Second language partial word form learning in the written mode

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Resumen

La investigación sobre el conocimiento parcial respecto de la forma de las palabras puede utilizarse para evaluar cómo la prominencia perceptual y los recursos de procesamiento afectan el aprendizaje de vocabulario. Para este propósito, el presente estudio examina las propiedades de fragmentos de palabras producidas por aprendices de una segunda lengua. Alumnos cuya lengua materna es el inglés y que están aprendiendo español trataron de aprender nuevas palabras en español viendo parejas de palabras y dibujos. Después de la etapa de aprendizaje, se les pidió que escribieran las palabras únicamente cuando se les presentara el dibujo de ésta. Sus producciones fueron analizadas a partir de los siguientes criterios: (a) el porcentaje de palabras parciales versus palabras completas; (b) la cantidad de palabras producidas en la primera etapa; (c) la longitud de los fragmentos de las palabras parciales, y (d) el lugar de las letras-meta producidas en palabras parciales (inicial, media o final). Los resultados indicaron una producción de 69% de palabras parciales y 31% de palabras completas, un alto porcentaje de fragmentos de una letra, además de que la posición inicial fue la privilegiada.

Abstract

Research on partial knowledge of word forms can be used to assess further how perceptual salience and processing resource allocation affect vocabulary learning. For this purpose the present study examined properties of word fragments produced by L2 learners. English-speaking learners of Spanish attempted to learn new Spanish words by viewing word-picture pairs. After the learning phase, they were asked to write the words when presented with pictures only. Their productions were analyzed for (a) percentage of partial versus fully produced words; (b) amount of word produced in partial words; (c) length of fragments in partial words; and (d) location of target letters produced in partial words (word-initial, -medial, or –final). The results indicated production of 69% partial words and 31% whole words, a high percentage of 1-letter fragments, and privileging for word-initial position.

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Previous research and inquiry has focused on receptive versus productive aspects of vocabulary knowledge (Marton, 1977; Melka, 1997; Stoddard, 1929). Other research has identified word-based properties that affect how readily we learn words on a second language (L2) (Ellis & Beaton, 1995). Another body of research has assessed the cognitive architecture underlying knowledge of words in a first language (L1) and in L2, such as by identifying word features favored when one attempts to retrieve a word during a tip-of-the-tongue state (Brown & McNeill, 1966; Ecke & Garrett, 1998). These areas of research provide useful background regarding the roles of perceptual salience and processing resource allocation during vocabulary learning, however, new research on partial word form learning in L2 can help to advance our understanding in this area. By identifying properties of L2 word fragments that learners produce when they can produce only part of a target word, one can assess the relative perceptual salience and privileging of different word parts during *word-level input processing*, or input processing that involves the allocation of attention and processing to target word forms, word meaning, and mappings between word forms and their meanings. For example, if learners tend to produce a higher percentage of L2 word fragments in word-initial position than in other positions within a word, one may assert that word-initial positions are privileged during word-level input processing as compared to other positions within a word.

In order to explore the roles of perceptual salience and processing resource allocation in L2 vocabulary learning, the present study analyzed words and word fragments produced by L2 learners after an immediate L2 vocabulary learning task. The words and fragments were analyzed to address four main questions of interest. (1) What is the percentage of partial versus fully produced words? (2) What is the general amount of the word (one-fourth, one-half, three-fourths) produced in partial words? (3) Are word fragments of a certain length (one-letter, two-letter, three-letter, four or more letters) produced more often than others? (4) Are target letters in some locations (word-initial, word-medial, word-final) produced more often than others? These questions were addressed in order to explore the nature of L2 word form learning in the written mode. The findings were used to assess perceptual salience and processing resource allocation during word-level input processing, particularly with regard to the length of fragments and the word-internal location of target letters produced.

