

## **Production and Recognition Bias of Stylistic Sentences Using a Story Reading Task**

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*Four experiments examined participants' ability to produce surface characteristics of sentences using an on-line story reading task. Participants read a series of stories in which either all, or the majority of, sentences were written in the same "style," or surface form. Twice per story, participants were asked to fill in a blank consistent with the story. For sentences that contained three stylistic regularities, participants imitated either all three characteristics (Experiment 2) or two of the three characteristics (Experiment 1), depending on the proportion of in-style sentences. Participants demonstrated a recognition bias for the read style in an unannounced recognition task. When participants read stories in which the two styles were the dative/double object alternation, participants demonstrated a syntactic priming effect in the cloze task, but no consistent recognition bias in a later recognition test (Experiments 3 and 4).*

**KEY WORDS:** memory; production; style; syntactic priming.

### **INTRODUCTION**

Memory for the surface form of stylistic text has been studied in the psychological literature from the perspective of understanding under what conditions and for what materials learning is found. More recently, studies in the psycholinguistic field have demonstrated short-term imitation of surface form in production tasks (Bock & Loebell, 1990). This phenomenon, termed "syntactic priming," is of interest for those who study how surface information in text is learned, because it demonstrates a sensitivity to surface form in production in situations where surface form is not emphasized nor particularly salient.

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A consistent finding in the verbal learning literature is that memory for syntax may be high initially but decays quickly (Begg, 1971; Bransford, Barclay, & Franks, 1972; Bransford & Franks, 1971). Sachs (1967) showed that recognition memory for the form of the sentence, although high immediately, decreases significantly even at delays of as few as 27 seconds. Psycholinguistic studies have shown that the surface information of a sentence is held until the clause level (Gernsbacher, 1985; Jarvella, 1970, 1971), after which it becomes less available.

However, there are circumstances in which memory for the surface form of sentences is improved. In the psychological literature, improved memory for the surface form of text is seen when there is increased processing of surface form. This change in processing can be prompted by either changes in task demand or by characteristics of the material itself. The transfer-appropriate processing framework (Morris, Bransford, & Franks, 1977) predicts that performance is improved when there is a match in the processing performed both at study and test. Typically, the default task in story reading is for comprehension, and that is what is tested. Memory for surface information improves when participants are given processing tasks that increase attention for surface form, such as rhyme (Morris, Bransford & Franks, 1977), or grammatical judgments (Graesser & Mandler, 1975).

Text with characteristics that induce increased attention to form are remembered better. Under incidental conditions, people have better memory for the form of emotionally interactive material (Keenan, MacWhinney, & Mayhew, 1977; Kintsch & Bates, 1977), such as jokes, asides, and sarcasm. Participants remember the form of sentences that contain explicit references, such as nouns and phrases (Bates, Masling, & Kintsch, 1978), better than those without explicit references (presumably, because explicitness of reference signals new information). In McDaniel (1981), participants had equivalent memory for the meaning of sentences that varied in syntactic complexity, but better memory for the form of syntactically complex sentences.

In the field of linguistic stylistics, stylistic text is described as having a pattern and form that emphasizes and highlights surface information. Stylistic text is defined as a deviation of normal text (Chapman, 1973; Enkvist, 1973; Mukarovsky, 1970). This is typically a deviation in frequency, in which stylistic text contains a higher or lower frequency of particular words, phrases, or syntactic structures than normal text. Other characteristics of stylistic text that may encourage memory for form are features that recur or repeat (Chapman, 1973, p. 14; Freeman, 1970, p. 4) and are optional (Enkvist, 1973) in that the choice of form is not forced due to semantic or other factors.

Few studies have examined the ability to produce stylistic text. In Bartlett's (1932) study, subjects performed repeated recalls of an adaptation of a North American folk tale. Although the subjects could recognize that the style was "different," they did not incorporate the surface structure in the recalls; that is, they had poor "productive control" of the style. Brewer and Hay (1984) found that participants, when recalling texts written in a genre style, were more likely to retain the content than the surface form of the recalled sentences. According to Brewer and Hay, if subjects have productive control of the style, they "style-match" and produce text that is consistent with the style. If they do not have productive control, the text is recalled in a more standard style. As established styles were used, this study does not address how people come to have productive control over a style.

Other studies in which participants have been given repeated experience with a style demonstrate learning for the surface regularities of texts. In Rubin, Wallace, and Houston (1993) novices read and recalled 5 ballads over 5 sessions and then completed tasks testing their knowledge of the ballad form. Novices demonstrated learning of the multiple constraints of style using both production and other measures. Zervakis and Rubin (1998) used the same approach as Rubin, Wallace, and Houston, but used novel, controlled styles instead of naturalistic material. Subjects were able to incorporate style characteristics over successive recalls, with tense and descriptor type learned quickly and clause order more slowly. Subjects were able to generate a new story of the same style and list rules of the style learned and were more likely to incorporate or list marked style characteristics.

