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What is This?

This study explores the relation between fluency in writing and linguistic experience and provides information about the processes involved in written text composition. The authors conducted a think-aloud protocol study with native speakers of English who were learning French or German. Analysis reveals that as the writer's experience with the language increases, fluency (as measured by words written per minute) increases, the average length of strings of words proposed between pauses or revision episodes increases, the number of revision episodes decreases, and more of the words that are proposed as candidate text get accepted. To account for these results, the authors propose a model of written language production and hypothesize that the effect of linguistic experience on written fluency is mediated primarily by two internal processes called the translator *and the* reviser.

Fluency in Writing

Generating Text in L1 and L2

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For students taking an in-class essay exam, communicating with friends in an online chat room, or pulling an all-nighter to finish up a research paper, being able to write quickly, with few pauses or hesitations is very useful. But being able to write fluently is important in many other contexts when writers have an idea that they want to write down before they forget it. Conversely, being less fluent than one's peers, as are many second language learners, can be a serious barrier to educational achievement. A better understanding of the processes underlying fluent writing can have important implications for the field of composition.

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In studies of spoken language, rate of production is the criterion most frequently used to define fluency. However, Fillmore (1979) has identified three additional criteria that are also often used to characterize fluent language production: one concerned with qualities of coherence and complexity; a more pragmatic one concerned with appropriateness; and one more concerned with inventiveness (e.g., the ability to pun, joke, and create metaphors). These additional criteria may well be part of everyday notions of fluency but may conflate a useful distinction between fluency (defined by rate) and proficient use of language (defined by rate and the additional criteria). Schmidt (1992), in his discussion of second language (L2) spoken fluency, distinguishes between global language proficiency (in which "speaking fluently" and "speaking well" are seen as synonymous) and the concept of fluency as "the processing of language in real time" (p. 358). Although Schmidt focuses on spoken language fluency, he observes that speed and ease of processing probably characterize fluent language use across modalities.

In their analysis of language development in L2 writing, Wolfe-Quintero, Inagaki, and Kim (1998) also view fluency as a temporal phenomenon, defining it as the number of words and structures accessed in a given span of time. Simply stated, more fluent writers access a greater number of words and structures more efficiently; less fluent writers access fewer words and structures less efficiently. For the purposes of our research, we define written fluency as the rate of production of text. In contrast, we view proficiency—reflected in characteristics such as accuracy, grammatical and lexical complexity, and appropriateness—as a related but distinct concept that we will not treat in the present study.

Sentence Production Processes

The ease of processing that characterizes fluent language production may be the result of knowledge that has been proceduralized (Towell, Hawkins, & Bazergui, 1996) through strengthening of connections (Anderson, 1995), learning sequences of language—from the sequences that make up words to the sequences that make up discourse (Ellis, 1996), or chunking (Chase & Simon, 1973; Ellis, 1996; Miller, 1956). Schmidt (1992) describes fluency as an "automatic procedural skill" that is relatively free from conscious attention (p. 358). Beginning second-language learners can bootstrap their way into more fluent language production by using routines and automatized

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Table 1
Segment of a Writing Protocol

Protocol:	. . . ok . . . the summer after tenth grade . . . I and oh . . . I and . . . no . . . twenty seven students . . . and I . . . from my school district . . . that sounds kind of awkward . . . would it be twenty seven students from my school district and I . . . but then I was part of the school . . . oh but if I said from my school district . . . ah ha . . . from my school district . . . the summer after tenth grade . . . twenty seven students from my school district . . . and I . . . went to France . . . for two weeks . . .
Written sentence:	The summer after tenth grade, 27 students from my school district and I went to France for two weeks.

NOTE: The writer produces language in bursts and evaluates them. *The summer after tenth grade* is one burst.

chunks of language that allow them to more easily produce longer strings of language within a shorter period of time (Ellis, 1996). For beginning second-language learners whose second language has not been proceduralized, writing can be a very effortful process; it may require conscious attention to retrieve words and spelling, leaving little working memory free to attend to higher-level concerns such as generating detailed content and organizing the discourse.