Previous research

To date, the issue of patterns in L2 partial word form learning has not been addressed specifically or systematically in research on L2 acquisition. Research on assessments of L2 vocabulary learning have focused largely on knowledge of word meaning, including comprehension of word meaning (*e.g.*, Meara & Buxton, 1987), production of word meaning (*e.g.*, Laufer & Nation, 1995), and word associations (*e.g.*, Read, 1993; Riegel & Zivian, 1972). One can view a recent survey of work on second language vocabulary assessment by Read (2007; see also Read, 2000) as evidence that the tendency to focus of knowledge of word meaning to a greater extent than word form remains prevalent. With regard to assessing knowledge of word form, a test developed by Laufer and Goldstein (2004) measures size and strength of lexical knowledge, including recall of word form, but the scoring procedure for this test includes dichotomous scoring of "correct" or "incorrect" and therefore does not measure different levels of partial word form knowledge. Other researchers have developed assessment measures of different degrees of word form knowledge, such as partial-to-complete word form knowledge (Schmitt, 1997) and measures of knowledge of consonants in word-initial, -medial, or -final position (Meara & Ingles, 1986). What has been missing, however, is greater attention to the overall importance of partial word form learning and, importantly, development of a research program that systematically examines patterns in L2 partial word form learning and assesses what these patterns can tell us about how learners process L2 words as input. The present study was designed to initiate and stimulate interest in a research program of this nature by examining patterns in partial word forms produced by L2 learners after an L2 vocabulary learning task.

Despite the lack of previous research on partial word form learning in particular, a review of four areas of inquiry related to vocabulary learning and word form knowledge should help to situate the study within a larger context: (a) receptive versus productive aspects of vocabulary knowledge (Marton, 1977; Melka, 1997); (b) the role of short-term memory in vocabulary learning (Gathercole & Baddeley, 1989); (c) word-based determinants of L2 vocabulary learning (Ellis & Beaton, 1995); and (d) features of the cognitive architecture underlying knowledge of word forms based on other research methodologies, such as research on tip-of-the-tongue states (*e.g.*, Brown & McNeill, 1966; Ecke & Garrett, 1998). Findings

in these areas point to the multifaceted nature of vocabulary knowledge, the role of cognitive capacity in vocabulary learning, the relationship between word properties and word learnability, and privileging for certain word-internal locations in the development of a lexical representation.

In an analysis of research on receptive versus productive aspects of vocabulary knowledge, Melka (1997: 84) acknowledged "the generally accepted assumption that in one's lexicon receptive vocabulary is much larger than productive vocabulary and that reception precedes production", noting also that estimates of receptive vocabulary knowledge have been twice as large as productive vocabulary knowledge (see also Marton, 1977; Stoddard, 1929). One explanation of differences between productive and receptive vocabulary knowledge is that people must know words more precisely for productive purposes than for receptive use (see the "amount of knowledge" explanation, Nation, 2001: 28-29). With regard to vocabulary testing in particular, this explanation points to the importance of the degree to which one is required to produce a target word form as opposed to being provided with a target word form on a vocabulary test. As a general rule, the more a test provides the form of a word for the test-taker, the less the test-taker's performance will depend on precise knowledge of the word form. Similarly, the less a test provides the form of a word for the test-taker, the more performance will depend on precise knowledge of the word form. From this perspective, one can view the productive/receptive distinction as existing primarily at the level of testing, with the basic type of word knowledge in the test-taker's mind remaining the same. This explanation is consistent with the following statement by Melka (1997: 101-102): "It is certainly not clear whether [reception] and [production] ought be considered as two separate systems dependent on each other, or rather as one unique system (one lexical store) used in two different ways, receptively or productively".

Melka (1997: 98) also drew attention to the need to develop better measures of learners' knowledge of the formal properties of words and noted that "getting a subject to produce a target word could... be considered as an ideal way of checking productive knowledge". In the present study, learners were asked not only to produce target L2 words but also to produce partial words when they could not produce entire words. By analyzing the properties of partially produced words, the study provided new data that can be analyzed with regard to the issue of productive and receptive aspects of vocabulary knowledge. If we demonstrate

that L2 learners produce a substantial amount of partial words as compared to whole words, this finding would be consistent with the idea of a single lexical store. More specifically, it would suggest that scores on receptively oriented tests of vocabulary are higher than on productively oriented tests because on receptively oriented tests one is given access to word forms based on knowledge of only a subset of the word form in question. For example, one could use knowledge of *ar----a* to access "squirrel" when cued by the Spanish word *ardilla*. On a productively oriented test, however, one cannot access the entire word in this manner, such as when being able to access only *ar----a* when cued by a picture of a squirrel or by the English word "squirrel". In this way, research on learners' partial word productions can further our understanding of different degrees of word knowledge.