Syntactic priming offers an alternative explanation for style learning. Syntactic priming occurs when a person is more likely to produce a sentence of the same syntactic form as one recently read, spoken, or processed in some way. This has been observed in the corpora of natural language, such as children's speech (Keenan, 1977), in children's second language acquisition (Hatch, Peck, & Wagner-Gough, 1979), and in a range of language and cultural contexts (Tannen, 1987).

Bock and Loebell (1990) experimentally demonstrated syntactic priming with prepositional dative sentences and passive sentences, using a picture-describing task. Participants heard and repeated a priming sentence, and then described a picture. After speaking either a prepositional dative or prepositional locative priming sentence, participants were more likely to describe the picture with a prepositional dative sentence. Sentences primed the production of sentences with similar surface structure, even though similar structures specified different concepts. In addition, the content of the priming sentence and the picture to be described were unrelated, and differences in the type and number of adjectives, adverbs, and determiners did not affect the likelihood of reusing the sentence frame.

How does syntactic priming inform style learning? First, syntactic priming studies demonstrate a dissociation of form from content during language production; repetition of form was not dependent on meaning. Second, it is suggested that priming of the syntactic form occurs unintentionally; it is not due to additional intentional, form-specific processing (Potter & Lombardi, 1998). In the Bock and Loebell (1990) study, the speaking of the priming sentence was incidental to the sentence production task (describing a picture), and target sentences were separated by filler sentences. In the Potter and Lombardi (1998) study, participants were likely to produce a sentence of the same form as a recently read sentence, even when the task was an explicit recall of another sentence.

The purpose of this paper is to determine whether syntactic priming could be used as a possible mechanism for style learning. In order to do so, syntactic priming should be found under similar conditions in which style learning is found. Specifically, syntactic priming should 1) be found with both intentional and unintentional conditions, 2) be found for both preferred and non-preferred optional forms, and 3) exert effects at both short and longer time delays. Evidence for these three claims follows.

Style learning is known to occur under incidental conditions. For example, Rubin, Stoltzfus, & Wall (1991) found that participants were able to produce new names for pasta, laundry detergents, and painkiller medications, and these new examples conformed to the regularities of real examples in the number of syllables and word morphology. A similar finding has been found in prototype generalization studies (Posner & Keele, 1968). However, many studies have found that instructions to pay attention to the form or task demands that increase attention to the form of sentences improve memory for surface form.

Stylistic text is described as a deviation from typical text in that marked (foregrounded) forms are increased relative to unmarked forms. Therefore, syntactic priming must be demonstrated for both preferred and non-preferred forms in order to serve as a mechanism for style learning. In recall and production tasks, participants typically demonstrate a bias for unmarked compared to marked forms, such as by recalling dative sentences as double object (Bock & Brewer, 1974), complex sentences with subordinate clause first as main clause first sentences (Jou & Harris, 1990), or passive sentences as active (D'Arcais, 1974). Syntactic priming has been demonstrated with optional forms, such as passive/active and dative/double object, in which one form is marked, but not heavily so.

It is known that memory for style has been demonstrated over both short and long delays, with participants able to recall both the meaning and surface regularities of such material as songs, music, and rhymes long after the original acquisition (Hyman & Rubin, 1990; Rubin 1977). On the other

hand, the time course of syntactic priming is under dispute, with estimates of effects ranging from five clauses (Weiner & Labov, 1983) to more than 10 (Bock & Griffin, 2000). Branigan, Pickering, and Cleland (1999) found even shorter-lasting effects using a written task. However, Pickering, Branigan, Cleland, & Stewart (2000) have suggested the possibility that syntactic priming may show repetition effects. In addition, the effect of repeated syntactic priming has not been probed using more sensitive measures, such as a recognition task.

The following set of experiments had two primary aims. The first was to determine whether syntactic priming effects could be demonstrated with stylistic materials in which several surface forms (clause order, descriptor type, and tense) were varied simultaneously. Within that question, the effect of instruction and markedness of features was examined. If sentences are implicitly primed, it is hypothesized that syntactic priming would be found regardless of instruction. Alternatively, a transfer-appropriate processing approach would suggest that explicitness of instruction and markedness of the material additively contribute to imitation of surface form.

A second aim of the study was to examine whether consistent experience with an alternative style would be associated with a change in a recognition bias for the read style. That is, whether repeated instances of short-term syntactic priming could be seen as leading to a change in longer-term comprehension and production biases. It is proposed that early learning of a style may be reflected in a change in recognition bias, so that participants are more likely to falsely recognize sentences written in the form they had recently read or produced.

## EXPERIMENT 1

### Method

#### *Participants*

Forty Duke University undergraduates participated for partial completion of a course requirement; 20, in the indirect instruction condition; and 20, in the direct instruction condition.