Studies of written fluency have employed a variety of measures ranging from counts of the number of words, clauses, sentences, or T-units in a text, to averages of the number of words per clause, per sentence, per T-unit, per error-free clause, or per error-free T-units in a text. The Wolfe et al. (1998) meta-analysis of this research reveals that three measures (T-unit length, error-free T-unit length, and clause length) "consistently increased in a linear relationship to proficiency level [defined by program level, school level, or holistic rating] across studies, regardless of task, target language, significance of the results, or how proficiency was defined" (p. 29). However, these text-based measures of written fluency, although useful indicators of writing development, do not shed light on the production processes that enable a writer to compose text more fluently.

A series of studies by Kaufer, Hayes, and Flower (1986) provides both empirical observations of students writing in their first language (L1) and a model of written language production that supply a valuable context for thinking about the processes involved in generating written sentences. These authors found that in the context of a think-aloud protocol study, L1 writers typically "construct sentences by proposing and evaluating sentence parts" (p. 126). Table 1 shows a sample of a writing protocol illustrating the production of language

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in parts, or "bursts," of proposed text and the evaluation of those bursts.

These bursts of proposed text were identified by pauses of two or more seconds in the verbal protocol or by a grammatical discontinuity indicating that the language prior to the discontinuity has now been revised. Kaufer et al. (1986) noted that the more experienced writers (graduate students) tended to propose language in bursts averaging about 10 or 12 words, but the less experienced writers (undergraduates) tended to propose bursts averaging about five to six words.

Using the same methodology, Friedlander (1989) studied native Mandarin speakers with limited experience in English. He observed that when these individuals composed in English, they proposed very short bursts of language averaging about two words in length. The results from Kaufer et al. (1986) and Friedlander (1989) suggest that the average length of bursts of proposed language increases as the writer's experience with the language increases.

Our objective in the present study is to explore the relation between fluency and linguistic experience, and through this relationship, to provide information about the processes involved in written text production. In particular, we hypothesize that burst length is a central contributor to fluency. If a given set of ideas can be translated into words in one burst, the total time required for writing will be less than if two or three bursts are required to produce the same word string.

A New Model of Written Language Production

We began by adapting the model of written language production proposed by Kaufer et al. (1986), to incorporate insights from the models of composing and revision proposed by Hayes (1996). Our model of written language production, presented in Figure 1, has three levels: a resource level, a process level, and a control level. We will now describe each of these levels.

The resource level includes those internal memories and general-purpose processes that the processes at the other levels (the process level or control level) can call on. For example, long-term memory may be called on by the proposer to supply information for a narrative, by the translator for lexicographic and grammatical information, and by the transcriber for orthographic rules. The translator may call on the reading process to read the text produced so that it can complete sentences with appropriate number and tense. The translator calls on

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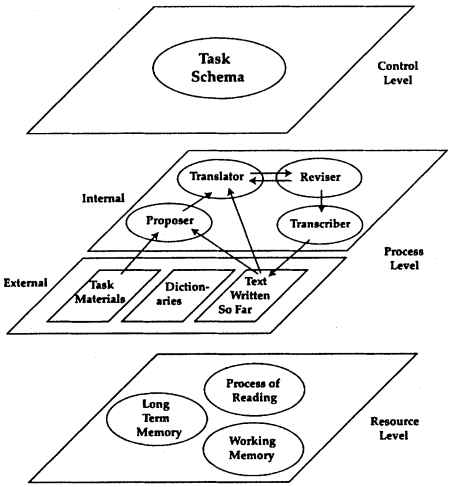

Figure 1. A model of written language production

working memory to store its output in a buffer, similar to the articulatory buffer described by Gathercole and Baddeley (1993), where it can be critiqued by the reviser.

The process level is divided into internal processes and the external environment of those processes. The internal processes include a proposer, a translator, a reviser, and a transcriber. The proposer is a prelinguistic source that produces ideas to be expressed. The translator converts the prelinguistic ideas into strings of language with appropriate word order and grammar. The reviser evaluates both proposed and written language, and the transcriber turns the content of the articulatory buffer into written language.

The external environment of the processes includes the audience, the text that the writer has produced so far, and task materials such as source texts, critic's comments, or notes. The environment may also include dictionaries, style guides, computer interfaces, spelling checkers, and so on. The external environment described here is roughly equivalent to the task environment described by Hayes (1996), which includes both the social and the physical environments of the writer.