In another area of L2 vocabulary research, Ellis and Beaton (1995) revealed a number of correlations between specific properties of L2 words and the degree to which words were learned. In addition to demonstrating positive effects for the Keyword Method (Raugh & Atkinson, 1975), their study found L2 word learnability to be affected by the following properties: word length, phonotactic regularity, part of speech, concept imageability, and pronunciation time. Based on Beaton and Ellis' findings, one can expect L2 words to be learned more readily if they are shorter words, nouns, highly imageable words, acoustically similar words, easily pronounceable words, and phonotactically regular words. These findings are informative with regard to word-based predictors of learnability at the level of whole words. New research on learnability based on word-internal properties should help to expand upon these findings, however. For example, information about whether word-internal location affects the learnability of target letters can provide information about how learners attend to internal features of target words, expanding upon our understanding of the role of word-based factors such as word length.

Finally, another area of research has investigated the nature of word knowledge and word-internal structure by examining tip-of-the-tongue (TOT) states and malapropisms. Brown and McNeill (1966) tested subjects in the TOT state about words that came to their mind when attempting to retrieve L1 words. The researchers found that other words that the subjects reported as being similar in sound to the target word tended to share sounds at the beginnings and ends of the words. This finding provided evidence for the *bathtub effect*, or the phenomenon that people tend to remember word parts at the beginnings and ends of words as

opposed to the middle parts of words. Aitchinson (1994: 134) referred to the bathtub effect as "perhaps the most commonly reported finding in the literature on memory for words". In a subsequent study on memory for the correct parts of target words in malapropisms, Aitchinson and Straf (1982) found that the bathtub effect was influenced by word length. Specifically, the researchers found that the beginnings of short words (1-2 syllables) were remembered marginally better than the beginnings of long words (3 or more syllables) and that the ends of long words were remembered substantially more than the ends of short words. Some findings of research on TOT in L2 (Ecke & Garrett, 1998) has indicated both increased recovery of word-initial word segments over word-medial and –final, which is consistent with Meara and Ingles (1986) findings that L2 students recalled more consonants correctly when they occurred at the beginning of the word than in medial or final position. Other research, however, has revealed increased recovery of both word-initial and -medial positions over word-final positions (Campaña Rubio & Ecke, 2001; see also Ecke, in press, for a review on TOT research and bilingual lexical retrieval).

Obtaining and examining partial word productions for partially learned words offers a unique alternative research methodology for testing and expanding upon earlier findings on the bathtub effect and partial word form recovery during L2 TOT states. The alternative methodology can be used to test whether the bathtub effect is tied to the nature of word learning. Do the word-level primacy and recency effects that characterize the bathtub effect appear in the early stages of vocabulary learning when learners have learned only part of a target word form? By comparing the prevalence of fragments produced in word-initial, word-medial, and word-final positions of target words, the present study addressed this question. Finding a bathtub effect in the present study would provide evidence for extending previous findings on the bathtub effect as well as primacy and recency effects in other areas of memory research (Murdock, 1962; see also Ebbinghaus, 1885/1964; Nipher, 1878). Peters (1985) argued that utterance-initial and utterance-final units are more salient and attended to more often by children learning an L1. Other studies have demonstrated primacy effects and, in some cases, recency effects at the initial stage of L2 input processing when English speakers attempted to repeat Spanish sentences that they had just heard (Barcroft & VanPatten, 1997; Rosa & O'Neill, 1998). The present study provided evidence about whether location-based privileging of this nature extends to location within individual words.