#### *Materials and Design*

The 20 stories were constructed so that each story consisted of six sentences in one style (in-style sentences), one in the opposing style, three filler sentences of other syntactic forms, and two cloze blanks. The same style was

used for all 20 stories. The two styles used differed along three style characteristics, and were the same as those used in Zervakis and Rubin (1998). The three style characteristics were selected because: 1) they changed surface structure, 2) they had little effect on the meaning of the story, and 3) there were at least two optional forms available. Style 1 consisted of complex sentences with dependent-independent clause order, double adjective descriptors (e.g., picture-perfect cookies) and present tense; style 2 consisted of complex sentences with independent-dependent clause order, phrase descriptors (e.g., pretty as a picture cookies) and past tense (Appendix 1 contains story examples). Dependent-independent clause order was considered the less preferred form because English is a right-branching language. The phrase descriptors were considered less natural from pre-testing, and present tense is considered marked, compared to past tense. The 20 stories used in Experiments 1 through 4 describe a main character who performed a series of actions, but the stories were not written with the use of strict plot grammars.

The cloze blanks were randomly placed in the second through ninth position, with the restriction that blanks appeared in these eight positions an approximately equal number of times. All cloze blanks immediately followed an in-style sentence. The filler sentences were written in the same tense as the dominant style. Participants read the stories in one of two orders.

The recognition test consisted of 40 sets of five sentences. For 20 sets, the correct *old* sentence was an in-style sentence, and for the remaining 20, the correct *old* was the out-style sentence in each story. That is, the same sentences were tested for both style groups, the only difference being that sentences that were in-style for one group were out-style for the other group. In this way, verbatim recall could be contrasted with bias for the read style. Each set of five sentences contained the read style sentence and four foils: the sentence written in the opposite style, and three of six possible combinations of the two styles. The six possible combinations were sentences that differed from the read style in clause order only, descriptor only, tense only, clause and descriptor, clause and tense, and descriptor and tense. Three of the six foils were randomly chosen for each set with the restriction that the set for the other recognition sentence from the same story used the remaining three foils. Thus, the six foils were equally presented for in-style and out-style sentences. The order of the sentence types within sets was randomized, and the order of sentences from the stories was pseudo-randomized, so that sentences from the same story were separated in the test.

### *Procedure*

Participants were instructed that this was a comprehension study. Participants read a series of 20 stories, self-paced one sentence at a time, on

a computer at normal viewing distance. Cloze blanks were indicated by a blank underline on the screen. Half the participants were given indirect instructions for the cloze task, in which they were instructed to fill in the blanks “consistent with the story.” The other half were given direct instructions to fill in the blanks “consistent with the story—with both the plot *and* the style, where style refers to the type of tense, the type of sentence or grammatical structure, and the kind of words or descriptors used.” Participants were given booklets with blank lines for completing the cloze task.

After the story reading phase, participants completed an unannounced recognition test on paper, in which they were instructed to select the exact sentence they had read during story reading.

## Results

The cloze sentences were scored separately for descriptors, clause order, and tense. For the descriptor scoring, a construction of the form of “adjective or adverb as a noun” describing a noun was scored as a phrase descriptor (e.g., “gray as grit day” or “sunset as red as watermelon”). A construction of the form of “adjective adjective” or “adverb adjective” describing a noun was scored as a double descriptor. It was not necessary to use the same words for these constructions as in the original story, because form rather than meaning was scored.

For clause scoring, the sentences were first scored by the number of clauses they contained. To be scored as a clause, the construction needed to have both a stated subject and a stated verb. Although this does not conform exactly to what is linguistically considered a clause, all the clauses used in the story sentences followed this construction. Second, sentences of two or more clauses were scored as complex, compound, or compound/complex. Sentences were scored as complex if they had an independent and a dependent clause and did not have any independent compound clauses. An independent clause can stand alone as a sentence; a dependent clause begins with a subordinate conjunction, such as *after*, *because*, *before*, *since*, *while*, or *when*. Compound clauses stand alone and are joined by coordinate conjunctions, such as *and*, *or*, or *but*. Third, the clause order for the complex sentences was scored by noting the order of the first two clauses.

Separate analyses of variance were estimated for the three style characteristics of clause order, descriptor, and tense. The cloze data were analyzed with a 2 by 2 analysis of variance (ANOVA), in which style read was a between-subject variable with two levels and instruction was a between-subject variable with two levels (direct versus indirect). The dependent variables were the proportion of style 1 characteristics to the total number of responses, or the proportion of style 2 characteristics to the total number of

responses, in separate analyses. Because sentences were scored as being in either past or present tense, results for the two tense styles were the same.

The means for the cloze data are shown in Tables I to III. Also shown for completeness in Table I are the number of other two-clause sentences (compound and compound/complex) and the total number of two-clause sentences produced. It was found that participants produced a style consistent to the style read for descriptors and tense only. There was no significant effect of style for clause orders: dependent-independent,  $F(1,36) = 1.79$ ,  $MSE = 0.008$ ,  $p > .05$ , independent-dependent,  $F(1,36) = 0.94$ ,  $MSE = 0.012$ ,  $p > .05$ . However, there was a significant effect for instruction for dependent-independent clause order,  $F(3,36) = 5.14$ ,  $p < .05$ , which appears to be due to direct instruction increasing the total number of complex clause order sentences. There were significant effects for style for descriptor: double adjective,  $F(1,36) = 6.09$ ,  $MSE = 0.010$ ,  $p < .05$ , phrase adjective,  $F(1,36) = 33.25$ ,  $MSE = 0.035$ ,  $p < .0001$ . For phrase descriptors, there were additional effects for instruction,  $F(1,36) = 14.28$ ,  $p < .001$  and style by instruction,  $F(1,36) = 11.56$ ,  $p < .005$ . There was a significant effect of style for tense,  $F(1,36) = 695.96$ ,  $MSE = 0.010$ ,  $p < .0001$ ; participants produced sentences in the same tense they had read.

