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How readers process syntactic input depends on their goals

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ABSTRACT

During reading, the recognition of words is influenced by the syntactic compatibility of surrounding words: a sentence-superiority effect. However, when the goal is to make syntactic categorization decisions about single target words, these decisions are influenced by the syntactic congruency rather than compatibility of surrounding words. Although both these premises imply that readers can extract syntactic information from multiple words in parallel, they also suggest that how the brain organizes syntactic input—and consequently how surrounding stimuli affect word recognition—depends on the reader's top-down goals. The present study provides a direct test of this conception. Participants were offered nouns and verbs amidst a grammatical context ('*this horse fell*') and ungrammatical context ('*fell horse this*'). Using a conditional task setup, we manipulated the amount of emphasis put on respectively sentences and single words. In two blocks readers were instructed to make sentence grammaticality judgments only if the middle word was respectively noun or verb; in two other blocks readers were instructed to syntactically categorize the middle word only if the sentence was respectively correct or incorrect. We established an interaction effect whereby the impact of grammatical correctness on syntactic categorization decisions was greater than the effect of grammatical correctness per se. This first sentence-superiority effect in the categorization of single words, combined with the absence of this effect in prior flanker studies, leads us to surmise that word-to-word syntactic constraints only operate if the reader is engaged in sentence processing.

1. Introduction

Much of recent reading research has focused on the question whether higher-order (e.g., lexical, semantic, syntactic) information can be extracted from multiple words in parallel (for reviews, see e.g. Brothers, Hoversten, & Traxler, 2017; Reichle, Liversedge, Pollatsek, & Rayner, 2009; Schotter, Angele, & Rayner, 2012, Snell & Grainger, 2019a). Although the answering of such polar questions has advanced our knowledge of what the reading system is in principle capable of, in theoretical terms the system has remained a black box in spite of this endeavour. Less effort has been invested in determining, for instance, what the cognitive architecture driving parallel syntactic processing might look like (e.g., Snell & Grainger, 2019a; Snell, van Leipsig, Grainger, & Meeter, 2018). Would the brain have means of knowing which activated syntactic categories belong to which word positions? At what cognitive levels might syntactic recognition of one word affect that of other words? Or might there be scenarios where words are processed truly in parallel, i.e., without cross-talk at levels of lexico-semantic and syntactic processing? Here we build on two recent studies which have shown that readers extract syntactic information from multiple words in parallel, but which have prompted different accounts of whether and how syntactic input impacts ongoing word recognition. Aiming to reconcile conflicting patterns, in the present paper we address the following question: How do the reader's goals influence the way the brain processes syntactic input from multiple words?

Two pieces of evidence for parallel syntactic processing were obtained by respectively Snell, Meeter, and Grainger (2017) and Snell and Grainger (2017). In the former study, participants did a simple syntactic categorization task in which briefly shown (170 ms) central target words were flanked by either syntactically congruent or incongruent words. Faster responses were found in the presence of congruent flankers (e.g. *noun noun noun*) compared to incongruent flankers (*verb noun verb*), evidencing that syntactic information was extracted from the flankers during their brief presentation time. Snell et al. (2017) further

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tested whether syntactically compatible flankers (e.g. *adjective noun verb*) would facilitate categorization decisions compared to incompatible flankers (*verb noun adjective*). Such a finding would lend support to the notion that tentatively recognized syntactic categories are integrated as a whole—a sentence structure—that in turn constrains the ongoing recognition of its constituents. However, no significant difference in performance was observed between these two conditions. The findings thus suggested that while syntactic information can be picked up from multiple words in parallel (evidenced by the contrast of congruent vs. incongruent flankers), the syntactic recognition of a word proceeds independently from that of other words.[1]

The other study of Snell and Grainger (2017) tells a different story. In their Rapid Parallel Visual Presentation (RPVP) paradigm, participants were offered four-word sequences which, after a brief 200 ms presentation time, were replaced by masks and a cue at one of four word locations. The task was to type the word seen at the cued location. All locations being probed an equal number of times, each target was tested in a grammatically correct sequence ('*the man can run*') and a scrambled version of the same words ('*run man can the*'), with the target ('*man*') being tested at the same position in both conditions. There was an effect of sentence grammaticality, with correct sequences leading to better recognition than scrambled sequences; a so-called sentence-superiority effect. The effect was equal in size across the four positions, which indicated that syntactic information was extracted from the whole sequence and consequently constrained the recognition of words across all positions evenly.[2]

