

AAUSC 2018 Volume—Issues in Language Program Direction

Understanding Vocabulary Learning and Teaching: Implications for Language Program Development

Johanna Watzinger-Tharp

University of Utah

Kate Paesani

University of Minnesota

Series Editors

Peter Ecke

University of Arizona

Susanne Rott

University of Illinois at Chicago

Editors



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Library of Congress Control Number: 2018953450

Student Edition:

ISBN: 978-0-357-10668-6

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Chapter 3

Minor Manipulations Matter: Syntactic Position Influences the Effectiveness of Incidental Vocabulary Acquisition During L2 Reading

Maria Rogahn, Denisa Bordag, Amit Kirschenbaum, and Erwin Tschirner,
University of Leipzig

Introduction

Syntactic Prominence in L1 and L2 Incidental Vocabulary Acquisition

Conveying a message involves not only the speaker's choice of which information to communicate but also how this information can be phrased in order to emphasize individual discourse entities and mark their importance. Various linguistic means can be used to express this focus, for example, syntactic structure, focus markers such as *only*, and, in speaking, also through prosody. The term "syntactic prominence" has been used to refer to the perceived importance of the constituents of a sentence based on syntactic structure (see Birch & Rayner, 1997, 2010; McKoon, Ratcliff, Ward, & Sproat, 1993). In this study, we explore whether the processing advantages observed for the prominent syntactic constituents have implications for the early stages of incidental vocabulary acquisition (IVA), that is, the acquisition of new words during reading in the first and second language (L1 and L2). This question is important for language instruction because it has practical consequences for the development of reading material. If the programmatic goal is to foster word learning through the exposure to reading materials, new lexical items should be presented, for example, in textbooks or graded readers, in such a way that the position of the new item promotes its acquisition.

Incidental Vocabulary Acquisition

A substantial portion of both L1 and L2 vocabulary is acquired incidentally, that is, as a by-product of a primary activity, such as listening or reading (Laufer, 2003). IVA through extensive reading and listening has been acknowledged as an important source of vocabulary knowledge, especially for more advanced learners (Nagy, Anderson, & Herman, 1987; Nagy, Herman, & Anderson, 1985; Sternberg, 1987).

The “default argument” (Hulstijn, 2003) behind this assumption is that the plethora of vocabulary knowledge that native and advanced speakers possess cannot have been acquired deliberately in its entirety and must therefore be due to incidental learning.

Contrary to intentional learning, where learners have a clear sense of what to learn and where to direct their attention, in an incidental acquisition setting the learner has to detect the unknown word in the context first: it must be neither overlooked nor mistaken for another, already familiar word. This crucial issue has been related to the process of “noticing” (Schmidt, 1990, 2012) the new word in the text. Noticing occurs when a subset of newly detected information becomes the focus of attention, enters short-term working memory, and is then linked with long-term memory (Robinson, 2003, p. 654). As the process of turning input into intake hinges on it, noticing has been viewed as a *sine qua non* prerequisite for incidental learning to take place (Ellis, 2006, 2007; Schmidt, 1990, 2012).

The frailness of the incidental “picking up” of a new word from context has been viewed as a critical issue in listening, reading while listening (Brown, Waring, & Donkaewbua, 2008), and reading (e.g., Hulstijn, Hollander, & Greidanus, 1996). Reading research has revealed large differences in the number of incidentally acquired words, both between L1 and L2 and between studies within L1 and L2 (see Waring & Nation, 2004; Waring & Takaki, 2003 for overviews). Waring and Nation (2004, p. 101) report incidental acquisition rates that vary from 4 to 25% of new words in seven L2 studies and Swanborn and De Gloppe’s (1999) meta-analysis of 20 L1 studies indicate that, on average, only about 15% of unknown words that were encountered during extensive reading were actually acquired. These findings resulted in questioning the reliability and effectiveness of IVA compared to intentional learning. At the same time, there are also studies demonstrating the superiority of incidental learning over intentional learning (Ahmad, 2012; Lehmann, 2007).

The differences in acquisition outcomes have led researchers to explore which factors affect incidental acquisition during reading. While some factors are rather obvious, for example, the number of occurrences of the unknown word (e.g., in L2: Hulstijn et al., 1996) or overall proportion of unknown words in the text (e.g., in L1: Nagy et al., 1987), others are more subtle.

Webb (2008) argues that IVA is crucially affected also by the quality of the context in which the unknown word appears. A number of studies have shown that context properties such as genre (e.g., Taylor & Beach, 1984; Zabrocky & Moore, 1999), topic familiarity (Pulido, 2003), and syntactic complexity (Bordag, Kirschenbaum, Opitz, & Tschirner, 2014, 2015) can indeed affect IVA and that their role can be different in L1 and L2. For example, Bordag et al. (2014) provided evidence that the L1 speakers’ acquisition were not influenced by the syntactic complexity of the context, while a parallel experiment with advanced L2

learners revealed that their IVA was positively affected by syntactic complexity (Bordag et al., 2015). The authors argue that participants devoted more attention to the unknown words and to the inference of their meanings in the syntactically complex contexts because, in the more demanding context, the meaning of each individual word became crucial for building up the mental text model. Syntactic complexity in their study was manipulated along the dimensions of sentence length, number of subordinate clauses, number of embedded structures, and number of passive voice constructions and did not include a manipulation of syntactic prominence, which is the focus of the research presented here. The results of the Bordag et al. (2015) study indicate that syntactic simplifications of texts for L2 learners may have a negative effect on L2 word learning and that a sensitive and differentiated approach is needed when accommodating the syntax of texts to the proficiency level of learners.