Turning to the longer-term effects of style learning, the proportion of style 1 or style 2 sentences chosen as *old*, depending on the style read, was used as a measure of recognition bias. The recognition data were analyzed with 2 by 2 ANOVA, where style read was a between-subject variable with two levels (style 1 vs. style 2), and instruction was a between-subject variable with two levels (direct or indirect). The proportion of style 1 or style 2 sentences chosen as *old* to the total number of sentences chosen as *old* was the dependent variable. Due to balancing of the foils, it was found that results for style 1 and style 2 sentences (and their characteristics) were virtually the same. Therefore, only style 1 results are presented.

**Table I.** Number of Cloze Completion Sentences from Experiment 1 Scored by Sentence Type

Style read	Style produced			Total of all 2-clause
	Dependent-independent	Independent-dependent	Other 2-clause	
Indirect Instructions				
Dependent 1st	1.2	5.4	4.2	10.8
Independent 1st	0.7	3.3	3.3	7.3
Direct Instructions				
Dependent 1st	4.9	6.0	4.7	15.6
Independent 1st	2.3	5.5	1.7	9.5



**Table II.** Number of Cloze Completion Sentences from Experiment 1 Scored by Descriptor Type

Style read	Style produced	
	Phrase	Double
Indirect Instructions		
Phrase	5.8	1.5
Double	0.2	2.7
Direct Instructions		
Phrase	22.8	0.5
Double	1.1	5.5

As shown in Table IV, there was a significant effect of style read,  $F(1,36) = 14.67$ ,  $MSE = 0.010$ ,  $p < .0005$ ; participants demonstrated a recognition bias for the more commonly read style. The effect of instruction was not significant. For recognition accuracy, correct *old* sentences were only those sentences for which all three style characteristics were the same as originally read. For those who read style 1 sentences, recognition accuracy was 52% for style 1 sentences and 49% for style 2 sentences. For those who read style 2 sentences, recognition accuracy was 29% for style 1 sentences and 68% for style 2 sentences.

One can also examine whether there was a recognition bias for the three style characteristics separately. The data were analyzed with three 2 by 2 ANOVAS, with style read and instruction as between-subject factors. There was a significant effect of style read for clause order,  $F(1,36) = 14.76$ ,  $MSE = 0.016$ ,  $p < .0005$ , descriptors,  $F(1,36) = 10.84$ ,  $MSE = 0.008$ ,  $p < .005$ , and tense,  $F(1,36) = 17.10$ ,  $MSE = 0.023$ ,  $p < .0005$ . Participants were more likely to have chosen as *old* sentences that contained characteristics consistent with the style read, independent of the actual form

**Table III.** Number of Cloze Completion Sentences from Experiment 1 Scored by Tense

Style read	Style produced	
	Present	Past
Indirect Instructions		
Present	38.2	1.5
Past	1.8	38.0
Direct Instructions		
Present	37.5	2.3
Past	4.1	35.9

**Table IV.** Number of Style 1 and Style 2 Sentences Chosen as “Old” by Story Style in Experiment 1

Style read	Style chosen as <i>old</i>	
	Style 1	Style 2
Indirect Instructions		
Style 1	10.4	12.5
Style 2	6.7	18.2
Direct Instructions		
Style 1	13.1	8.9
Style 2	7.1	17.1

of the sentence read. There was also a significant effect of instruction for descriptors,  $F(1,36) = 4.15, p < .05$ , in which participants were more likely to choose as *old* sentences with descriptors consistent with the style read, especially when given direct instructions.

### Discussion

Although a priming effect in production was found for descriptors and tense, there was no priming effect for the more complex clause order. Although participants did not produce a proportionally larger number of the correct complex clause order sentences, they did produce a number of complex clause sentences, and an even larger number of two-clause sentences (see Table I). Both clause order and descriptor demonstrated instruction effects in the cloze task.

A recognition bias effect for the read style was found for all three style characteristics. A recognition bias effect was found for clause order even though a syntactic priming effect was not. In contrast to the cloze task, a forced-choice recognition task does not require productive control of the style.

### EXPERIMENT 2

Experiment 2 examined the effect of relative frequency or proportion of stylistic sentences on cloze completions and recognition ratings. Recurrence, or systematic repetition of stylistic forms, is a feature of stylistic text and may aid in the learning of form (Freeman, 1970). Experiment 2 used stories similar to stories used in Experiment 1, but instead of the majority of sentences being in the same style with one opposing sentence, all sentences were in the same style.

## Method

### *Participants*

Forty-three Duke University undergraduates participated for partial completion of a course requirement, 20 students in the indirect instruction condition and 23 in the direct instruction condition.