The presence of a sentence-superiority effect in the RPVP paradigm is at odds with the absence of such an effect in the flanker paradigm using syntactically compatible versus incompatible flankers. How might one account for this discrepancy? One obvious direction of reasoning concerns the different measures of interest: to probe a syntactic categorization decision isn't the same as probing word recognition. Yet, arguably, to recognize a word is inevitably to make a syntactic categorization, and vice versa (for '*book*' is recognized differently in '*a book*' than in '*to book*'; see also Wittenberg & Levy, 2017; Fine, Jaeger, Farmer, & Qian, 2013). The mere fact that the two studies used different measures does not reveal whether and why these tasks would or would not gauge the same underlying processes, and is therefore by itself no account of why sentence superiority effects were observed in one measure but not the other.

Given that parallel syntactic processing was evidenced in both tasks, one could argue that lexical processes must operate similarly in the two settings, while top-down attentional processes may differ. After all, readers were asked to focus on a single target word in the flanker paradigm, while having to distribute attention across whole sentences in the RPVP paradigm. But this doesn't hold either: the aforementioned flanker congruency effects suggest that attention is in fact also widely distributed in the flanker paradigm. More direct measures of attention have indeed shown that portions of covert attention are allocated to the flankers (Snell, Mathôt, Mirault, & Grainger, 2018), and that the attentional distribution even resembles that of sentence reading (i.e., with a rightward bias; Snell & Grainger, 2018).

[1] One may wonder why a difference was observed between congruent and incongruent flankers if the syntactic recognition of words proceeds independently from that of surrounding words. The answer is that the locus of the congruency effect would be at the level of decision-making, rather than at levels of semantic or syntactic processing. Words are independently activated, and subsequently jointly impact the decision.

[2] It could be argued that this sentence-superiority effect was essentially a memory effect, as sentences are more easily remembered than random word sequences. However, applying electro-encephalography in the same paradigm, Wen, Snell, and Grainger (2019) found that the locus of the effect was in the N400 window, with effects emerging as early as 270 ms post stimulus onset. This indicates that syntactic constraints operated during the encoding of words, rather than post-lexically.

Attention being directed to multiple words in both tasks, and syntactic processing occurring for multiple words in both tasks, the crucial difference seems to concern what happened with activated words in the brain. Previous research has suggested that how readers process words and sentences depends on their goals (e.g., Schotter, Bicknell, Howard, Levy, & Rayner, 2014); and this appears to be reflected here specifically in syntactic processing. In the flanker task of Snell et al. (2017), the reader's goal is to interpret a single word. Even though the surrounding words are also recognized, these are not interpreted and therefore do not guide interpretation of the target word. In contrast, in the RPVP paradigm the reader's goal is to interpret all words, given that any one word could be cued for report. As such the RPVP paradigm likely bears closer resemblance to natural sentence reading, successful execution of which similarly depends on the interpretation of combinations of words rather than single words (e.g., Myslín & Levy, 2016). Snell, van Leipsig, et al. (2018) have theorized that during sentence reading, readers engage a syntactic sentence-level representation onto which activated words are mapped, guided by low-level visual cues (e.g., word length) and top-down expectations. Feedback from the sentence-level to the level of individual words would constrain ongoing word recognition. For instance, if an article is recognized at position 1, and a verb is associated with position 3, then feedback from the sentence-level would provide additional activation of noun-type words, while attenuating non-nouns. Feedback from the sentence-level has previously been shown to modify the recognition of past linguistic input (Levy, Bicknell, Slattery, & Rayner, 2009), and has more recently been shown to influence the ongoing recognition of present linguistic input (Snell & Grainger, 2017; Wen et al., 2019).

1.1. The present study

A synthesis of the above sparks the prediction that word-to-word syntactic constraints—i.e., sentence superiority effects—are a function of the extent to which the reader is engaged in sentence processing, and that such effects must in principle be obtainable in a syntactic categorization task if the reader were somehow also engaged in sentence processing. The present study was designed to test this conception. Encountering grammatically correct and incorrect three- word sequences (e.g., '*this horse fell*' versus '*fell horse this*', respectively), readers had to make syntactic categorization decisions about central target words while also making grammatical judgments about the whole sequence. The assumption here was that the interpretation of three-word sequences would engage readers in sentence processing, and that this would in turn influence the syntactic categorization task.