Syntactic Prominence

The role of syntactic structure in sentence and text processing has been one of the prominent topics in the communicative approach to grammar. According to Givón (2001), “one syntactic structure is unlikely to be a ‘mere’ stylistic variant of another. However subtle, variant grammar entails a variant communicative effect, and thus presumably also a variant communicative goal. Subtle options of style are nothing but subtle options in the communicative use of grammar” (p. 282). Several experimental studies have supported such claims by demonstrating how seemingly small syntactic changes affect which information readers register, or fail to notice. As an example, Baker and Wagner (1987) instructed L1 readers to look for falsehoods in sentences as in the following example:

- (1) (Subordinate clause): Bloodletting, generally accomplished with the aid of rats, was thought to remove “poisons” from the blood.
- (2) (Main clause): Bloodletting, thought to remove “poisons” from the blood, was generally accomplished with the aid of rats. (p. 249)

The results revealed that participants were less likely to spot the occurring anomalies in subordinate clauses (although they were, of course, well aware that bloodletting does not involve rats) as in (1) than in main clauses as in (2), thus indicating that the clause type influences which information is perceived as important and is therefore instrumental for assessing truthfulness. The authors argue that syntactically less prominent concepts in subordinate clauses are more prone to result in underspecified representations, which reduces the probability that the false information or anomaly will be detected (cf. Sanford & Sturt, 2002). Sanford (2002), who also let his participants detect small changes in short texts, observed that the changes were approximately 25% more likely to be noticed if they occurred in main clauses.

Syntactic prominence has been further studied by examining constructions such as *it*-cleft sentences (e.g., in L1: Morris & Folk, 1998; in L1 and L2: Sennema-Skowronek, 2008), *wh*-questions (e.g., Birch & Rayner, 1997), and *there*-insertions (e.g., Birch & Rayner, 2010). Several authors (e.g., Birch & Rayner, 2010; McKoon et al., 1993) have argued that readers allocate more attention to syntactically prominent referents and that syntax serves as “mental processing instructions” (Givón, 1992). In their L1 study, McKoon et al. (1993) observed that syntactically prominent concepts (adjectives in predicate position, e.g., *His critical boss is demanding at times.*) were more accessible and retained longer in short-term memory than concepts presented in the less prominent position (adjectives in the prenominal position, e.g., *His demanding boss is critical at times.*). These findings, indicating that syntactic prominence influences the allocation of reader’s attention (cf. noticing) and a word’s retention in short-term memory, lead to the question addressed in this study, that is, whether syntactic prominence also affects IVA during reading.

With the following two research questions, we wanted to explore possible intersections of the lines of research that, on the one hand, show that IVA is affected by the syntactic context (e.g., Bordag et al., 2015) and, on the other hand, that the accessibility and retention of new words in short-term memory is affected by syntactic prominence (e.g., McKoon et al., 1993):

1. How does the syntactic prominence of a new word influence the early stages of IVA? Are new words in syntactically prominent positions (e.g., subjects in main clauses) acquired more readily than words in syntactically less prominent positions (e.g., objects in relative clauses)?
2. Do L1 and L2 learners exhibit the syntactic prominence effect to a different degree (if at all) as suggested, for example, by the results of Bordag et al. (2014, 2015)?

To our knowledge, these research topics have not been addressed so far, despite their theoretical relevance and practical implications for L2 instruction (e.g., text adaptations of graded readers or composition of learners’ texts in textbooks).

Method

The present study examines syntactic prominence as a qualitative context factor that can affect incidental acquisition of lexical knowledge. Its focus is on the initial stage of word acquisition that we operationalized as the establishment of a semantic representation in the mental lexicon following meaning inference. In this respect, the study differs from most previous studies on IVA that test later acquisition stages with methods typically requiring explicit recall of the new words

and/or their properties, for example, the Vocabulary Knowledge Scale (Wesche & Paribakht, 1996).

Syntactic prominence is operationalized by presenting the novel words in different syntactic contexts within short texts. Novel words with high syntactic prominence (HSP) are presented as subjects in main clauses, novel words with low syntactic prominence (LSP) as objects in subordinate clauses. Immediately after reading a short text containing the novel word (learning phase), participants completed a self-paced reading task (testing phase) in which the novel word was paired with a semantically plausible or implausible adjective in a sentential context. If an adequate meaning of the novel word has been at least temporarily stored, participants should detect the semantic violation and longer reading times should be observed in the implausible condition. The self-paced reading task has been employed in several studies (Bordag et al., 2014, 2015) to explore the initial stages of word acquisition immediately after exposure and taps into tacit knowledge (cf. Elgort & Warren, 2014).