### *Materials and Design*

Twenty stories of 10 sentences each were constructed. Eight of the 10 sentences were in-style sentences, and two were converted to cloze blanks.

A recognition test was constructed of 40 sets of five sentences. Because a recognition bias for the in-style cannot be distinguished from verbatim memory if all sentences are in-style, half of the recognition test items consisted of unread sentences. For 20 of the sets, the correct *old* sentence was an in-style sentence selected from each story. The 20 other sets used a sentence consistent with the story but never seen: one of the two sentences removed for the cloze task. The foils were constructed as in Experiment 1, so that the six foils were equally presented for read and unread sentences.

### *Procedure*

The procedure was the same as in Experiment 1. Participants completed an unannounced recognition test after the story reading phase. They were instructed to “check the exact sentence that appeared, or could have appeared, in the reading portion of the experiment.”

## Results

The cloze data were scored and analyzed in the same manner as Experiment 1 and are shown in Tables V to VII. There was a significant effect

**Table V.** Number of Cloze Completion Sentences from Experiment 2 Scored by Sentence Type

Style read	Style produced			Total of all 2-clause
	Dependent-independent	Independent-dependent	Other 2-clause	
Indirect Instructions				
Dependent 1st	6.3	4.4	5.5	16.2
Independent 1st	0.9	3.4	2.6	6.9
Direct Instructions				
Dependent 1st	17.7	6.1	2.7	26.5
Independent 1st	0.6	8.2	1.6	10.4

**Table VI.** Number of Cloze Completion Sentences from Experiment 2 Scored by Descriptor Type

Style read	Style produced	
	Phrase	Double
Indirect Instructions		
Phrase	21.4	1.2
Double	0.0	5.2
Direct Instructions		
Phrase	27.8	0.9
Double	0.0	9.2

of style for descriptor: double adjective,  $F(1,39) = 886.09$ ,  $MSE = 0.010$ ,  $p < .0001$ , phrase adjective,  $F(1,39) = 223.87$ ,  $MSE = 0.025$ ,  $p < .001$ , and tense,  $F(1,39) = 1209.71$ ,  $MSE = 0.008$ ,  $p < .0001$ . There was a significant effect of style for clause order for dependent-independent clause order,  $F(1,39) = 15.38$ ,  $MSE = 0.057$ ,  $p < .0005$  but not independent-dependent clause order,  $F(1,39) = 0.15$ ,  $MSE = 0.033$ ,  $p > .05$ . There were also a near-significant instruction effect,  $F(1,39) = 3.86$ ,  $p = .057$ , and a style by instruction interaction,  $F(1,37) = 3.62$ ,  $p < .065$  for dependent-independent clause order, in which there was a trend towards producing more dependent-independent clause order sentences with direct instruction (see Table V).

Turning to the recognition test, the proportion of style 1 sentences chosen as *old*, depending on the style read, was used as a measure of recognition bias. The data were analyzed with a 2 by 2 by 2 ANOVA, with style and instruction between-subject variables with two levels and sentences read vs. unread a within-subject variable with two levels. There was a significant effect of style,  $F(1,39) = 67.39$ ,  $MSE = 0.089$ ,  $p < .0001$ , and significant style by read,  $F(1,39) = 6.97$ ,  $p < .05$  and style by read by instruction,  $F(1,39) = 5.12$ ,  $p < .05$ , interactions. Participants chose as *old* sentences of the same style as they had read (see Table VIII). In addition, participants were

**Table VII.** Number of Cloze Completion Sentences from Experiment 2 Scored by Tense

Style read	Style produced	
	Present	Past
Indirect Instructions		
Present	35.5	4.5
Past	0.0	39.9
Direct Instructions		
Present	39.3	0.7
Past	0.3	39.7

**Table VIII.** Number of Style 1 and Style 2 Sentences Chosen as old by Story Style in Experiment 2

Style read	Style chosen as <i>old</i>	
	Style 1	Style 2
Indirect Instructions		
Style 1	21.9	2.2
Style 2	4.4	29.4
Direct Instructions		
Style 1	25.7	1.4
Style 2	1.0	32.3

more likely to choose sentences that were read as *old*, especially in the direct instruction condition. Recognition accuracy for the form of the sentences (read only) was 63% for the style 1 group and 80% for the style 2 group.

The data were also analyzed with three 2 by 2 ANOVAS for the style characteristics separately, for style and instruction, using the proportion of style 1 characteristic sentences chosen as *old* as the dependent variable. There was a significant effect of style for clause order,  $F(1,39) = 117.41$ ,  $MSE = 0.043$ ,  $p < .0001$ , descriptor type,  $F(1,39) = 220.87$ ,  $MSE = 0.027$ ,  $p < .0001$ , and tense,  $F(1,39) = 70.78$ ,  $MSE = 0.049$ ,  $p < .0001$ . Participants chose as *old* sentences containing the same characteristics as the style they had read.