At the control level is the task schema, which includes the task goals and a set of productions that govern the interactions among the processes. At the process level, we have specified a typical set of interactions that might be activated by the task schema (indicated by the arrows in Figure 1). We want to emphasize, however, that these inter-

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actions are, at least in part, under voluntary control and would not be the same for all tasks and all writers. Thus, writers engaged in what Elbow (1973) calls "freewriting" may elect not to activate the revision process, but if they were working on a draft of a research proposal, they may choose to revise extensively. When faced with a writing task that is difficult for them, less confident L2 writers may choose to rely heavily on dictionaries, or they might choose instead to rely on L1 resources, or they may decide to change their message instead.

In many writing tasks, we would expect that sentence generation would start with the proposer, which, influenced by the task goal and the text written so far, would generate prelinguistic material and pass it to the translator. The translator would then process the prelinguistic input and store its output in an articulatory buffer where it would be evaluated by the reviser. If the output is judged acceptable, then the transcriber will add it to the text written so far. If the output is deemed unacceptable, the proposer or the translator could opt to try again. If the writer is returning to a draft-in-progress, the process may begin with the reviser evaluating text as the writer reads it and continue until the reviser makes an unfavorable evaluation, at which point, the proposer would begin to generate alternatives.

We assume that interactions among these four processes are not one-directional with each process passively accepting input from the previous one. Rather, we believe that each process is influenced by the next process in line. For example, we assume that the prelinguistic source may propose several variations of an idea and that some of these variations are easier to translate into well-formed strings than others. Easy to translate versions may be chosen in preference to harder to translate versions. Thus, the material that is chosen for expression may depend both on the proposer and the translator. Furthermore, we assume that the reviser continually monitors the output of the translator. In the Kaufer et al. (1986) study, writers frequently interrupted the production of a linguistic string with a revision episode to correct a grammatical error. Thus, in this case, the sentence-generation process depends on the interaction between the translator and the reviser.

Research Questions

The hypothesis guiding this study is that the effect of linguistic experience on written fluency is mediated primarily by the translator. That is, we hypothesize that linguistic experience will change the

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translator and that those changes will be reflected in increases in average burst length. For example, as the writer gains linguistic experience, lexical retrieval processes of the translator may become more efficient, allowing more cognitive resources to be allocated to other aspects of the writing task (McCutchen, Covill, Hoyne, & Mildes, 1994). We can imagine that linguistic experience may also have a secondary effect on fluency through the reviser. For example, when an individual has little language experience, translation will take more cognitive effort, and the translator may generate ungrammatical or otherwise inappropriate strings. The reviser may be able to apply the linguistic knowledge that it shares with the translator more effectively once those strings have been proposed. When the individual has more experience with the language, the translation process is more fully proceduralized, and the translator will tend to propose grammatical or more appropriate strings. In individuals with little language experience, there is likely to be more revision, which will slow production.

In this study we are investigating four research questions in the context of similar writing tasks:

1. Does fluency (as measured by words written per minute) increase as the writer's experience with the language increases?
2. Does average burst length increase as the writer's experience with the language increases?
3. Do the number of revision episodes decrease as the writer's experience with the language increases?
4. Do more of the words that are proposed as candidate text get accepted (and written down) as the writer's experience with the language increases?

Any factor that either increases the rate at which the generator produces candidate language or increases the proportion of candidate language accepted by the editor should increase fluency.

METHOD

Participants

The participants were undergraduate university students enrolled in the third-semester French or German course or enrolled in the fifth- or sixth-semester French or German course. Six students were taking

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French, and seven were taking German. They are all native speakers of English. They were each paid $25 for participating in this study.

Procedure

Each participant was observed in two sessions, a few days apart. In each session, the participant was asked to think aloud while composing a short essay. One essay was composed in English and the other in the language that the participant was studying. For half of the participants, the English essay was composed first and for the other half, the English essay was composed second. There were four topics used in the study, of the kind that beginning language students are familiar with: How do you like to spend your Saturdays? What is special about your family? Describe a trip that you have taken or would like to take. Describe a day in school.

Each session was conducted in the language the participant was writing in. For example, if the participant was composing in German, the experimenter gave the instructions and answered all questions in German. This was done in an effort to minimize any tendency to switch languages when composing in L2. Participants were allowed to use dictionaries while writing. At the beginning of each session, prior to composing the essays that provided the data for the study, the participants were given practice in composing while thinking aloud.

All of the sessions were videotaped and audiotaped. We later transcribed the sessions and timed them by watching the video and recording the starting and ending times. We started timing the session from the moment the writer first started verbalizing what later became text (rather than when the writer began planning their texts in a more general way) and stopped timing when the writer finished writing the last word of the text (rather than when the writer said "OK, I'm done" or after he or she reread the text a final time without adding any new text).