Crucially however, we did not simply compare responses between grammatically correct and incorrect sequences to test this hypothesis. The reason for this is that one is guaranteed to find a main effect of grammaticality; ('grammatical' decisions are produced faster than 'ungrammatical' decisions; Mirault, Snell, & Grainger, 2018; Snell & Grainger, 2019b). Consequently, when observing faster syntactic categorization decisions in the presence of grammatically correct flankers, there would be no telling whether this was indeed due to facilitatory word-to-word constraints, or rather because the entire categorization decision process simply commenced earlier in this condition (i.e., right after completing the grammaticality judgment, which is earlier in the case of a 'grammatical' decision).

Our solution was to manipulate the order in which tasks were done. In one conditional task set, comprising two blocks, readers were asked to syntactically categorize the central word (*noun/verb*), but only if the sentence structure was grammatically correct (one block) or incorrect (the other block) respectively; we refer to these blocks as first-sentence-then-word, i.e., SW-blocks. In another conditional task set, also comprising two blocks, readers were asked to perform a grammatical check of the sentence (*grammatical/ungrammatical*) but only if the central word was a noun (one block) or a verb (the other block) respectively: these blocks are referred to as first-word-then-sentence, i.e., WS-blocks.

The rationale behind manipulating task order is that this allowed us to isolate and gauge the main effect of sentence grammaticality in WS-blocks, and subsequently to compare the size of this effect against the effect of sentence grammaticality in SW-blocks. If the effect were larger in SW-blocks, then this would show that the effect observed in SW-blocks did not manifest entirely during the conditional response check, but also impacted the subsequent syntactic categorization—hence reflecting a sentence superiority effect on syntactic categorization decisions.

In addition, readers were instructed to provide an alternate response (with a third button) if the conditional rule was not met: e.g., in the block where readers had to make a grammaticality judgment only if the middle word was a verb, the reader had to press the alternate response button if the middle word was a noun. As such, the two WS-blocks offered us an additional means to obtain a sentence superiority effect, with the possibility that alternate responses would be provided faster in the presence of compatible flankers compared to incompatible flankers.

2. Methods

2.1. Participants

Twenty-four students (20 female) from Aix-Marseille University gave written consent to partake in this experiment and received monetary compensation (10€/hour) or course credit. All participants were native French speakers, reported to have normal or corrected-to-normal vision and ranged in age from 18 to 31 years (M = 22.6, SD = 6.9).

2.2. Materials

Following Snell et al. (2017), we constructed 50 sentences that consisted of three words each. All words had a length between two and five letters. The middle word in each sentence was either a noun or a verb (25 occurrences of each).[3] These were words selected from the French Lexicon Project database (Ferrand et al., 2010), and had an average ZipF frequency of 5.32 (for more on the ZipF scale, see van Heuven, Mandera, Keuleers, & Brysbaert, 2014). For every sentence, we obtained an incorrect version by reversing the word order (see Fig. 1). We verified that reversed sentences were indeed syntactically incorrect and contained minimal noun-verb ambiguities (in a small percent of the cases, targets could have a second, non-dominant meaning which belonged to the other category, we made sure to always select the most prevalent word category). All stimuli are listed in the Appendix.

To manipulate the amount of emphasis put on syntactic categorization and sentence processing respectively, we created two sets of instructions that forced participants into either having to first look at the structure of the sentence or the syntactic category of the middle word in order to be able to respond correctly. The first two instruction sets, named the 'first-sentence-then-word' (SW) condition, asked the participants to respond to the syntactic category of the middle word only if the structure of the sentence was correct or incorrect, respectively. The other two instruction sets, named the 'first-word-then-sentence' (WS) condition, asked the opposite, i.e., to respond to the correctness of the sentence only if the middle word was a noun or a verb, respectively.