Participants

Eighty native speakers of German, mostly students at the University of Leipzig with an average age of 23.6 years, participated in the experiment. They were paid for their participation and had normal or corrected-to-normal vision.

Sixty-four advanced L2 learners of German, mostly exchange students at the University of Leipzig with an average age of 24.2 years, participated in the experiment. Their native languages were mostly of Slavonic or Romance origin and their L2 German proficiency corresponded to level B2 or C1 of the Common European Framework of Reference for Languages (CEFR). Most participants included in the study took part in a CEFR-based test that separately measures proficiency in reading, listening, writing, and speaking as part of their admission to a German university. The minimum level required for participating in the present study was B2, and the maximum level was C1 (effective operational proficiency); C2 corresponds to mastery. Most participants reached the B2 level in one or more skills and the C1 level in the other (typically receptive) skills. Because there were four experimental lists (crossing the two two-leveled factors: Syntactic Prominence and Plausibility) and each participant was assigned to one of them, four participants created a superparticipant with a complete design (see the “Analyses” section for more detail on this method). The four individual participants that together created one superparticipant were matched for their L1: six Romance superparticipants always with one L1 (Italian, French, Portuguese, and Spanish), ten Slavonic superparticipants always with one L1 (Czech, Polish, Russian, Bulgarian, and Ukrainian). Altogether there were thus 64 participants, which equals 16 superparticipants. All participants were paid for their participation and had normal or corrected-to-normal vision.

Materials

Pseudowords.

Eighteen low-frequency, mostly concrete German nouns with the average frequency class of 17.25 were selected according to the frequency classification in the database of Wortschatz Projekt (public access available via www.wortschatz.uni-leipzig.de), which relates to the frequency of the most common word “der”—the frequency class of 17 thus means that “der” occurs 2¹⁷ as often than the words in this class (minimum frequency class was 15, maximum frequency class was 20, and median was 17.5).

Each low-frequency noun was later replaced by a phonologically unrelated pseudoword in the texts (see Appendix A). Pseudowords instead of existing German words were used to ensure that participants had no prior knowledge of target words. Half of the pseudowords were monosyllabic, the other half disyllabic. The pseudowords were generated with the help of the Wuggy pseudoword generator (Keuleers & Brysbaert, 2010).

Texts.

Twenty short texts (ca. 100 words each) were constructed that enabled the inference of the meaning of each low-frequency word, which was central to the text’s “storyline” and was replaced by a pseudoword. Each pseudoword appeared in the text two times. The texts were written with the help of dictionary definitions of the low-frequency words and their statistical co-occurrences using the Digitales Wörterbuch der Deutschen Sprache corpus of the German language and the Wortschatz Projekt.

Two versions of each text were created, which differed in two sentences that contained the novel word (see Appendix B for example texts). In the texts in the HSP condition, these two sentences had the novel word as a subject of a main clause and therefore in nominative case. In the texts that included LSP structures, the novel words were objects in subordinate clauses.

In most of the sentences that differed between the two text versions, it was possible to use either the same verb (see the following example sentence) or a verb with the same basic meaning but different predicate–argument structure and causativity. For example, while a causative verb was used in the LSP condition (e.g., *legen* “lay”), a corresponding inchoative or stative verb was used in the HSP condition (e.g., *liegen* “lie”).

- (3) HSP sentence (see Appendix C for a syntactic analysis)

Nachdem die ganze Masse nun lange genug auf dem Herd stand, muss die BräÙe (i.e., Pulpe/pulp (paper)) für die Weiterverarbeitung jetzt nur noch abkühlen.

‘After the whole mixture has been on the stove for long enough, the *BräÙe* (i.e., *Pulpe/pulp* (paper)) only needs to cool down for further processing.’

(4) LSP sentence

Die ganze Masse stand nun lange genug auf dem Herd, sodass sie die Bräße (i.e., Pulpe/pulp (paper)) für die Weiterverarbeitung jetzt nur noch abkühlen muss.

‘The whole mixture has been sitting on the stove for long enough, so that she only needs to cool down the *Bräße* (i.e., *Pulpe*/'pulp' (paper)) for further processing.’

With four exceptions (out of 40), verbs used in the HSP and corresponding LSP sentences shared the same stem. In order to construct subclauses to the corresponding main clauses, subordinating conjunctions were used in the sentences with LSP, while coordinating conjunctions, if any, were used in sentences with HSP. The novel word never appeared at the end of the text; at least five words followed. The average length of LSP and HSP texts was 99.2 and 98 words, respectively. The difference is due to the presence of an additional personal pronoun (as a subject) needed in the subordinate clause in which the novel word appeared as an object (LSP texts). Other factors affecting syntactic complexity—that is, the number of clauses per sentence, the number of passive voice constructions, and embedded structures—were kept constant between the two conditions.

In addition, seven filler texts with an existing word of medium frequency placed in two varying syntactic prominence positions were constructed, which consisted of only known high-frequency words. These filler texts helped to disguise the study's objectives.

Self-paced sentences.