## Discussion

Participants demonstrated a syntactic priming effect for the read style for all three style characteristics; clause order (for dependent-independent order), descriptor type, and tense. Style was imitated to a high degree in both direct and indirect instruction conditions, perhaps because the high proportion of stylistic sentences induced increased processing of surface form. A recognition bias for the read style was found for both read and unread sentences.

## EXPERIMENT 3

Experiment 3 replicates Experiment 1 using dative and double object sentences as the two opposing “styles.” Each story consisted of six sentences of the in-style, one of the opposing style, three filler sentences, and two cloze blanks. As in Experiment 1 and 2, cloze blanks immediately followed an in-style sentence in all stories, but in this case, the cloze blanks

began with a noun and a dative/double object verb (see story examples in Appendix 1). Appendix 2 lists the dative/double object alternating verbs used in the stories. The recognition test was constructed in the same manner as Experiment 1, in which two sentences from each story were tested, one being the out-style sentence for that style and the other an in-style sentence.

The recognition test consisted of 40 sets of three sentences, with one in-style and one out-style sentence taken from each story. The three sentences were 1) the correct sentence, 2) the sentence of the opposing syntactic form, and 3) a paraphrase sentence. For 20 of the sets, the correct *old* was an in-style sentence, and for 20, the correct *old* sentence was the out-style sentence.

## Method

### *Participants*

Sixty-eight Duke University undergraduates participated for partial completion of a course requirement, 36 in the indirect instruction condition and 32 in the direct instruction condition.

### *Procedure*

Participants in the indirect instruction condition were given instructions to complete the cloze sentences “consistent with the story.” Participants in the direct instruction condition were given the instructions to complete the cloze sentences “consistent with the story; that is, with both the plot, or meaning of the story, *and* the style, or grammatical structure.” Participants completed an unannounced recognition test after the story reading section.

## Results

The means for Experiment 3 are shown in Tables IX and X. The cloze data were analyzed with a 2 by 2 analysis of variance (ANOVA), in which style read was a between-subject variable with two levels (dative vs. double object) and instruction was a between-subject variable with two levels (direct vs. indirect). The dependent variable was the proportion of dative to total sentences produced or double object to total sentences produced, in separate analyses.

There was a significant effect of style: dative,  $F(1,64) = 21.44$ ,  $MSE = 0.016$ ,  $p < .0001$  and double object,  $F(1,64) = 8.54$ ,  $MSE = 0.019$ ,  $p < .05$ , in which participants were more likely to complete cloze sentences in the same dative/double object form they read (see Table IX). There was no main effect for instruction or any higher-order interactions.

The recognition data were analyzed by a 2 by 2 ANOVA, in which style was a between-subject variable with two levels (dative vs. double

**Table IX.** Number of Dative or Double Object Cloze Completion Sentences from Experiment 3

Style read	Style produced	
	Dative	Double object
Indirect Instructions		
Dative	11.0	20.1
Double object	5.7	23.6
Direct Instructions		
Dative	10.8	20.8
Double object	5.1	24.7

object) and instruction was a between-subject variable with two levels (direct vs. indirect). The proportion of dative or double object sentences chosen as *old* was used as the dependent variable.

For dative sentences the overall F ratio approached but did not reach significance,  $F(3,64) = 2.65$ ,  $MSE = 0.007$ ,  $p = 0.056$ , with the effect of style being significant,  $F(1,64) = 5.08$ ,  $p < .05$ . The effect of style was not significant for double object sentences,  $F(1,64) = 1.04$ ,  $MSE = 0.009$ ,  $p > .05$ . There were no instruction effects or style by instruction interactions.

Recognition accuracy for correct surface form was 46% for the dative style group and 37% for the double object style group. The participants were able to successfully reject the paraphrases, but were poor at correctly choosing which of the two alternative constructions they had read.

## Discussion

Participants demonstrated a syntactic priming effect in which participants were more likely to complete cloze completions of the same syntactic form as read. Instruction had no effect; the propensity of participants to imi-

**Table X.** Number of Dative and Double Object Sentences Chosen as *Old* by Story Style in Experiment 3

Style read	Style chosen as <i>old</i>	
	Dative	Double object
Indirect Instructions		
Dative	17.2	18.7
Double object	14.6	20.8
Direct Instructions		
Dative	15.4	20.0
Double object	14.4	19.8

tate the form of a recently read sentence did not significantly differ with direct and indirect instructions. As the means indicate, participants demonstrated an overall bias for double object sentences in both production and recognition. These results are comparable to the results of Bock and Loebell (1990) that showed a bias for the double object form. When participants produced an utterance that allowed for both alternative forms, 32% of the utterances were datives and 67% were double objects when primed by a dative, and 25% were datives and 75% double objects when primed by a double object.

Effects in the recognition test approached but did not reach significance. The lack of a strong recognition bias effect in the presence of productive control in syntactic priming was unexpected. To ensure that we had the power to see a smaller effect, Experiment 3 was repeated.

## EXPERIMENT 4

### Method

#### *Participants*

Forty-three Duke University undergraduates participated for partial completion of a course requirement; 21 students in the indirect instructions condition and 22 in the direct instructions condition.