A blocked design was used with the order of our four instruction sets varying across participants (in order to fully counter-balance the order of blocks, 24 participants were used so that every possible order occurred once). Within each block, trials followed a 2 × 2 factorial design with sentence grammaticality (correct vs. incorrect) and target word category (noun vs. verb) as factors. All sentences were used twice per block: once in their correct form, and once with a reversed word order. The experiment thus consisted of 400 trials, with all sentences within each block being presented in random order.

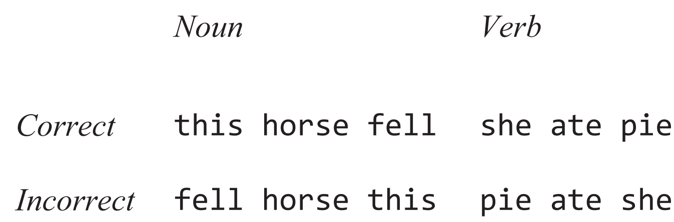

Fig. 1. Stimulus examples. Incorrect sentences were obtained by switching the first and last word so that the target word always stayed the same across conditions. Sentences in this figure are in English rather than French for the purpose of illustration. French stimuli are listed in the Appendix.

2.3. Apparatus

The stimuli and experimental design were implemented with OpenSesame (Mathôt, Schreij, & Theeuwes, 2012) and presented on a 24-inch 1024 × 768-pixel LCD-screen. Participants were seated at a 60-cm distance from the display, so that each character space subtended 0.32° of visual angle. All words were presented in lowercase using a 24-point monospaced font (droid sans mono). All responses were collected via a gamepad controller.

2.4. Procedure

Participants were seated in a comfortable office chair in a dimly lit room. Before the experiment began, instructions were given both verbally and visually on screen. Every trial began with two vertically aligned fixation bars. After 200 ms, the sequence appeared between the fixation bars and stayed on-screen for the duration of 300 ms.[4] After this, a post-mask was presented, consisting of a hashmark (#) at the place of each letter. Participants had unlimited time to respond, but were encouraged to answer as fast and accurately as possible. Responses were given with a button press of the right or left index finger (for correct and incorrect sequences, and for nouns and verbs respectively). When the first requirement of each task was not fulfilled, participants had to give an alternate response instead (i.e., press the bottom button on the gamepad with the right thumb; see Fig. 2 for an example of the trial procedure). After each response, a feedback screen with a green (correct) or red (incorrect) dot appeared for 300 ms. A new trial began after the feedback screen. Prior to the start of each block, 12 practice trials were presented to allow the participant to (re)adapt to the new set of instructions. No practice data were included in the analysis. Each specific instruction set was shown both before and after practice. Participants were offered a small break in between blocks. The experiment lasted approximately 25 min.

2.5. Statistical power estimation

Collapsing noun and verb targets, our experiment comprised 2400 measurements per condition, thus exceeding the 1600 measurements recommendation by Brysbaert and Stevens (2018) for having abundant statistical power. We additionally estimated statistical power using the data from the studies of Snell et al. (2017) and Snell and Grainger

[3] It should be noted that 5 out of the 50 targets (*somme*, *part*, *est*, *mets* and *saute*) were marked as being applicable as both a noun and a verb, although these words did have stronger prevalence in one category than the other. Slight ambiguities for these particular items may have introduced some noise in our data, but in any case do not undermine the interpretation of our results.

[4] The reason why we opted for a longer presentation time than Snell et al. (2017) and Snell and Grainger (2017), who used 170 ms and 200 ms respectively, is that in the present study participants needed to perform two tasks.