Each text was followed by one to three sentences that were related to the topic of the text and which the participants read in the self-paced reading manner word by word (moving window). One of them was the critical self-paced sentence that was used for assessment. In it, the novel word was combined with an adjective that was either compatible (plausible condition) or incompatible (implausible condition) with the meaning of its corresponding low-frequency word. The adjective did not appear in the texts. A variable number of self-paced reading sentences (between one and three) was used so that participants could not create any expectations with respect to when the novel word would appear and to keep the length of the experiment as short as possible.

5. plausible

Tom stellte die wässrige Bräße (= Pulpe) auf den Herd und las ein Buch.
 “Tom put the watery Bräße (= pulp (paper)) on the stove and read a book.”

6. implausible

Tom stellte die elegante Bräße (= Pulpe) auf den Herd und las ein Buch.
 “Tom put the elegant Bräße (= pulp (paper)) on the stove and read a book.”

The novel word was preceded and followed by the same words (except for the adjective) in both conditions.

Comprehension statements.

Twenty-seven comprehension statements, each referring to the contents of one of the texts or one of the self-paced filler sentences, were created that had to be answered with a yes or no answer. The purpose of these statements was not comprehension assessment but to keep participants attentive to the texts and the self-paced sentences. None of the statements referred to the novel word itself.

Procedure

Subjects were tested individually or in pairs in an experimental room in the presence of an experimenter. They were administered written instructions on the task they would perform, mentioning that the texts they would read might contain low-frequency words, which they may not know because they come from dialects or special registers. Nevertheless, they should try to understand the texts and read them at a usual, not-too-slow speed. The experiment took on average 24 minutes for L1 speakers and 29 minutes for L2 participants.

Stimuli were presented on a 17-inch monitor using the E-Prime 2.0 (Psychology Software Tools, 2012). The experimental session started with two practice trials followed by the experimental and the filler trials. Each trial started with the presentation of a text. Participants read the text silently and pressed the space bar when they finished. The text appeared as a whole on the monitor and participants read it in a natural way.

By pressing the space bar, a plausible, an implausible, or a filler sentence appeared, with each letter masked with an X, so that each word of the sentence consisted of a row of Xs whose number corresponded with the number of the letters in the word. Each time the participant pressed the space bar, one word was disclosed, while the previous one turned into Xs again. This way, participants were able to read the whole sentence, word by word (self-paced reading with a moving window, Just & Carpenter, 1992). The reaction time of each space bar press was measured. The number of self-paced sentences following each text varied between one and three sentences, but one text was always followed by the same number of self-paced sentences in all conditions. One of the sentences was always the critical plausible or implausible sentence. The others were filler sentences.

After the presentation of the self-paced sentence(s), the statement referring to the text or a filler sentence appeared on the screen, and the participant had to agree or disagree by pressing one of the corresponding buttons: yes or no.

Each participant read each text only once, either in the syntactically high or low version, followed either by the semantically plausible or implausible sentence. That means that each participant read five texts in the HSP condition followed by a plausible sentence, five texts in the HSP condition followed by an implausible

sentence, five texts in the LSP condition followed by a plausible sentence, and five texts in the LSP condition followed by a plausible sentence. Thus, there were four experimental lists and participants were always assigned to one of them. The texts and sentences in each condition rotated and were presented in a pseudorandomized fashion so that it was not possible to predict which condition would follow. For each experimental list, there were two randomizations.

Analyses

Reaction times were measured at four different positions (factor Position): at position n (the novel word itself) and the spill-over region,¹ that is, the three following words ($n + 1$, $n + 2$, and $n + 3$). The reading times of the individual words in the critical self-paced reading sentences were analyzed through $2 \times 2 \times 4$ Analysis of Variance (ANOVAs) tests with factors Plausibility, Syntactic Prominence, and Position. The factor Plausibility had two levels (plausible vs. implausible condition), the factor Syntactic Prominence also had two (HSP and LSP), and the factor Position had four levels, that is, the positions n , $n + 1$, $n + 2$, and $n + 3$. The ANOVAs were always performed both over superparticipants (i.e., in F1) and items (i.e., F2). One superparticipant always consisted of four participants who together saw each item in each condition. Subsuming multiple participants with complementary lists under a single point (i.e., the “superparticipant”) is considered a “standard procedure” (e.g., Isel, Gunter, & Friederici, 2003, p. 280) in experiments with a Latin square design.

Results

Results L1 Participants

Before statistical analyses were carried out, the reaction time data was checked for outliers. Single data points were excluded from further analyses if they deviated more than three standard deviations from the particular participant’s mean. According to this procedure, 133 (2.3%) data points were removed from a dataset of 6,400 points.

Statistical tests (ANOVAs) with the factors Position (four levels), Plausibility (two levels), and Syntactic Prominence (two levels) revealed main effects for Position ($F(3, 57) = 14.6, p < .001, \eta^2 = .43$; $F(3, 51) = 22.3, p < .001, \eta^2 = .57$) and Plausibility ($F(1, 19) = 28.3, p < .001, F(1, 17) = 4.5, p = .048, \eta^2 = .21$). Participants were faster in the plausible (414.9 ms) than in the implausible (435.6 ms) condition (see Table 3.1). The interaction between Position and Syntactic Prominence was significant as well ($F(3, 57) = 3.2, p = .03, \eta^2 = .14$; $F(3, 51) = 5.5, p = .002, \eta^2 = .24$).