Research questions

The analyses in this study addressed the following questions: (1) What is the percentage of partial versus fully produced words? (2) What is the general amount of the word (one-fourth, one-half, three-fourths) produced in partial words? (3) Are word fragments of a certain length (one-letter, two-letter, three-letter, four or more letters) produced more often than others? (4) Are target letters in some locations (word-initial, word-medial, word-final) produced more often than others? Answers to these four questions will help to expand upon previous inquiries into the nature of productive vocabulary knowledge and the role of word-based determinants of L2 word learnability. Answers to Questions 3-4 have specific implications regarding the nature of word-level input processing with regard to whether learners attend to a variety of different fragments within a word (Question 3) and whether learners more readily learn the beginnings and ends of words during the initial stages of word learning (Question 4).

Method

Participants

The participants in the study were 25 native speakers of English in an intensive second-semester Spanish class at a large university in the Midwestern United States.

Materials

The following materials were used to conduct the experiment: a consent form and language background questionnaire; general instructions for the experiment; a pretest on the 24 experimental words; 24 flashcards with each of the 24 experimental words and simple black-and-white drawings (referred to here as "pictures") of each word used in the experiment; overhead projectors to project flashcards onto a television screen; 24 flashcards with numbered pictures of the 24 experimental words to be used for the posttests; and answer sheets for the posttest.

Experimental words

The 24 experimental words were concrete nouns. Words of different lengths were included in order to reflect real-word variation in word length. A selection of two-, three-, four-, and five-syllable words was included for this initial study on L2 partial word form learning in order to search for overarching patterns that may emerge without controlling for syllable length as in independent variable and in this way provide some baseline data for future studies on L2 partial word form learning that include word length or number of syllables as an independent variable. The target words included words from different dialects of Spanish, but each word was viewed in at least one English-Spanish bilingual dictionary or Spanish monolingual dictionary. The target words were *serrote* "saw", *regadera* "watering can", *borla* "tassel", *rastrillo* "rake", *embudo* "funnel", *destornillador* "screwdriver", *imán* "magnet", *clavo* "nail", *taladro* "drill", *cabestrillo* "sling", *pinza* "clothespin", *chiringa* "kite", *aletas* "flippers", *resbaladilla* "slide", *pala* "shovel", *balde* "bucket", *clavija* "plug", *sacudidor* "feather duster", *asa* "handle", *candado* "lock", *tenazas* "pliers", *estantería* "bookcase", *lupa* "magnifying glass", and *gancho* "hook". This list includes words with different derivational suffixes and different gender markers. It was not expected that these particular elements would affect performance on a discrete-item vocabulary learning task, however, future studies also could manipulate morphological properties of the target words, such as controlling for feminine versus masculine words, among the numerous possible independent variables that could be included in research on partial word form learning.

Procedure

All data were collected in the participants' regular classrooms in intact classes according to the following procedures:

(1) Each participant completed the consent form and background questionnaire.

(2) Each participant was given an opportunity to read general instructions for the experiment.

(3) All of the participants took the pretest. The words on the pretest appeared in reverse order to that used in the exposure phase to avoid habituating the

participants to the exposure phase order. None of the participants provided correct translations of any of the 24 Spanish words on the pretest.

(4) In the learning phase, participants were instructed to do their best to learn each new word that they viewed. The words were presented in two groups of 12 words each. Each word group was presented twice in the same order. Words 1-12 appeared for 12 seconds each twice in the same order; then Words 13-24 appeared for 12 seconds each twice in the same order. Each word-picture pair was presented for 12 seconds each.

(5) Approximately one minute after the learning phase, the posttest began. On the posttest, the participants were asked to write as much of each target word as they could in a space provided when its corresponding picture appeared. During the posttest, each picture for each target word (without the target word itself) appeared for 12 seconds.