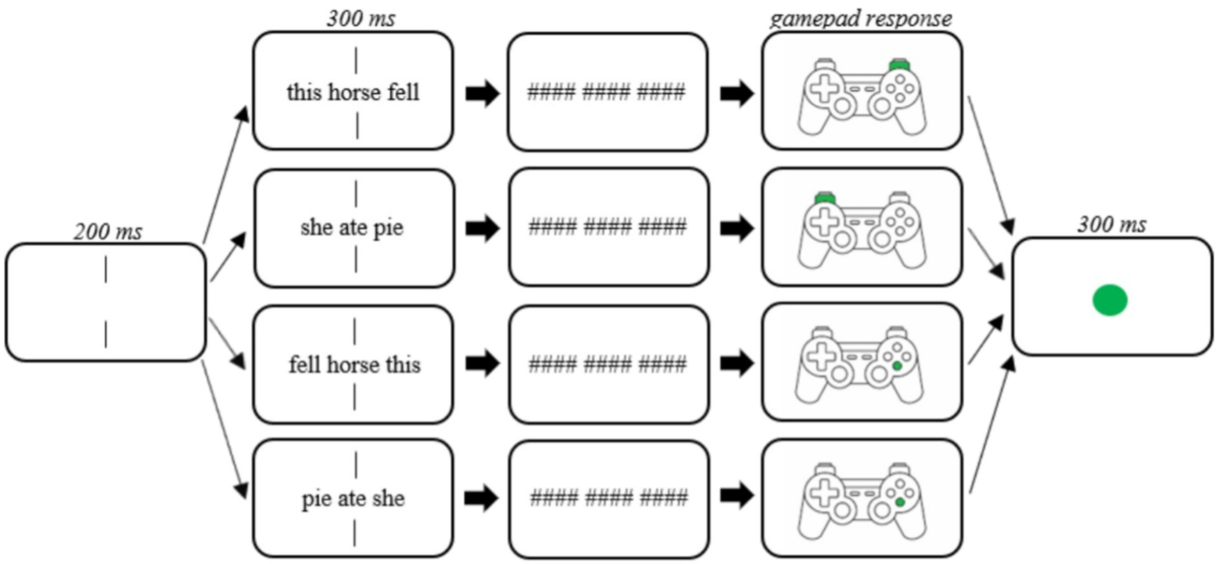

Fig. 2. Example of the procedure used (with correct responses) for the first-correct-sentence-then-word instruction set. Each type of sentence displayed here was seen with every task set. The alternate response was the same button for each task set. Sentences are displayed in English for convenience purposes.

(2017), both of which are a direct progenitor of the present study. Averaging effect sizes from these studies, we assumed a beta coefficient of 0.133. Statistical power was estimated using simulations with the *simR* package (Green & MacLeod, 2016) in the R computing environment. Drawing 200 random samples with an alpha-level of 0.05 and using a linear mixed model structure that comprised the interaction between task set and grammaticality (see Footnote 5), a significant statistic was returned 99% of the time. In the current design we thus had an a priori estimated power of 0.99.

3. Results

For the analysis of response time (RT), trials which exceeded the 2.5SD interval from the grand mean (per instruction set) were excluded (2.18%). Only correctly answered trials were included in the RT analysis, leading to the exclusion of 12.99% more observations. Finally, it should be noted that trials requiring an alternate response were analyzed separately, and were thus not included in the main analyses.

Data were analyzed using linear mixed-effect models fitted with the (g)lmer functions from the lme4 package (Bates, Mächler, Bolker, & Walker, 2015). Items and participants, as well as their interaction, were used as crossed random effects (Baayen, Davidson, & Bates, 2008). Task set (SW-blocks vs. WS-blocks) and grammaticality (grammatical vs. ungrammatical sentences) were treated as fixed 2-level factors in the models.[5] We report *b*-values, standard errors (*SEs*) and *t*- or *z*-values (for RTs and error rates respectively), with values beyond |1.96| deemed significant. To meet the model's assumption that the data are distributed normally, an inverse transformation (−1000/RT) was performed before analysis. The SW-blocks and grammatically correct sentences were always used as reference levels. An overview of average RTs and error rates can be found in Table 1; (note that noun and verb targets were collapsed, as we had no a priori reason to assume that the hypothesized sentence superiority effect would affect nouns and verbs differently).

[5] The model structure as denoted in R syntax was as follows: RT ~ task ∗ grammaticality + (1| participant) + (1| item). Noun and verb target trials were collapsed in all analyses, as we had no reason to assume that our hypothesized effect would differ between nouns and verbs. The maximal random effects structure permitted by the data led us to use models with by-item and by-participant random intercepts but without by-item and by-participant random slopes, due to a failure to converge on a subset of the analyses.