¹In the self-paced reading paradigm, effects often appear only after the presentation of the critical word; therefore, the reaction times at the spill-over regions are analyzed as well.

Table 3.1. Mean Reaction Times and Valid Values (in Percentage) for Positions n (= the Novel Word Itself), $n + 1$, $n + 2$, and $n + 3$ for the Factors Plausibility and Syntactic Prominence (L1 Participants)

Position	Plausibility	Syntactic Prominence	
		High	Low
n	Implausible	464.3 (96.7%)	450.6 (95.6%)
	Plausible	429.2 (97.2%)	430.2 (98.9%)
$n + 1$	Implausible	454.7 (96.7%)	461.3 (96.9%)
	Plausible	419.8 (99.2%)	445.7 (98.6%)
$n + 2$	Implausible	412.3 (97.2%)	412.6 (96.7%)
	Plausible	393.8 (99.2%)	390.9 (98.3%)
$n + 3$	Implausible	416.8 (97.2%)	411.9 (97.8%)
	Plausible	405.7 (97.8%)	404.2 (99.2%)

The subsequent ANOVAs over the individual positions revealed a significant Plausibility effect on the regions n ($F(1, 19) = 9.9, p = .005, \eta^2 = .34$; $F(1, 17) = 4.3, p = .055, \eta^2 = .20$) and $n + 1$ ($F(1, 19) = 19.5, p < .001, \eta^2 = .51$; $F(1, 17) = 6.3, p = .023, \eta^2 = .27$) and the effect fades away at $n + 2$ ($F(1, 19) = 5.1, p = .019, \eta^2 = .20$; $F(1, 17) = 4.1, p = .070, \eta^2 = .14$), where $F(2)$ is insignificant and is absent in $n + 3$. In summary, the slower reading times in the implausible conditions at the first two positions and the absence of the corresponding interaction indicate that the novel words' meanings had been acquired by L1 speakers successfully in both Syntactic Prominence conditions.

Results L2 Participants

Statistical analyses proceeded in the same way as for the L1 participants. Two hundred and eighty eight (6.25%) data points were excluded from a dataset of 5,120 data points because they were outliers.

The ANOVAs with factors Position, Plausibility, and Syntactic Prominence revealed significant main effects for Plausibility $F(1, 15) = 12.1, p = .003, \eta^2 = .45$, $F(1, 17) = 13.0, p = .002, \eta^2 = .43$, Position $F(1, 45) = 18.0, p < .001, \eta^2 = .56$, $F(3, 45) = 18.9, p < .001, \eta^2 = .52$) and a tendency toward significance for Syntactic Prominence $F(1, 15) = 3.6, p = .087, \eta^2 = .18$, $F(1, 17) = 4.2, p = .056, \eta^2 = .20$ (novel words that appeared in the HSP position tended to be read faster). The interaction between Position and Syntactic Prominence ($F(3, 45) = 2.9, p = .045, \eta^2 = .16$, $F(3, 45) = 4.1, p = .012, \eta^2 = .19$) as well as the triple interaction ($F(3, 45) = 5.5, p = .003, \eta^2 = .27$, $F(3, 45) = 3.5, p = .064, \eta^2 = .15$) were also significant, at least in $F(1)$.

Table 3.2. Mean Reaction Times and Valid Values (in Percentage) for Positions n (= the Novel Word Itself), $n + 1$, $n + 2$, and $n + 3$ for the Factors Plausibility and Syntactic Prominence (L2 Participants)

Position	Plausibility	Syntactic Prominence	
		High	Low
n	Implausible	530.1 (89.9%)	532.6 (85.4%)
	Plausible	495.9 (86.6%)	549.2 (90.6%)
$n + 1$	Implausible	507.2 (91.3%)	502.1 (93.8%)
	Plausible	480.2 (95.8%)	482.3 (95.5%)
$n + 2$	Implausible	457.9 (97.6%)	466.2 (95.1%)
	plausible	428.0 (96.9%)	424.7 (99.0%)
$n + 3$	Implausible	456.3 (93.4%)	467.0 (96.2%)
	Plausible	450.4 (95.8%)	466.3 (96.9%)

ANOVAs over the individual positions (see Table 3.2) revealed that, at the position n , the interaction between the factors Plausibility and Syntactic Prominence was significant in $F_1(1, 15) = 10.0, p = .006, \eta^2 = .40$, and marginally in $F_2(1, 17) = 3.1, p = .092, \eta^2 = .16$, where the factor Syntactic Prominence was also significant $F_2(1, 17) = 6.8, p = .019, \eta^2 = .30$. The subsequent t -tests revealed that while the factor Plausibility was significant in the HSP condition $t_1(1, 15) = 3.6, p = .002, t_2(1, 17) = 1.96, p = .034$, it was not significant in the LSP condition ($ts < 1$).