Design

The experimental design was a mixed one with one within- and two between-subjects variables. The between-subjects variables were the L2 (French or German) and the number of semesters that the participant had studied that language (three or five or more). The within-subjects variable was the language in which the participant was composing (L1 or L2). The most direct test of the hypotheses will be

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provided by comparing the writing performance of participants composing in their L2 who have different numbers of semesters of experience in studying the L2. A second test will be provided by comparing the writing performance of writers composing in their L1 and their L2.

Coding Scheme

The data for this study included the texts that our participants wrote, the typed transcripts of their think-aloud protocols, and the videotapes of the writing session. We first compared the transcripts with the texts and the videotapes to identify occasions on which participants were reading the texts that they had already written. Next, we bracketed comments that did not lead directly to the production of text such as questions about the task (e.g., "Do you want me to write in ink?"), planning statements (e.g., "I'm going to write about my family"), and extraneous comments (e.g., "I really loved this trip"). Third, we timed the protocol and segmented it wherever there was a pause of two seconds or more. Finally, we further segmented the protocol wherever the writer revised or repeated previously proposed language.

In coding the protocols, we attended solely to those segments in which the writers proposed new language. Interpreted in terms of our model, segments that were terminated by revision represent occasions on which the generating processes of the proposer and translator were interrupted by the reviser. Segments that ended in pauses represent occasions on which the generating processes ran their course and were not interrupted by the reviser. We will refer to segments terminated by pauses as *P-bursts* and segments terminated by revisions as *R-bursts*. The data were coded by two judges, each of whom coded half of the data. To check reliability, they each independently coded the same 33 segments. The correlation between judges was 0.82 by Cohen's Kappa.

Table 2 shows 12 segments from one of our L1 protocols in which the writer composes one sentence. New language that the writer proposed for inclusion in the text is underlined. Language that the writer included in the written text is bolded. A repetition of language that the writer had proposed earlier is italicized. These repetitions may include reading of text already written.

The writer starts by proposing the words *Many people think*. In Segment 2, he repeats the words *Many people* but revises *think* replacing it

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Table 2
A Segmented Protocol

Segment Number	Burst Type	Segment Content	Number of New Words
1	R	**Many people** think, or	3
2	R	*many people* find uh	1
3	P	*many people* **see music and sports as opposite**	6
4	P	*opposite* **ends**	1
5	P	*as opposite ends* **of the spectrum** uh	3
6	P	**which has been good**	4
7	P	*which has been good* **for my sister and I**	5
8		*which has been good for my sister and I* uhm	
9	P	**because we've been exposed**	4
10	P	*been exposed* **to both**	2
11	R	*to both* worlds	1
12	P	*to both* **disciplines** yah	1

NOTE: A P-burst is a segment that is terminated by a pause of at least two seconds. An R-burst is a segment that is terminated by revision.

with *find*. It is this revision that leads us to classify Segment 1 as an R-burst. In Segment 3, the writer again repeats *Many people*, proposes *see* as a revision for *find*, continues to generate new text, and pauses. This segment is classified as a P-burst. In Segments 4 to 7, he continues to propose and accept new words. Segment 8 has not been coded because it contains no new language. In Segments 9 to 10, more new language is proposed, Segment 11 is a revision episode, and in Segment 12, a new word is proposed. This segment completes the sentence. We interpret *yah* as a comment, so it is not included in the word count. The number of words of new language proposed in the segments is the primary data for the study.

RESULTS

First, our results confirm the hypothesis that experience with language has a measurable impact on fluency, at least as measured by words written per minute. We first compared writing in L2 with writing in L1 and then made comparisons between the third-semester and fifth-semester students. Figure 2 shows that on average, our writers wrote fewer words per minute in L2 than in L1. The students wrote an average of 10.75 words per minute when writing in their L2 and an average of 17.2 words per minute when writing in English, their L1.