3.1. Response times

RTs per condition (as well as alternate response times) can be seen in Fig. 3. A main effect of sentence grammaticality was to be expected based on previous research (e.g., Mirault et al., 2018; Snell & Grainger, 2019b)—and indeed found ($b = -0.33$, SE = 0.04, $t = -8.70$). The central question was whether the impact of sentence grammaticality on syntactic categorization decisions was greater than the effect of sentence grammaticality per se (i.e., that the effect of sentence grammaticality was greater in SW-blocks than in WS-blocks). In line with this hypothesis, we observed a significant interaction effect between task set (SW versus WS) and sentence grammaticality (grammatical versus ungrammatical) with a larger effect of grammaticality in SW-blocks than WS-blocks ($b = 0.16$, SE = 0.03, $t = 5.19$). Importantly, we observed no difference between task sets ($b = -0.01$, SE = 0.02, $t = -0.69$), indicating that the order of sub-tasks did not affect overall difficulty.

As explained in the Introduction, additional evidence for an influence of word-to-word syntactic constraints may be obtained by analysing the alternate responses in the WS-condition. In line with our hypothesis, the noun/verb alternate response was made quicker when the flanking words were grammatical than ungrammatical ($b = -0.10$, SE = 0.03, $t = -3.56$; see also Fig. 3).

Given the main effect of sentence grammaticality, one may wonder why no difference was observed between grammatical and ungrammatical alternate responses ($b = 0.00$, SE = 0.03, $t = -0.08$; see also Fig. 3). The likely reason for this is that alternate responses are essentially *negative* responses (e.g., 'the sequence is not grammatical' or 'the sequence is not ungrammatical'). It is easier to say that an ungrammatical sequence is a negative than to say that a grammatical sequence is a negative, and this compensates for the fact that correctness is recognized faster than incorrectness. Also note that WS-block alternate responses ('*this is not a noun*'; '*this is not a verb*') do not have this asymmetry. We can therefore confidently ascribe the effect in WS-block alternate responses to sentence grammaticality.

3.2. Error rates

In the error rates, the interaction between task set and grammaticality did not reach significance ($b = 0.27$, SE = 0.17, $z = 1.58$), although a numerically stronger increase in the proportion of errors in the SW condition than in the WS condition did align with the significant interaction observed in RTs. A main effect was observed for sentence

Table 1
RTs and error rates.

	RT (ms)		Error rates (%)	
Grammaticality	Grammatical	Ungrammatical	Grammatical	Ungrammatical
SW-blocks	1009 (531)	1336 (616)	11.33 (3.17)	15.08 (3.58)
WS-blocks	1022 (505)	1194 (573)	18.08 (3.85)	19.58 (3.97)

Note. Values between parentheses indicate standard deviations. (SW = first-sentence-then-word, WS = first-word-then-sentence).

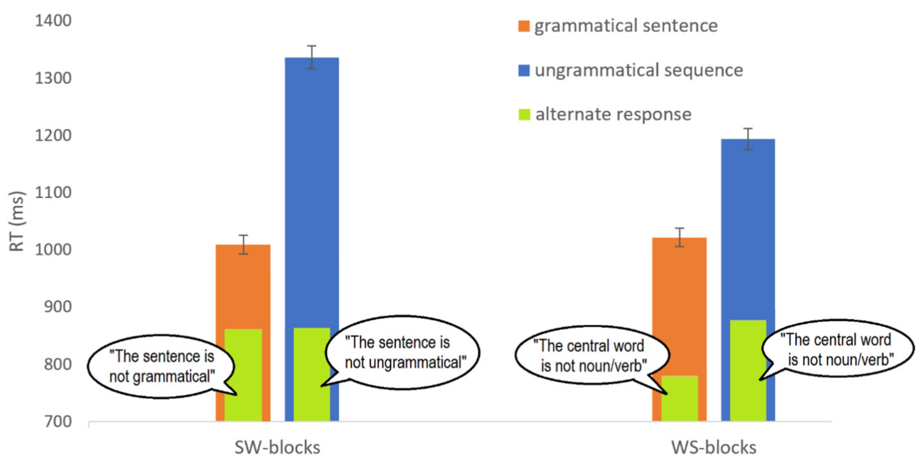

Fig. 3. Mean RTs per condition. Error bar values indicate standard errors (*SEs*). Alternate response times are indicated in green. Abbreviations: SW, first-sentence-then-word; WS, first-word-then-sentence. Note that RTs in the main trials correspond to noun/verb decisions for the SW-blocks and grammatical/ungrammatical decisions for the WS-blocks, while the alternate responses in SW-blocks reflect negative sentence grammaticality decisions (e.g. 'the sentence is not ungrammatical') and alternate responses in WS-blocks reflect negative syntactic categorization decisions (e.g., 'the central word is not noun'). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