On the position $n + 1$, only the factor Plausibility was significant $F_1(1, 15) = 8.8, p = .009, \eta^2 = .37, F_2(1, 17) = 10.6, p = .005, \eta^2 = .38$, which was also the case at the position $n + 2$ $F_1(1, 15) = 7.9, p = .013, \eta^2 = .34, F_2(1, 17) = 13.6, p = .002, \eta^2 = .44$. At the position $n + 3$, no factors were significant. In summary, L2 learners also acquired meaning of the novel words in both conditions, but they showed an acquisition advantage for the novel words that appeared in HSP condition—as evidenced by the implausibility effect at the position n , which was significant only for the HSP words.

Comparison of the L2 and L1 results.

The results at the positions $n + 1$ and $n + 2$ indicate that both the native and non-native readers were able to infer and at least temporarily store the meanings of the novel words in both syntactic prominence conditions. There is however a crucial difference between the L1 and L2 reading behavior at the position n , the novel word itself. When the native speakers read the novel word in the self-paced reading sentence, they showed the same plausibility effect for all novel words, irrespective of the syntactic prominence condition in which they appeared. However, when the L2 learners read the novel word, the implausibility effect was observed

only when the novel word appeared in the HSP condition in the previous text. The fact that the L2 implausibility effect for the HSP novel words appeared as soon as they were presented indicates a better access to their semantic representations—either through a stronger connection between form and meaning, or because of their stronger representation. These claims are supported by a joint analysis of the L1 and L2 experiments over the critical position n . In F1, two interactions were significant (Experiment \times Syntactic Prominence: $F(1, 35) = 6.7, p = .014, \eta^2 = .16$, Plausibility \times Syntactic Prominence: $F(1, 35) = 5.7, p = .022, \eta^2 = .15$) as well as (marginally) the triple interaction (Experiment, Syntactic Prominence \times Plausibility): $F(1, 35) = 3.0, p = .090, \eta^2 = .08$, which reached significance also in $F(1, 17) = 3.3, p = .037, \eta^2 = .19$.

General Discussion

In the present study, we explored the role of syntactic prominence in L1 and L2 incidental acquisition. Our aim was to find out whether readers' ability to acquire new words during reading is influenced by the syntactic position of these words. In addition, we wanted to find out whether syntactic prominence affects L2 and L2 IVA to the same degree. These questions are relevant for authors of various types of reading materials, including texts in a text book or graded readers. Based on our results, we conclude that syntactic prominence is another factor that affects IVA in its early stages, at least in L2. In line with the previous findings, we assume that words which appear in syntactically prominent positions are perceived as more important and are processed more thoroughly which leads to their better representation in memory. Syntax, the “mental processing instructions” (Givón, 1992), might guide the reader toward paying more attention to syntactically prominent constituents and thus contribute to their noticing. According to Schmidt (1990, 2012), noticing, that is, the conscious attention paid to an instance of language, is a prerequisite for incidental acquisition and the potential to turn input into intake. In other words, specific input features, as, for example, novel words, need to attract at least a minimum of focal attention to be registered and, consequently, to be acquired. The current investigation showed that novel words with low syntactic prominence (LSP) may only barely reach this minimum to trigger noticing processes in L2 (as there was a later but still significant effect of Plausibility also in the LSP condition), while novel words with high syntactic prominence (HSP) triggered the noticing process in both groups of participants.

Another account, which might offer an explanation for the different results in the high and LSP conditions, relates to the L2 learners' possible failure to construct the overall sentence meaning, which thus might stay underspecified under some circumstances (e.g., Sanford & Sturt, 2002). A well-known example for this type of underspecification is the *Moses Illusion*. When asked: “How many animals of each kind did Moses put on the ark?,” the overwhelming majority of participants

in the classic study by Erickson and Matteson (1981) answered “Two” instead of noticing that it was actually Noah. In contrast, participants did notice the false information when it appeared in an *it*-cleft (Bredart & Modolo, 1988). The focus on Moses in “It was Moses who took two animals of each kind on the Ark” led to a detection of the error while “It was two animals of each kind that Moses took on the Ark” did not. A large part of representations stay underspecified or incomplete during the cumulative process of constructing the meaning of a sentence during reading. In most instances, reading can be more effective if readers process only those aspects that are relevant for their purpose. In our study, underspecification might have been promoted by the de-emphasis caused by novel word’s object status and/or placement in a subordinate clause in the LSP condition. The results we obtained were, therefore, due to a negative effect of LSP on meaning construction.

An important question that arises is “Why the disadvantage of encountering a novel word in an LSP condition (i.e., as an object in a subordinate clause contrary to a subject in a main clause in the HSP condition) was observed only in L2?” One reason can be a difference in the perceived distance between the two compared constituents with respect to their syntactic prominence by the two groups of participants. For experienced L1 readers, the difference in syntactic prominence between subjects in main clauses and objects in subordinate clauses may be negligible: both types of constituents are very frequent and have been encountered innumerable times by the L1 participants. In contrast, the difference between the two clause structures might be much larger for the L2 learners, albeit advanced. Research into German interlanguage development shows that subordinate clause word order is one of the last and thus most complex structures to be acquired and used correctly, whereas L1 children typically do not display comparable difficulties (e.g., Clahsen, Meisel, & Pienemann 1983; Pienemann 1998). The gap between the syntactic prominence of subjects in the main clause and objects in the subordinate clause thus might be larger for the L2 learners than for the L1 natives, which might explain why we observe the acquisition difference for the HSP and LSP conditions with one group, but not with the other.