Scoring and analyses

All of the participants' productions were scored and tallied in order to address each of the four research questions addressed by the study. All of the statistical analyses were based on percentages of each participant's individual maximum score because what was of interest for this particular analysis was the proportion of full versus partial words that each participant recalled, which is reflected in these percentage scores. For example, for the analysis of partial versus fully produced words (Question 1), the maximum possible total raw score was 24 because one could produce up to 24 partial words, 24 fully produced words, or some combination of the two (but no more than 24 total combined). If a participant produced 6 partial words and 4 full words, percentages would be determined as follows: 6 partial + 4 fully produced = 10 as an individual maximum; therefore, 6/10 = 60% partial and 4/10 = 40% fully produced. These percentage scores were first calculated within the statistical analysis program and then submitted to repeated measures analyses of variance (ANOVAs). Alpha was set at .05.

All posttests were scored first using the lexical production scoring protocol (LPSP-written) developed by Barcroft (2000) (Appendix 1). Following this protocol, a score of 1 was assigned to any completely produced word. Other scores were assigned as follows: .25 if approximately one fourth of the word was produced, .50 if approximately half of the word was produced, .75 if approximately

three fourths of the word was produced, and a score of 0 was assigned in all other cases. For example, for the experimental word *embudo* "funnel", the following written responses would each receive a score of 0: [nothing written], "lasa," "m...," and "sifa." The following responses would receive a score of .25: "e..." or "...o" (because at least 1 letter is correct in each case); "ubu..." (because at least 25% but less than 50% [2 of 6 = 33.3%] of the letters are present); and "alada" (because the number of syllables produced is correct, which is an nontrivial demonstration of partial word form knowledge). The following responses would receive a score of .50: "em...," "...do," or "...bu..." (because at least 25% but less than 50% [2 of 6 = 33.3%] of the letters are correct) and "bimo..." or "bumo" (because at least 50% but less than 75% [3 of 6 = 50%; 4 of 6 = 66.6%] if the letters are present). The following responses would receive a score of .75: "emb...," "...udo," "...bud...," "embuda," "funudo," "embuda," or "embudosa" (because at least 50% but less than 100% [3 of 6 = 50%; 4 of 6 = 66.6%; 5 of 6 = 83.3%] of the letters are correct or because additional letters are added [as in "embudosa"]. The following responses would receive a score of 1: "embudo" or "embúdo" (because 100% of the letters are correct or because 100% of the letters are correct and an accent was added [as here in "embúdo"] or omitted [as would be in a response of "iman" for "imán"]). This scoring was completed by an independent evaluator trained on how to use the scoring protocol. All LPSP-written scores were entered into the statistical analysis spreadsheet.

For the analysis of partial versus fully produced words (Question 1), the number of times each participant scored 1 was compared to the number of times each participant scored .25, .50, or .75. For the analysis on amount of word produced in fully produced words (Question 2), the number of times each participant scored .25 (one-fourth of a word), .50 (one-half of a word), and .75 (three-fourths of a word) was compared. For the analysis on fragment length (Question 3), tallies were made from the original posttests to determine the number of times each participant produced one-letter fragments, two-letter fragments, three-letter fragments, and fragments of four or more letters. These totals were used to determine percentages for each participant.

For the analysis on word-internal location (Question 4), tallies were made from the original posttests to determine percentages of letters correctly produced in word-initial, word-medial, and word-final segments of the target words. For words with 3 or more syllables, (a) word-initial percentages were determined by

dividing the number of correctly produced letters in the first syllable by the total number of letters in the first syllable, (b) word-final by dividing the number of correctly produced letters in the last syllable by the total number of letters in the last syllable, and (c) word-medial by dividing the number of correctly produced letters in the rest of the word by the total number of the letters in the rest of the word. Scores for 2-syllable words were determined in a similar manner; however, word-initial position was based on the first letter of the word only, word-final position on the last letter only, and word-medial on the remaining letters.