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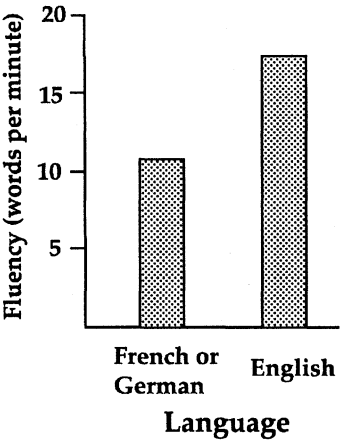

Figure 2. Fluency in L2 and L1

This difference is significant by Wilcoxon Signed Ranks test (Siegel & Castellan, 1988, p. 87) at the .0002 level.

For each writer, we then divided fluency in L2 by fluency in L1. The average ratio of L2 to L1 fluency for all writers was .66. Figure 3 shows the average ratio of L2 to L1 fluency for both third-semester (.55) and fifth-semester (.80) students. The difference between the third and fifth-semester students is significant at the .037 level by Wilcoxon-Mann-Whitney test (Siegel & Castellan, 1988, p. 128). However, although this result is consistent with our hypothesis concerning the relation of fluency and linguistic experience and with the other results that we report, we believe that it should be interpreted with caution. For the third-semester students, the average number of words written per minute in L2 was 10.61, and in L1 it was 20.1. For the fifth-semester students, the average number of words written per minute in L2 was 10.91, and in L1 it was 13.831. Thus, the difference in ratios depends on the surprisingly low L1 fluency of the fifth-semester students rather than a relatively high L2 fluency. We believe that the most plausible interpretation of this pattern of data is that by sampling accident the fifth-semester students happened to have lower verbal ability than the third-semester students and that this difference led to reduced fluency in both L1 and L2. Scholastic Aptitude Test (SAT) verbal scores for these two groups support this hypothesis. The average SAT verbal scores for third-semester students was 660 and for fifth-semester students, 638.

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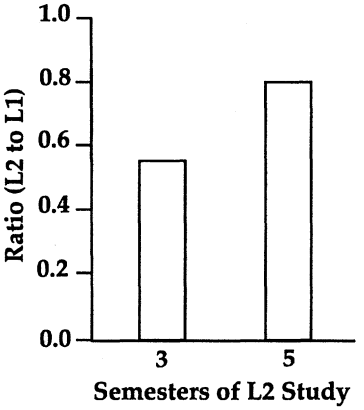

Figure 3. Ratio of L2 to L1 fluency and L2 experience

Second, our results show that these differences in fluency are associated with differences in length of P-bursts. As with the previous analysis, we first compared writing in L2 with writing in L1 and then made comparisons between the third-semester and fifth-semester students. The shaded bars in Figure 4 show that the average P-burst length for all of the students is longer when they write in L1 than when they write in L2. The average P-burst length for students when writing in L2 was 2.41, and it was 3.7 when they were writing in L1. This difference is significant at the .0052 level by Wilcoxon Signed Ranks test.

The unshaded bars in Figure 4 show average P-burst lengths for third-semester and fifth-semester students writing in L2. The burst lengths are longer for the fifth-semester students: the average P-burst length for the third-semester students was 1.97; for the fifth-semester students it was 2.93. This difference is significant at the .05 level by Wilcoxon- Mann-Whitney test.

Third, our results show that the differences in fluency are associated with measures of revision performance. As a measure of the impact of revision on the writing process, we calculated the percentage of bursts that involved revision, that is, the percentage of R-bursts (see Figure 5). When students were writing in L1, on average, 13% of their bursts were R-bursts. When they were writing in L2, on average, 26% of their bursts were R-bursts. This difference between L2 and L1 was significant at the .0004 level by Wilcoxon Signed Ranks test. If we compare the percentage of R-bursts for third-semester students with

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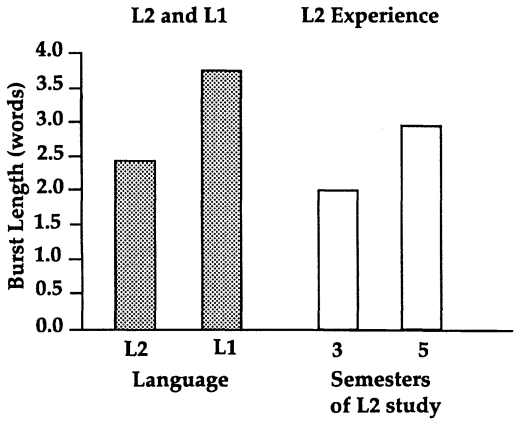