#### *Procedure*

Participants were run using the same materials and procedures as in Experiment 3.

### Results

Cloze completions and the recognition test were scored as in Experiment 3. The means are shown in Table XI. There was a significant effect of style for dative,  $F(1,39) = 4.25$ ,  $MSE = 0.007$ ,  $p < .05$ , although style for double object sentences approached but did not reach significance,  $F(1,39) = 3.75$ ,  $MSE = 0.015$ ,  $p = .06$ . There was a tendency for participants to produce double object sentences in both style conditions.

The means for the recognition test are shown in Table XII. Style was not significant: dative,  $F(1,39) = 0.02$ ,  $MSE = 0.016$ ,  $p > 0.05$ , double object,  $F(1,39) = 0.07$ ,  $MSE = 0.039$ ,  $p > .05$ , with no instruction effects or interactions (see Table XII). Recognition accuracy for the form of the read sentence was relatively poor: 44% for the dative style group and 41% for the double object style group.



**Table XI.** Number of Dative or Double Object Cloze Completion Sentences from Experiment 4

Style read	Style produced	
	Dative	Double object
Indirect Instructions		
Dative	7.8	22.9
Double object	5.3	26.3
Direct Instructions		
Dative	7.4	21.1
Double object	5.8	23.5

Data from Experiments 3 and 4 were combined. For the cloze analysis, there was a significant effect of style: dative,  $F(1,107) = 23.67$ ,  $MSE = 0.013$ ,  $p < .0001$ , double object,  $F(1,107) = 11.54$ ,  $MSE = 0.017$ ,  $p < .0001$ , with no instruction effects or interactions. For the recognition test, there was no effect of style [dative,  $F(1,107) = 2.39$ ,  $MSE = 0.011$ ,  $p = .125$ , double object,  $F(1,107) = 0.60$ ,  $MSE = 0.020$ ,  $p > .05$ ], instruction effects, or interactions.

## Discussion

The combined analysis of Experiments 3 and 4 demonstrate Bock and Loebell's finding of syntactic priming using a cloze task during a story reading task. There was no interaction of this effect with instruction type. Imitation of the syntactic form most recently read was about the same, regardless of whether subjects were given indirect instructions to complete a sentence consistent with the story or direct instructions to complete a sentence with the same plot and grammatical structure as the story sentences. The lack of an instruction effect supports the claim that syntactic priming is an unintentional "byproduct" of normal sentence processing.

**Table XII.** Number of Dative and Double Object Sentences Chosen as *Old* by Story Style in Experiment 4

Style read	Style chosen as <i>old</i>	
	Dative	Double object
Indirect Instructions		
Dative	16.4	17.6
Double object	15.3	19.0
Direct Instructions		
Dative	17.2	17.2
Double object	17.7	16.8

Although syntactic priming occurred in the story reading task, a recognition bias for the read style was not reliably found in the recognition task. As recognition is usually considered a more sensitive measure than production, any priming effects from the story task were not long lasting. One could claim that the amount of experience given was not sufficient. However, changes in recognition bias were found for the styles used in Experiments 1 and 2. The dative/double object alternation is dissimilar in a number of respects to stylistic forms that do show style learning. For one, the dative/double object alternation is subtle and not highly marked; participants showed relatively low recognition accuracy for the form of the sentences. Secondly, while Experiments 3 and 4 varied only the syntactic level, Experiments 1 and 2 used styles that varied on multiple levels.

## GENERAL DISCUSSION

Experiments 1 and 2 attempted to replicate Bock and Loebell's syntactic priming effect using an on-line story reading task, with stylistic materials. Style characteristics differed in their ability to be primed. Priming effects were found for descriptor type and tense (Experiments 1 and 2), but clause order was imitated only when all story sentences were written in the same clause order (Experiment 2). Complex clause order sentences contain information about the order, number, and the type of relation connecting clauses. There may be limitations to the degree to which syntactically complex or long structures are implicitly primed, because of memory or planning constraints.

The effects of markedness and instruction were examined. Marked forms of descriptors (Experiment 1) and clause order (Experiment 2) were more readily produced in the sentence production task. Instruction effects were also found for descriptor type and clause order in some cases. Instruction effects interacted with markedness, in which direct instructions were more likely to increase marked forms. It was hypothesized that direct instructions would increase production only for those features that are explicitly learned. No instruction effects were found for dative/double object sentences. Other factors that may determine whether instruction has an effect on production are whether participants have productive control over the form and factors that increase processing of form.

A recognition test was given to determine whether consistent experience with a style induced a recognition bias for the read form. A recognition bias was found for stylistic sentences but not for dative/double object sentences. The results could be due to either a) syntactic priming effects not being related to long-term changes in preferences, or b) insufficient experience being given to demonstrate effects. A third possibility offered by Bock

and Griffin (2000) is that syntactic priming is a form of process-specific procedural learning, so that effects may be seen with production tasks but not explicit memory tasks.