grammaticality ($b = -0.62$, SE = 0.21, $z = -2.89$), with fewer errors in the presence of grammatically correct flankers. We also observed a main effect for task condition ($b = -0.39$, SE = 0.19, $z = -3.07$), which indicated that the grammaticality judgment was in itself more difficult than the syntactic categorization. Note that the latter finding does not necessarily imply that WS-blocks were overall more difficult than SW-blocks: the higher error rate for WS-blocks is compensated by the fact that there were more errors during the conditional check in SW-blocks (~9% and ~13% for WS-blocks and SW-blocks, respectively, which is comparable to the opposite difference between WS-blocks and SW-blocks reported in Table 1).

Similar to alternate response RTs, the alternate response error rates in syntactic categorization decisions differed significantly between grammatical and ungrammatical sequences, with more errors in the ungrammatical condition ($b = 0.78$, SE = 0.22, $z = 3.54$), thus providing more evidence for sentence superiority.

4. Discussion

The general aim of this experiment was to determine whether word-to-word syntactic constraints are a function of the reader's engagement in sentence processing. In previous research, employing a syntactic categorization task with syntactically compatible and incompatible flankers, Snell et al. (2017) didn't observe a so-called sentence-superiority effect. They did however find that syntactic information is picked up from multiple words in parallel, evidenced by faster recognition in the presence of syntactically congruent compared to incongruent flankers. Given that the flankers in that study were irrelevant (and indeed detrimental) to the task at hand, it appears that the system cannot prevent itself from attending and syntactically processing surrounding words.

The present experiment comprised the same manipulation as that of Snell et al. (2017), with readers being presented nouns and verbs amidst a syntactically correct and incorrect context. This time however, readers were additionally asked to make grammaticality judgments about the three-word sequence. In line with our hypothesis, this prompted constraint from the syntactic categories of the flankers on target processing, such that the target categorization decision was easier to make amidst a correct context compared to an incorrect context. This first sentence-superiority effect in the flanker paradigm wasn't evidenced by the main effect of sentence grammaticality per se, but rather by the fact that the difference in syntactic categorization speeds between grammatical and ungrammatical sequences was greater than the difference in grammaticality judgment speeds between grammatical and ungrammatical sequences. Importantly, overall response speeds were equal between WS-blocks and SW-blocks, which indicates that the order of sub-tasks did not affect overall task difficulty.

More direct evidence of sentence superiority was provided by the alternate responses in WS-blocks. Readers were faster and less error-prone in indicating that the middle word was not a noun/verb when the flanking words formed a correct sequence than when the flanking words formed an incorrect sequence.

Hence, although readers appear to unavoidably pick-up syntactic information from multiple words in parallel, the extent to which syntactic cues guide the ongoing recognition of individual words varies as a function of readers' intentions. This principle is illustrated in Fig. 4, which shows the flow of information from visual input to decision output *with* (A) and *without* (B) engagement in sentence reading. Specifically, when the goal is to interpret single words, the (syntactic) recognition of a given word proceeds quite independently from that of other words; hence the absence of a sentence-superiority effect in the study of Snell et al. (2017). When, on the other hand, the reader is engaged in interpreting combinations of words—i.e., sentence structures—jointly processed syntactic categories will exert mutual constraints.

CRediT authorship contribution statement

Aaron Vandendaele: Conceptualization, Data curation, Formal analysis, Methodology, Writing - original draft. **Mathieu Declerck:** Conceptualization, Methodology, Writing - review & editing, Funding acquisition. **Jonathan Grainger:** Conceptualization, Methodology, Writing - review & editing, Funding acquisition. **Joshua Snell:** Conceptualization, Methodology, Writing - original draft, Writing - review & editing, Supervision, Funding acquisition.