Figure 4. Burst length by language and L2 experience

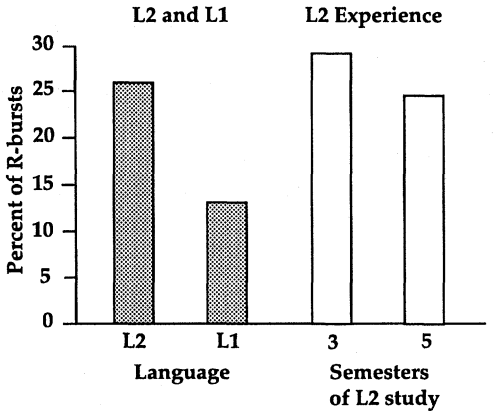

Figure 5. Percentage of R-bursts by language and L2 experience

the percentage for fifth-semester students writing in L2, as shown by the unshaded bars in Figure 5, the differences are statistically significant ($p = .026$) by Wilcoxon-Mann-Whitney test. For the third-semester students, 29% of their bursts were R-bursts; for the fifth-semester students, 24% of their bursts were R-bursts.

As a measure of the impact of revision on the text produced, we calculated the percentage of proposed new words that the writers actually used in their written texts. The shaded bars in Figure 6 show that the percentage of proposed new words that were included in the final

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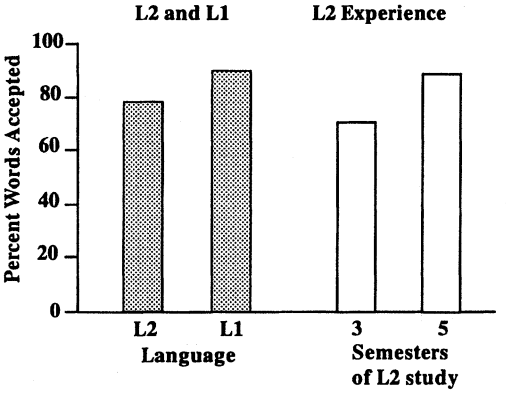

Figure 6. Percentage of words accepted by language and L2 experience

text was greater when writers were composing in L1 than when they were composing in L2. When writing in L2, they accepted 78% of what they proposed for inclusion, and when writing in L1, they accepted 87%. This difference is significant at the .02 level by Wilcoxon Signed Ranks test. As we might expect, and as the unshaded bars in Figure 6 show, fifth-semester students accepted more of what they orally proposed (87%) than did the third-semester students (69%). This difference is significant at the .02 level by Wilcoxon-Mann-Whitney test.

DISCUSSION

We have found that increased experience with a language was associated with increased fluency in writing that language. Indeed, as little as two semesters of study appears to yield a significant increase in written fluency. In addition, we have found that increased linguistic experience is associated with an increase in burst length, a decrease in the frequency of revision, and an increase in the number of words that are accepted and written down. Thus, all of the research questions we asked above can be answered "yes."

We interpret these results as reflecting the workings of two processes that underlie written fluency: a translation process that turns thought into proposed language and a revision process that selects or

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modifies the proposed language. We believe that burst size is a parameter of the translation process that is fundamentally related to fluency. An increase in burst size reflects an increase in the capacity of the translator to handle complex language structures. Linguistic experience may enhance this capacity by increasing the lexicon of words and stock phrases, or by increasing facility with more complex grammatical forms. These phenomena may well be closely related to chunking phenomena widely observed in studies of human memory (Newell, 1990).

The changes in revision performance, we believe, also largely reflect changes in the translation process. As the translator's facility with complex grammatical forms and lexical retrieval increases, cognitive resources are freed up so that the translator is able to apply more fully the writer's sense of the grammar while proposing a string of language. In contrast, with writers who have limited experience with the language, lexical retrieval is more effortful, and the translator is unable to fully apply the grammar because of the lack of cognitive resources. Therefore, for these writers, their sense of the grammar is more fully applied by the reviser, which does not have the burden of creating the text. Thus, we believe that students revise less as they become more experienced with the language, not because the revision process becomes more lax (we suspect that the opposite is true), but because, with experience, the translator becomes more grammatically accurate while proposing a string of language and thus less frequently generates language that violates the writers' own sense of the grammar.

