written]

c. but I know we have to be *patient* [written]
he has a lot of *patience* [written]
A. is more *impatient* than me [written]

d. I have someone else *correct* my grammar [spoken]
he would look at my journal and give me *correction* [spoken]

e. look for *happiness* in everything [spoken]
no, I don't say that make # uh, God make us *happy* [spoken]
I say God doesn't want to give us ha # *unhappiness* [spoken]
I was very *unhappy* [written]

f. I *believe* everything happen for a reason [written]
someone who will share your *belief* [written]

g. she don't speak very *fluently* [spoken]
so after about a year I'm very *fluent* in Cantonese [spoken]

The example in (3) is a conversational turn in the first audio recording.

(3) Friend: OK, because I did this, I'm being *punished*. [spoken]
Patty: No ... there's no *punishment* from God. [spoken]

This apparent discrepancy between the types of errors we observe in (1) as opposed to Patty's production of the syntactically appropriate forms in (2) and (3) thus warranted further study.

3. This Study

The goal of this study was to try to determine whether Patty knows the syntactic category associated with a particular derivational form. I was interested in trying to answer the following questions in particular: Is Patty aware of the requirement for particular derivational forms in particular syntactic contexts? Has she partially but incompletely learned which forms "go with" which contexts (an issue of morpholexical knowledge)? Does she have trouble accessing or retrieving the right form in production even if she knows it (an issue of morpholexical performance)? As we will observe, the short answer to all of the above appears to be "yes."

3.1 Procedure

The task used was a simple multiple-choice test similar to that used by Tyler and Nagy (1989). There were 40 test items—20 real-word items and 20 nonce-word items. Ten adult NS controls also completed the test. Because Tyler and Nagy's study showed no difference between neutral vs. non-neutral suffixes on their test of syntactic knowledge, I did not make this distinction. (For tests of

relational or especially selectional knowledge, however, this variable would clearly need to be taken into consideration.)[2]

A sample real-word task item is shown in (4) and a nonce-word item in (5).

(4) I tried to _____ his motives for doing that. [*Real-word example*]

a. analysis b. analytical c. analyze d. analytically

(5) The committee is too _____ to deal with that project. [*Nonce-word example*]

a. vorincible b. vorintism c. vorintiousness d. vorincify

Patty and the NS participants were asked to circle the correct answer, even if they were unsure of the meanings of the words in the set of answers.

3.2 Results

A comparison between Patty's results and those of the NS controls is provided in Table 2.

	Percent items answered correctly		
	Real-word items	Nonce-word items	TOTAL
NS controls	100% (200/200)	98% (196/200)	99% (396/400)
Patty	80% (16/20)	75% (15/20)	77.5% (31/40)

Table 2. Results of task requiring the choice of appropriately-suffixed words (based on Tyler & Nagy's (1989) Experiment II) for Patty and English NS adults

As shown in Table 2, and in line with what we might expect given her production data, Patty's percentage correct is considerably lower than that of the adult NS control group. At the same time, it is also significantly higher than chance (χ^2 (1) = 6.545, $p < .025$). Comparing her performance with that of NS schoolchildren shown previously in Table 1, it is comparable with the results reported for NS 6th graders in the real-word condition, and substantially better than the results reported for NS 8th-graders in the nonce-word condition. However, like the adults, but unlike the NS children, Patty does not exhibit a difference between real- and nonce-word conditions.

3.3 Discussion

The overall results from both this task and her naturalistic production data suggest that Patty is aware of the requirement for particular derivational forms in particular syntactic contexts. Whereas the production data suggest an occasional problem with lexical retrieval of the correct form,[3] the recognition task data suggest that Patty knows which syntactic categories are associated with many but not all English derivational suffixes (of the ones that occurred in this task).

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[2] Tyler and Nagy (1989) found no significant main effect for either suffix type or stem frequency in their test of relational knowledge; however, the particular task they used to assess relational knowledge indicated that the non-suffixed items included as a baseline control posed unexpected difficulty even for the 8th-graders in their study, the highest grade level tested. They conclude that subjects' generally low scores on the task, even on the non-suffixed items, most likely reflect "general limitations" on the students' reading, vocabulary and test-taking abilities rather than a lack of knowledge about the morphological relationship between derivates and their stems (p. 656).

[3] For example, Patty correctly chose the appropriate answer (c) for the example shown in (4) above, which she had previously erred on in her naturalistic production (cf. the error shown in example (1a)).

In checking to see whether any items appear to be fairly consistently misanalyzed, we observe that Patty appears not to have established a reliable generalization for the verbal(izing) form X-*ify* (3/9 errors, and a 4th item self-corrected). The only example making use of this suffix I could find in her naturalistic production data was a cryptic utterance in which she was quoting from a discussion that took place in her former bible study class, and said "edify, edify, you know?" (It is not at all clear from the context that she herself understands what this means; her interlocutors did not.)