A difference in sensitivity to syntactic manipulation for native speakers and L2 learners has also been reported by Bordag and colleagues (Bordag et al., 2014, 2015). While syntactically complex contexts lead to better incidental acquisition of lexical knowledge (both semantic and grammatical) in L2, no difference was observed in L1. The authors argue that, while the syntactic manipulation in the experiment created two different conditions for the L2 learners, the two syntactic manipulations did not result in different processing of the texts for the experienced L1 readers: texts in the syntactically complex condition were read with almost the same ease as syntactically simple texts. For the L2 readers, reading of the syntactically complex texts was more demanding and required more attention, from which the incidental acquisition of the unknown words profited. Because more attention was necessary to construct a sentence’s meaning, there was a

higher potential for noticing novel words and integrating them with the constructed meaning. At the same time, there was no difference in text comprehension between the two groups, as evidenced by their responses to comprehension questions.

In the present study, syntactic complexity in the texts was kept as constant as possible between the two conditions, but LSP sentences were slightly more complex due to the subordinate sentence and the associated word order (verb final order) that differs from that of a German main clause (verb second order). However, since no advantage was observed for the acquisition of the novel words in the contexts that tended to be more complex due to the prominence manipulation, we might consider this small difference in the complexity status of the low and HSP texts negligible. Nonetheless, in future studies additional manipulations of syntactic prominence free from an alteration in syntactic complexity should be employed.

It should also be stressed that the way syntactic structures are processed depends on their properties. Results obtained for comparisons between subjects in the main clause and objects in the subordinate clause, as in our study, may not lead to the same results as comparisons between other structures. Previous studies, albeit with tasks not aiming at incidental acquisition, have shown that manipulating syntactic prominence through comparisons which involve more marked (i.e., less frequent and distinctive) structures like cleft sentences that serve to direct focus ostentatiously might well lead to advantages for processing of syntactically prominent constituents in L1. Further research is also necessary to decide which other syntactic cues are influential in L2 incidental acquisition and which individual contributions to syntactic prominence are made by the argument type and clause type, that is, the two factors that were combined in the present study.

Nevertheless, the present study is the first to indicate that IVA may benefit from syntactic prominence in L2 learning. It shows that the way information is conveyed governs the processes that are involved in the inference and acquisition of meanings of unknown words. This finding has important implications both for research of IVA in L1 and L2 and for language instruction. In L2 IVA, there are multiple factors that may contribute or hamper the acquisition of unknown words (cf. Rieder, 2002). This study indicates that there may be more subtle factors that have so far not been considered.

The study also shows that the way novel words are introduced to learners and the syntactic context in which they are placed in text books, graded readers, and reading syllabi needs to be reconsidered in light of these findings. The implication of our research is that even as nuanced factors as the syntactic position of a new word in a sentence can decide whether such word will be incidentally acquired or not. It would be advantageous for L2 learners if such findings were taken into account when preparing reading materials. Authors of textbooks

are typically aware of which new words they introduce in a lesson. If they want to support the acquisition of those words, they should preferably place them in syntactically prominent positions. Similarly, when authors of graded reads consider which modifications they make, they should take into account that readers' IVA of presumably unknown words will benefit if these words are presented in syntactically prominent positions. In authentic texts, our results suggest that it will be primarily the words in syntactic prominent positions that would be expected to be picked up incidentally. Future research should focus on identifying other context factors that affect IVA, which could thus be used when constructing or adapting texts for learners of different proficiency levels to optimize their vocabulary acquisition.

Acknowledgments

We would like to thank Thomas Pechmann for his valuable comments, as well as Ricarda Theobald and Benjamin Krasselt for running the experiments. The research was part of a project grant provided to Denisa Bordag (BO-3615/2-1) and its follow-up grant (BO-3615/2-3) by Deutsche Forschungsgemeinschaft (DFG, German Research Council).

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Appendix

Appendix A: German Low-Frequency Words, Pseudowords, and Their English Translations

German Low-Frequency Word	Pseudoword Used	English Translation
<i>Warze</i>	Zolm	wart
<i>Haube</i>	Resch	bonnet
<i>Jojo</i>	Driebott	yo-yo
<i>Zwirn</i>	Wüick	twine
<i>Zwille</i>	Pünz	slingshot
<i>Lid</i>	Schrilbe	eyelid
<i>Schmorchel</i>	Frahl	snorkel
<i>Furt</i>	Schöffzark	ford
<i>Narkose</i>	Bontur	anesthesia
<i>Straßenwalze</i>	Nausel	road roller
<i>Pipette</i>	Gindel	pipette
<i>Sternschnuppe</i>	Flozett	shooting star
<i>Schuldschein</i>	Jonk	IOU (borrower's note)
<i>Schleppe</i>	Leuk	train (clothing)
<i>Zuber/Bütte</i>	Treb	trough (washing)
<i>Rain (Feld)</i>	Spaut	field margin
<i>Pulpe</i>	Bräße	pulp (paper)
<i>Gugelhupf</i>	Kälit	Gugelhupf/Bundt cake
<i>Zunder</i>	Reulick	tinder
<i>Smaragd</i>	Heif	emerald