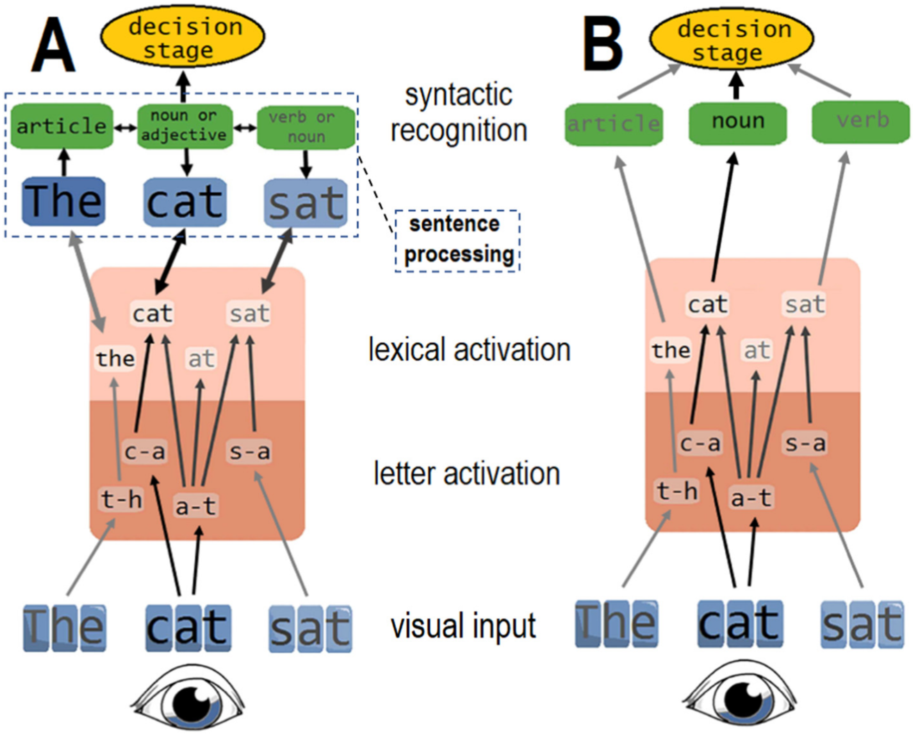

Fig. 4. Adaptation of the word- and sentence recognition process as conceptualized by Snell et al. (2017). Without sentence processing (B), syntactic recognition of the target (here '*cat*') is not constrained by the surrounding words; hence the results reported by Snell et al. (2017). With sentence processing (A), surrounding words constrain ongoing recognition of the target; hence the sentence superiority effect observed in the present study.

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Appendix A. Stimulus list

Noun target		Verb target	
Correct	Incorrect	Correct	Incorrect
la nuit passe	passe nuit la	elle saute bien	bien saute elle
cette usine vend	vend usine cette	qui veut nager	nager veut qui
sur route gelée	gelée route sur	ne payez rien	rien payez ne
avec yeux fermés	fermés yeux avec	il pleut fort	fort pleut il
en monde connu	connu monde en	en faire trop	trop faire en
en habit chic	usuel mot en	en avoir marre	marre avoir en
aux pieds nus	nus pieds aux	elles sont vues	vues sont elles
du même coup	coup même du	tout est prévu	prévu est tout
son chien joue	joue chien son	on reste calme	calme reste on
mon fils aîné	aîné fils mon	vous dites tout	tout dites vous
deux fois plus	plus fois deux	cela coûte cher	cher coûte cela
ce lien fort	fort lien ce	ne gène pas	pas gène ne
des plats bio	bio plats des	tout reste égal	égal reste tout
fait part de	de part fait	qui parle peu	peu parle qui
au début du	du début au	je mange tout	tout mange je
de façon que	que façon de	se lever tôt	tôt lever se
le texte sacré	sacré texte le	on verra bien	bien verra on
avant jeudi soir	soir jeudi avant	bien joué mec	mec joué bien
trois jours après	après jours trois	alors mets ça	ça mets alors
ta mère parle	parle mère ta	avoir eu tort	tort eu avoir
chez papa noël	noël papa chez	tu peux venir	venir peux tu
aucun verre cassé	cassé verre aucun	me fait rire	rire fait me
votre avis utile	utile avis votre	donc pars ainsi	ainsi pars donc
au cas où	où cas au	on fait tout	tout fait on
la somme due	due somme la	vous venez ici	ici venez vous

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