It is important to note that Patty does not make the kind of production errors in derivational morphology that have been reported in the SLI literature for patients with true morphological impairments. These would include the production of "illegal" morphemes that violate selectional restrictions such as **youthly* instead of *youthful*. Nor is there any preference for inflection and productive derivation as a substitution for unproductive derivation, which has also been reported (Badecker & Caramazza, 1998). Patty's production data do seem compatible with a processing view in which forms involving (at least) less productive morphology must be retrieved from the lexicon in whole-word format. There is no evident tendency to produce derivational "citation" forms (assuming we could even determine these in forms with bound roots or nonneutral, highly stem-deforming suffixation, e.g., *analyze~analysis*). Nor was there a tendency for her to choose bare stem or citation forms among her errors on the multiple-choice task (although the task was not designed to test this and ideally would be for future research). This result contrasts with at least her production of inflectional morphology, where she does indeed tend to omit regular affixation and instead produce bare forms in English.[4]

Related to this point, there also seems to be no reliance on any particular type of underspecified default (for example, the preference for a bare stem form, or the shortest form). In a morphological theory such as Distributed Morphology, lexical roots are presumed to be inherently unspecified for syntactic category and must acquire their category by virtue of being inserted into a specific syntactic context, such as little *v* or little *n* (Embick & Noyer, to appear; Marantz, 1997). The derived word is ultimately spelled out with an affix that "wins" a competition within a block of affixes competing for insertion. The "winner" is the form whose features most closely match those of the syntactic terminal node containing the Root and any other features picked up in the course of the derivation. In cases where no form is available that matches all the features exactly, an underspecified default or "elsewhere" form may be selected. However, a form with mismatching, incompatible features cannot be selected (for example, the nominal *-sis* affix cannot be affixed onto a Root *analy-* in a syntactic node bearing a little *v* category.)

Maybe for Patty, derivational affixes themselves are underspecified in terms of syntactic category. But this doesn't seem right, as it would predict seemingly random errors using other affixes as well (e.g., *analytive* or *analytion*) and these never occur in her data. The forms she produces are always actually-occurring forms of a word, suggesting that in at least some cases she does store whole-word forms rather than storing derivational affixes as separate lexical entries (i.e., contra the assumptions of Distributed Morphology and other morpheme-based linguistic models). Moreover, these words appear to be lexically related in the way that psycholinguistic priming experiments have suggested.

However, this does not mean that complex forms are not analyzed. Finding a significant difference in favor of known vs. novel word items would suggest item-by-item whole-word lexical acquisition in which the items are not necessarily analyzed into their component parts. However, this was not found. The fact that Patty performed as well as she did on the nonce-word items (outperforming English NS schoolchildren on a comparable task) suggests that she indeed recognizes that different derivational forms of lexical items are associated with different syntactic categories.

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[4] Patty's results also contrast with generalizations drawn by Stemberger (1998) in his connectionist-based study of morphology in language production by normal (i.e., non-SLI) native speakers. He argues that inappropriate derivational affixes generally represent a competing affix with the same meaning that is lexically inappropriate (a selectional violation in our terms, cf. section 2.1 above), as in his example *It's an arbitrary decidal* for 'an arbitrary decision' (p. 437). He also writes that, whereas affix-loss errors are common, addition errors are not: "Apparently, the transparency of the semantics leads to a base form being a strong competitor which, because of its higher frequency, is more likely to win out when inappropriate … ; but the derived form is unlikely to win out when inappropriate" (p. 437).

Looking back over the data in (2) and (3)—the various correctly derived forms occurring in her production data—we have no proof that Patty has separate lexical entries for stems and affixes. Rather, it is likely that she has learned that, for example, the entire word *punishment* is a nominalized resultative derivate (or associate) of the verb *punish*. The data on the whole appear to support a lexeme- rather than morpheme-based model of morphological representation (as argued for by Aronoff, 1994; Beard, 1995).

Finally, note a (methodological) difference in the conclusions we are likely to draw from the study of knowledge of derivational vs. inflectional morphology. In modeling learners' representation of functional categories (in both first and second language acquisition), acquisitionists often rely on some criterial proportion of correct use of inflectional affixes to posit learner knowledge of corresponding functional categories (e.g., T, C, or D). However, for highly productive derivational affixes associated (primarily) with a change in lexical category appropriate for a particular syntactic context, we do not assume that some criterial failure here indicates lack of knowledge of whatever features comprise the lexical categories N, V, or A (see Baker, 2003, for one especially detailed theory of lexical category feature values). In other words, Patty's selection of the wrong derivational form cannot be taken as evidence that she has no knowledge of the associated lexical categories N, V, or A, or their composite formal feature values in her English idiolect. Instead, we are more likely to assume—correctly, in my view—that she has simply not yet completely learned which forms correspond with those categorial features. As pointed out earlier by Tyler and Nagy (1989) the breadth of this learning (since there are so many derivational forms to learn) may well be linked to additional interrelated factors such as vocabulary development and reading ability and experience.

4. Conclusion

This small study admittedly scrapes the tip of the iceberg in terms of sketching out what still needs to be done to determine how derivationally-related word forms are represented within particular obligatory syntactic contexts in a second language idiolect. Factors that need to be controlled for in future research include the effect (if any) of L1 influence (both grammatical and prosodic), and derived-form type and frequency. At this point, it looks as if a combination of factors is contributing to the errors we find in the data. We should first keep in mind that the bulk of Patty's use of derivational morphology is appropriate and error-free, indicating that she is indeed aware of the requirement for particular derivational forms in particular syntactic contexts. However, where errors do occur, they seem to implicate both the incomplete acquisition of morphological mapping (i.e., knowing which forms "go with" which features or categories) and performance error (e.g., in lexical retrieval). Both the data from her naturalistic production and the derived-word recognition task indicate this.

It is also important to keep in mind, as we are reminded by McQueen and Cutler (1998), that "psychological morphology does not map neatly on to linguistic morphology" and that linguistic distinctions may not map neatly on to processing distinctions (p. 406). To the extent we can observe in this limited study, Patty's representation of derivational morphology is best modeled in a lexeme-based rather than morpheme-based type of linguistic theory. However, extralinguistic factors such as reading ability and experience and vocabulary acquisition (an indirect correlate of frequency), also appear to play an important role. Obviously, more research is needed.

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