We expected that bursts that were terminated by revision (R-bursts) would be substantially shorter on average than those that were terminated by pauses (P-bursts) because, in our model, revision interrupts the ongoing process of language production. Jones (1985), who also studied L2 composing, found that the average number of words written between pauses was less for frequent revisers than for less-frequent revisers. If one took the view that revision was equally likely to occur at any point in the production process, one might expect that R-bursts would be half the length of P-bursts. However, in our data, there was no consistent difference in the length of the two types of bursts. For L1, P-bursts were 3.61 words in length, and R-bursts were 3.96 words in length. For L2, the corresponding lengths were 2.48 words and 2.30 words.

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Does this failure to find a substantial difference in burst length indicate a major failure in our model? There are two factors that might allow a model such as ours to predict roughly equal lengths for the two types of bursts. First, it is reasonable to assume that long bursts are more likely to be interrupted by revision than short bursts simply because there are more opportunities for error in long bursts than in short ones. This bias will tend to reduce the average length of P-bursts and increase the length of R-bursts because fragments of long bursts are likely to be longer than fragments of short bursts.

Second, because of memory limitations, there is reason to expect that revisions will tend to occur late in a burst rather than early. If there is such a tendency, then R-bursts might be closer in length to P-bursts than one would expect if there were no such tendency.

To explore the effects of these two factors, we constructed a simulation in which we were able to vary the overall probability of revision, the tendency of revisions to occur early or late in bursts, and the distribution of burst lengths. Using distributions of burst lengths typical of those we observed in our data, we found that even a small bias for revisions to occur late in a burst yielded average burst lengths for R-bursts that were equal to or greater than for P-bursts.

We conclude that the text generation model we have proposed can, given reasonable assumptions, yield equal average burst lengths for P-bursts and R-bursts. Thus, our observation of roughly equal burst lengths for the two burst types does not indicate a failure of the model. These same assumptions, and particularly the assumption that longer strings are more likely to be revised than shorter ones, suggest that the average P-burst length measured in our study probably underestimates the length of P-burst that the translator is capable of producing in the absence of revision.

The L1 bursts that we have observed in this study are substantially smaller than those reported by Kaufer et al. (1986). The average burst length for undergraduate writers (calculated from the novice data in Table 2 of Kaufer et al., 1986) is 7.33 words, in contrast to our average P-burst length of 3.61 words. We believe this difference results, in large part, from differences in the way burst length was measured in the two studies. In particular, in the present study, a repetition of previously proposed language was taken as indicating the termination of a burst but not in the Kaufer et al. study. To verify that this difference in coding procedure could make a substantial difference in average burst size, we used our current coding procedure to recode a sample

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of the data used in the Kaufer et al. study. According to our new coding, burst sizes averaged two thirds the size of those reported by Kaufer et al. Other differences between the two studies may also have influenced burst length; however, most of the discrepancy can be attributed to differences in coding procedures. Thus, our model of written fluency accounts for previous data and also for the results of the present study.

In future studies, we plan several additional tests of the model. First, we plan to test our assumptions about the role of the articulatory buffer in the generation process. We also hope to explore the relation of the proposer and the translator by controlling the complexity of the ideas that the proposer proposes to the translator. Furthermore, we believe that it would be useful to explore how the measures of fluency we've used here are related to other aspects of proficient language use such as complexity, appropriateness, and inventiveness (Fillmore, 1979). It would also be useful to investigate the influence of the writing task on burst length and revision episodes. In other studies, topic has been shown to influence the amount of revision (Porte, 1996; Raimes, 1987), and we can imagine that more complex topics than the ones used in this study would have an impact on burst length.

Implications for Teachers

In this study, we found that fluency in writing increased as the writer's experience with the language increased. For teachers of second languages, in particular, this result reminds us of the need to give students many opportunities to practice writing, so that processes such as lexical retrieval can become more automatic. Second, we found that in less experienced writers, the writing process was frequently interrupted by revision. This suggests that teachers should guide students to practice effective writing strategies, such as the strategy of "write it down, even if flawed, and revise it later." Lay (1982) found that the Chinese students in her study relied on L1 when they had trouble retrieving a word in English they were searching for. So they wrote that word in Chinese and then switched back to English to finish writing what they wanted to say. Then later, they could go back and look those words up in their dictionaries. One student in Hall's (1990) study, when stuck searching for the best word, would write down a close approximation of the word she wanted and underline it, thus flagging it so that she could easily come back later to substitute a word she considered more appropriate. Our model provides

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theoretical justification for the position that strategies such as these can promote fluency in the second language writer because they allow the message to be generated and transcribed with fewer interruptions from the reviser.

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