Results

Results are presented in the order of Questions 1-5 addressed in this study. (1) Overall means were .69 (SD = .13) for partially produced words and .31 (SD = .13) for fully produced words. The ANOVA results indicated that this difference was significantly different, $F(1, 24) = 49.38, p < .001$, eta^2 = .673. (2). Mean scores for amount of word produced appear in Table 1. The ANOVA results revealed a significant main effect for amount of word produced, $F(2, 48) = 5.29, p = .008$, eta^2 = .181. Pairwise comparisons indicated marginal differences between productions of one-fourth of a word versus three-fourths of a word (p = .50) and productions of one-half of a word and three-fourths of a word (p = .065). No other significant differences were observed. (3) Means based on fragment length appear in Table 2. The results of the ANOVA on fragment length revealed a significant main effect for fragment length, $F(3, 72) = 105.17, p < .001$, eta^2 = .814. Pairwise comparisons indicated significant differences between productions of one-letter fragments versus two-letter fragments ($p < .001$), three-letter fragments ($p < .001$), and fragments with four or more letters ($p < .001$). The difference between two-letter and three-letter fragments was not statistically significant (p = .089). No other significant differences were observed. (4) Means based on word-internal location appear in Table 3. The results of the ANOVA on location revealed a significant main effect for location, $F(2, 48) = 8.49, p = .001$, eta^2 = .261. Pairwise comparisons indicated significant differences between productions of word-initial and word-medial position (p = .010) and between word-initial and word-final position (p = .008). No other significant differences were observed. Finally, in addition to the quantitative results above, as a qualitative observation, no evidence of wild guessing or even substantial guessing were observed.

Table 1. Means for overall amount of word produced in partially produced words

Amount produced	Mean	SD
One-fourth	.24	.22
One-half	.31	.13
Three-fourths	.45	.22

Table 2. Means for fragment length in partially produced words

Fragment length	Mean	SD
One letter	.57	.11
Two letters	.20	.10
Three letters	.13	.07
Four or more letters	.10	.07

Table 3. Means for location of fragments in partially produced words

Location	Mean	SD
Word-initial	.39	.08
Word-medial	.31	.06
Word-final	.30	.07

Discussion

The findings of the study can be summarized as follows. (1) Partial words were produced much more often than complete words. Partial words were produced 69% of the time and complete words only 31% of the time. (2) Three-fourths of a word was produced marginally more often than one-half or one-fourth of the word. (3) One-letter fragments were produced much more often than two-letter fragments, three-letter fragments, and fragments with four or more letters. Fragments produced were single letters 57% percent of the time, two letters 20% of the time, three letters 13% of the time, and four or more letters 10% of the time. (4) Production of target letters was greater in word-initial position than in other positions. Target letters were produced 39% of the time in word-initial position, 31% of the time in word-medial position, and 30% of the time in word-final position. Implications of these findings are discussed below.

The importance of partial word form learning

The finding that partial words were produced more than twice as often as complete words suggests that early L2 lexical learning involves a markedly large amount of partial word form learning. This finding suggests that learners attend to multiple parts of word forms during word-level input processing, gradually encoding and building up their formal knowledge of words. When processing and attempting to encode a new word form, the learners' task goes beyond making a form-meaning connection only. The learner must attend to, encode, and retain multiple parts of words. The results of the present study suggest that they do so gradually, frequently learning only parts of the target word forms during the initial stages.

With regard to the question of receptive versus productive vocabulary, this finding is consistent with explanations that focus on degree or precision of word knowledge for productive versus receptive use, such as Melka's (1997) discussion of a single lexical store and Nation's (2001) description of the "amount of knowledge" explanation. With regard to vocabulary testing in particular, the finding provides support for an explanation that emphasizes the distinction between requiring one to produce a target word form (productively oriented) versus providing one with a target word form (receptively oriented) on a vocabulary test. Participants in the present study produced partial words 69% of the time. Had they been provided with the target word forms on a receptively oriented test, they may have been able to use their subset of word form knowledge for each of these partially learned words and in this way demonstrate "full receptive knowledge" for many, if not all, of the words in question.