The results of this study provide additional evidence that some alternative surface forms in text are imitated in speech and written production via a short-term fluency of production and that this imitation does not appear to rely on additional or explicit processing of surface form. Longer-term changes in recognition bias, however, are seen only for stylistic sentences that contained a high frequency of marked recurrent surface features. In text, marked forms are typically used to highlight changes in emphasis and topic and to identify new or old information. Although marked characteristics were not used to convey additional pragmatic information in this study, surface forms that cue this type of information may be more closely attended to because of this association. Increased processing of the surface form of this type of material may support long-term learning of style.

In this study, long-term syntactic priming effects for the dative/double object alternation were not found under text writing conditions. However, in order to better understand the possible role of syntactic priming on long-term imitation, future studies should further explore the time frame in which experience-based effects are found and whether such experiences generalize to other psycholinguistic measures used to gauge linguistic knowledge and preferences.

## APPENDIX 1

### Sample Stories from Experiments 1 through 4

#### Experiment 1: Style 1

Bill decides to work in his garden on the weekend.  
After he checks his dwindling small supplies, he drives to the nursery.  
\_\_\_\_\_.  
After he browses the showy colorful annuals, he selects some beds.  
He picked up a shovel after he bought some essential as water fertilizer.  
Bill drives home with his supplies.  
Before he adds dark rich compost, he removes the winter mulch.  
He trims the straggly branches of the bushes.  
After the beds are worked-over ready, he plants the annuals.  
After he fills his shiny aluminum watering can, he waters the plants  
and bushes.  
\_\_\_\_\_.  
Since he, has a garden green thumb, his garden thrives.

**Experiment 1: Style 2**

Bill decided to work in his garden on the weekend.  
 He drove to the nursery after he checked his dwindling like a puddle supplies.

---

He selected some beds after he browsed the showy as Easter dresses annuals.

He picked up a shovel after he bought some essential as water fertilizer.  
 Bill drove home with his supplies.

He removed the winter mulch before he added dark as coffee grounds compost.

He trimmed the straggly branches of the bushes.

After the beds are worked-over ready, he plants the annuals.

He watered the plants and bushes after he filled his shiny as a hubcap watering can.

---

His garden thrived since he had a green as a leprechaun thumb.

**Experiment 2: Style 1**

Since it is a beautifully clear spring day, Bill decides to work in his garden.

---

After he browses the showy colorful annuals, he selects some beds.  
 After he buys some essential needed fertilizer, he picks up a shovel.  
 After he chats with the extremely friendly owner, Bill drives home.  
 Before he adds dark rich compost, he removes the winter mulch.

---

After the beds are worked-over ready, he plants the annuals.

After he fills his shiny aluminum watering can, he waters the plants and bushes.

Since he has a garden green thumb, his garden is thriving.

**Experiment 2: Style 2**

Bill decided to work in his garden since it was a clear as a bell spring day.

---

He selected some beds after he browsed the showy as Easter dresses annuals.

He picked up a shovel after he bought some essential as water fertilizer.  
 Bill drove home after he chatted with the friendly as a neighbor owner.

He removed the winter mulch before he added dark as coffee grounds compost.

\_\_\_\_\_.

He planted the annuals after the beds were turned like farmland ready.  
 He watered the plants and bushes after he filled his shiny as a hubcap  
 watering can.  
 His garden was thriving since he had a green as a leprechaun thumb.

### Experiments 3 and 4: Dative Style

Marty worked hard as a real estate agent.  
 He leased an apartment to a family.  
 He rented \_\_\_\_\_.  
 A couple walked in, wanting to buy a house.  
 The couple told their price limit to the agent.  
 Marty showed some photos and descriptions to the couple.  
 He showed \_\_\_\_\_.  
 He showed three properties to them around town.  
 The couple liked the second house very much.  
 Marty offered a good deal to the couple.  
 Marty sold the couple the house.  
 His boss, pleased, assigned more properties to Marty.

### Experiments 3 and 4: Double Object Style

Marty worked hard as a real estate agent.  
 He leased a family an apartment.  
 He rented \_\_\_\_\_.  
 A couple walked in, wanting to buy a house.  
 The couple told the agent their price limit.  
 Marty showed the couple some photos and descriptions.  
 He showed \_\_\_\_\_.  
 He showed them three properties around town.  
 The couple liked the second house very much.  
 Marty offered the couple a good deal.  
 Marty sold the house to the couple.  
 His boss, pleased, assigned Marty more properties.

## APPENDIX 2

Dative/double object verbs used in Experiments 3 and 4:

allocated  
 assigned  
 bequeathed  
 brought

faxed  
 fed  
 gave  
 handed  
 leased  
 left\*  
 lent  
 mailed  
 offered  
 promised  
 quoted  
 read  
 rented  
 sang\*  
 shipped  
 showed  
 smuggled  
 sent  
 sold  
 told

\* These verbs were found to be non-alternating dative-only verbs (Levin, 1993). For Experiments 3 and 4, out of the 180 sentences using dative/double object verbs, eight used the dative only verbs (one “sang” and seven “left”), with one “left” used in a cloze sentence. Cloze sentences using the non-alternating verb were removed from analysis.

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