Appendix B: Example Texts

High Syntactic Prominence Example Text for “Bräße,” i.e., “Pulpe”/paper pulp
(critical sentences are underlined)

Katja findet es sehr schade, dass jedes Jahr so viel Zeitungspapier in den Müll geworfen wird. Deshalb hat sie sich überlegt, aus dem ganzen Altpapier neues Papier herzustellen. Zuerst zerreißt sie dafür die Zeitung in kleine Stücke, mischt sie mit Wasser, und dann kocht die Bräße in einem großen Topf etwa zwei

Stunden. Als Katja bemerkt, dass der Brei aus Wasser und Papier noch zu dick ist, schüttet sie etwas mehr Wasser hinzu, damit er wieder etwas flüssiger wird. Nachdem die ganze Masse nun lange genug auf dem Herd stand, muss die Bräße für die Weiterverarbeitung jetzt nur noch abkühlen.

English Translation High Syntactic Prominence Example Text for “Bräße”, i.e., “Pulpe”/paper pulp

(critical sentences are underlined)

Katja thinks it is a shame that so much newspaper is thrown into the rubbish bins every year. She has therefore decided to make new paper from the waste paper. First, she rips the newspaper into little pieces, mixes them with water and then the Bräße boils in a pot for around two hours. When Katja notices that the mash of water and paper is still too thick she pours more water into it so that it becomes more fluid. After the whole mixture has been on the stove for long enough, the Bräße only needs to cool down for further processing.

Low Syntactic Prominence Example Text for “Bräße,” i.e., “Pulpe”/paper pulp

(critical sentences are underlined)

Katja findet es sehr schade, dass jedes Jahr so viel Zeitungspapier in den Müll geworfen wird. Deshalb hat sie sich überlegt, aus dem ganzen Altpapier neues Papier herzustellen. Zuerst zerreißt sie dafür die Zeitung in kleine Stücke und mischt sie mit Wasser, damit sie dann die Bräße in einem großen Topf etwa zwei Stunden kochen kann. Als Katja bemerkt, dass der Brei aus Wasser und Papier noch zu dick ist, schüttet sie etwas mehr Wasser hinzu, damit er wieder etwas flüssiger wird. Die ganze Masse stand nun lange genug auf dem Herd, sodass sie die Bräße für die Weiterverarbeitung jetzt nur noch abkühlen muss.

English Translation Low Syntactic Prominence Example Text for “Bräße,” i.e., “Pulpe”/paper pulp

(critical sentences are underlined)

Katja thinks it is a shame that so much newspaper is thrown into the rubbish bins every year. She has therefore decided to make new paper from the waste paper. First, she rips the newspaper into little pieces and mixes them with water so that she can boil the Bräße in a pot for around two hours. When Katja notices that the mash of water and paper is still too thick she pours more water into it so that it becomes more fluid. The whole mixture has been on the stove for long enough, so that she only needs to cool down the Bräße for further processing.

Appendix C: Syntactic Analysis of Example Sentences 3 and 4

Syntactic Prominence	First Field	Left Bracket	Central Field	Right Bracket
Low	<p>Main clause</p> <p>Die ganze <u>Masse</u>^{antecedent}</p> <p>The whole <u>mixture</u>^{antecedent}</p> <p>Subordinate clause</p>	<p><i>stand</i></p> <p>sat/stood</p> <p><i>sodass</i></p> <p>so that</p>	<p><i>nun lange genug auf dem Herd</i></p> <p>now long enough on the stove</p> <p><i>sie [subject] die Bräße [object]</i>^{postcedent}</p> <p><i>für die Weiterverarbeitung jetzt nur noch</i></p> <p>she [subject] the Bräße [object]^{postcedent}</p> <p>(i.e., <i>Pulpe</i> / pulp (paper)) for further processing now only</p>	<p><i>abkühlen muss.</i></p> <p>cool down must.</p>
High	<p>Main clause</p> <p>Subordinate clause</p> <p><i>Nachdem die ganze Masse</i>^{antecedent} <i>nun lange genug auf dem Herd</i>^{antecedent} <i>stand</i></p> <p>After the whole mixture^{antecedent} now long enough on the stove sat/ stood</p>	<p><i>muss</i></p> <p>must</p>	<p><i>die Bräße [subject]</i>^{postcedent}</p> <p>(i.e., <i>Pulpe</i> / pulp (paper)) <i>für die Weiterverarbeitung jetzt nur noch</i></p> <p>the Bräße [subject]^{postcedent}</p> <p>(i.e., <i>Pulpe</i> / pulp (paper)) for further processing now only</p>	<p><i>abkühlen.</i></p> <p>cool down.</p>