The finding on partial versus fully produced words also has important implications with regard to testing methods in vocabulary research. The results of the study suggest that productive vocabulary knowledge can be broken down and investigated by analyzing production patterns for both partial and fully produced words that learners have recently attempted to learn. Although target words were never provided for the participants on the posttest, varying degrees of word form knowledge were obtained based on the extent to which the participants were able to produce each target word. This methodology may be beneficial in future studies with regard to measuring degree of knowledge of the formal component of word knowledge. Providing a learner with a target word form on a vocabulary test could yield a score of 1 regardless of the test-taker's degree of partial knowledge of the

target word form. A score of 1 might be obtained, for example, if the test-taker has partial knowledge of one-fourth, one-half, or three-fourths of the target word form. By encouraging participants to produce partially learned words on their own, one may obtain a more precise measure of the degree to which each target word form has been learned. Additionally, in terms of scoring, a large amount of information can be lost if one scores productions only as 0 or 1 or even 0, .5, or 1. The present evidence of extensive partial word form learning affirms the need for scoring procedures that go beyond two or three tiers in order to obtain more precise measurements of different degrees of partial word form knowledge.

Amount of word learned in partial word form learning

The findings of the study with regard to amount of a target word produced indicate that the learners in the study often came close to learning a target word completely (at a level of three-fourths of a word or .75 on the LPSP-written) even though they were not able to produce the complete word form. The finding that three-fourths of word was produced (45% of the time) marginally more often than one-half (31% of the time) or one-fourth (24% of the time) provides further support for the assertions that (a) the participants could have accessed these words fully if they had been provided with the target word form and that (b) information about word form knowledge can be lost with scoring procedures with fewer tiers. A substantial number of partial word productions at each level of word form knowledge were observed. One would expect results for this issue to change in studies with different vocabulary learning tasks and with higher or lower performance levels due to factors such as amount of exposure to the target words. The present findings provide a base from which to explore this issue further.

Fragment length in partial word form learning

The results on fragment length indicated that the participants produced substantially more one-letter fragments than longer fragments. This finding is particularly interesting given that 45% of partially produced words were productions of three-fourths of a word or .75 on the LPSP-written. Although learners often reached the level of three-fourths of a word in their productions, they nevertheless produced a large number of small fragments within target words overall, including an

especially large number of single-letter fragments. The combination of single-letter and two-letter fragments accounted for 77% of the fragments produced within partially produced words. This finding provides some evidence against extensive linear and modular processing during the initial stages of word form encoding. Specifically, the finding suggests that learners do not systematically segment off large fragments of a word in some order of succession in order to encode these fragments before attending to other segments. Instead, what is suggested is that learners allocate processing resources to various fragments in a word in a more parallel and interactive manner, gradually building up the extent to which both small and larger word fragments are encoded and retained. In an effort not to overinterpret the present results, however, another possible interpretation is that the lack of large fragments are simply due to short-term memory constraints as opposed to providing evidence of parallel and interactive processing. In other words, processing could be serial and the lack of large fragments the result of limits of short-term memory during serial processing, but what remains clear from the results is that processing of a given word form does not discontinue when one fails to retain individual word parts; the processing continues as one gradually builds up more complete knowledge of the entire target word form.

Privilege for word-initial location in word form learning

The analysis on location provided evidence that word-initial position is privileged during the initial stages of learning target words. The percentage of target letters in word-initial positions was greater than percentages in word-medial or word-final positions. This result provides evidence for extending the primacy-effect component of the bathtub effect to the initial stages of L2 word learning. A recency effect was not observed in the present study, however. Only 30% of the letters of the target words were produced in word-final location versus 31% in word-medial position, a difference that was not significantly different. Therefore, the effect of location observed differed from the bathtub effect. Whereas the term "bathtub effect" makes use of the metaphor of someone in a bathtub with their head and feet out of the water, the present results correspond more of a lounge-chair effect, with one's head (word-initial position) being higher than one's torso and feet (word-medial and –final positions). This finding is consistent with the

findings of Campaña Rubio and Ecke (2001) that both word-initial and –medial positions were recovered more often that word-final position during TOT states in L2 and with the finding of Meara and Ingles (1986) that L2 students recalled more consonants correctly when they occurred at the beginning of the word than in medial or final position.

The present findings regarding location suggest that privileging of word-initial position may be a basic principle of initial word-level input processing. Further investigation is needed, however, in order to examine whether word-final position may be privileged over word-medial position in other vocabulary learning contexts. In the present study, the target Spanish words frequently contained syllables with primary stress in word-medial positions. Therefore, if syllables with primary stress are somehow privileged over other syllables within a word, production in word-medial position may have been similar to production in word-final position for this reason. If syllable stress were equalized in word-medial and word-final positions in a future study, it is possible that production in word-final position could be greater than in word-medial position. In languages that typically do not place primary stress on word-final syllables, such as Spanish, this manipulation would make the input set unrepresentative of real-world input. It would help to dissociate, however, potential effects of syllable stress from effects of location for the comparison between word-medial and word-final positions.

One additional consideration to be taken into account is the relationship between patterns in eye fixation when one processes written words while attempting to learn them and the effect of those patterns on eventual learning outcomes with regard to primacy and recency. Visual processing of shorter words may occur in one single fixation whereas longer words may require two or more fixations. One may hypothesize, therefore, that effects related to primacy or recency may be moderated by word length, and perhaps more specifically, by the number of fixations required to process a word that one is attempting to learn. Future studies that include multiple word lengths and perhaps measures of numbers of eye fixations per word should be able to test this hypothesis directly. Future studies that compare written- and spoken-mode vocabulary for the same words also should be able to ascertain whether the effects of primacy, recency, or both may be more pronounced when learning in the spoken mode or in the written mode.

Future research

The possible future studies described above address only a few of the numerous issues that can be examined by future studies on partial word form learning. To begin, future studies can examine both the spoken and written modes. These studies should help to determine which significant effects and patterns in the data maintain for both modes and which are specific to one mode only. Second, new studies can examine different L2s with participants of different L1s in order to explore the extent to which observed effects and patterns are universal. Third, with regard to the productive versus receptive issue, a future study could include a receptive posttest that provides target word forms for the participants. In this way, one could assess the relationship between partially produced words on a productive posttest and performance for these same items on a receptive test. One possible result is that most or nearly all partially produced words will be recalled on the receptive test. Fourth, and importantly, future studies can manipulate target word length as an independent variable. Finally, future studies can examine partial word form learning in contexts of incidental learning by having learners recall target words and word parts after reading a text or listening to oral input. Studies of this nature will help with questions of ecological validity. The discrete-item vocabulary learning task examined in the present study is only one of many possible real-life contexts of vocabulary learning. Other contexts of vocabulary learning, at least potentially, might lead to somewhat different patterns of partial word form learning. Numerous methodological innovations such as these can be explored in future studies.

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Appendix 1. Lexical Production Scoring Protocol (LPSP-Written) (Barcroft, 2000)

.00 points	.25 points	.50 points	.75 points	1 point
None of word is written;thisincludes: • nothingiswritten • theletterspresent do not meet any "for .25" criteria • Englishwordonly is written	1/4 of word is written; this includes: • any 1 letter is correct • 25-49.9% of the lettersarepresent • correct # of syllables	½ of word is written; this includes: • 25-49.9% of letters correct • 50-74.9% of letters present	3/4 of word is written; this includes: • 50-99.9% of letters correct • 75-99.9% of letters present • 100% letters correct but other letters added	Entire word is written; this includes: • 100% letters correct • 100% letters correctwithaccent addedoromitted

Instructions:(1)"Correct"referstoanyletterwrittenandplacedinitscorrectpositionwithinaword;"present"referstoany letterwrittenbutnotplacedinitscorrectposition.(2)Determinepercentagesbydividingletterscorrectandletterspresent bythenumberoflettersinthetargetword.Ifmorelettersarewrittenthanareinthetargetword,dividebythelargernumber. (3)Ifthesametargetwordiswrittenmorethanonce,scoreitonlyonceinthespacewhereitshouldbewrittenor,ifitisnot writteninthecorrectspace,scoreitinthefirstspacewhereitiswrittenbaseduponthetargetwordforthatspace.