Comparing eye movement and lexical decision experiments on Thai compound recognition

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Abstract

This study investigated how visual processing of simple and compound words in Thai can be modulated by the experimental tasks. A sentence reading eye-tracking experiment (Experiment 1) and a lexical decision experiment (Experiment 2) were conducted on Thai bisyllabic compounds and simple nouns. Experiment 1 had two interword spacing conditions and examined how adding interword spacing to Thai sentences (normally unspaced in writing) modulated lexical processing. Experiment 1's results showed that compounds incurred longer fixation durations than simple words, whereas interword spacing facilitated word recognition for both word types. Experiment 2 revealed a different result. Word recognition was faster for compounds than simple words. We assumed the disparity stemmed from different task demands. Sentence reading requires integration of semantics and syntactic processing, and compounds would require additional semantic integration processing. By contrast, lexical decision focuses on isolated word recognition and the word's syntactic and semantic features are not activated.

Keywords: Thai; eye tracking; sentence processing; lexical processing; lexical decision; compounds

Introduction

The role of morphological structure on word recognition has been well-studied using different types of morphologically complex words—including polymorphemic words, inflected words, and affixed words—across various experimental tasks (e.g., Murrell & Morton, 1974; Stockall & Marantz, 2006; Taft, 2004; Taft & Forster, 1975). Most of these earlier studies investigated morphological processing through the lexical decision task, followed by the increased prevalence in studying morphological processing using eye tracking during sentence reading, since the eye tracking method offers the advantage of characterizing the detailed time course of morphological processing (Bertram, 2011).

Among the small number of studies that have directly compared the processing of morphologically complex words to the processing of monomorphemic words to investigate the role of morphological complexity on word recognition, a puzzling pattern of results that emerged is that response times are faster to compound words than to monomorphemic words in lexical decision tasks (Bronk et al., 2013; Fiorentino & Poeppel, 2007; Ji et al., 2011), but compounds receive longer fixation durations than monomorphemic words in eye-tracking sentence reading tasks (Inhoff et al., 1996). In particular, two previous studies investigated how morphological effects might differ across different experimental tasks. Hyönä et al. (2002) compared the processing of inflected nouns and monomorphemic non-inflected nouns in Finnish, using the same target words in a lexical decision task and in a sentence reading task that measured eye movements. The lexical decision data showed slower response times for inflected than monomorphemic nouns, but this cost of morphological complexity was not observed in the sentence reading experiment, which found similar fixation durations for inflected and monomorphemic nouns. They concluded that task demands (e.g., the absence of a syntactic context in the isolated word recognition task) may account for the discrepant results. In another study, Inhoff et al. (1996) compared the processing of bimorphemic compound words (e.g., *blueberry*), bimorphemic suffixed words (*ceaseless*), and monomorphemic controls (*arthritis*) in a sentence reading task and a word naming task, and they found diverging results across the two tasks. First fixation durations on compound words were longer than on control and suffixed words during sentence reading, but naming latencies were shorter for compound words than for control and suffixed words.

These studies suggest that morphological complexity incurs a processing cost as evidenced by longer fixation durations on compounds compared to monomorphemic words, but this effect appears to be reversed in the lexical decision tasks which have shown a processing advantage in terms of faster response times to compounds compared to monomorphemic words. This striking reversal of morpheme-related effects is not well understood, but it may partly stem from the different cognitive demands involved in isolated word recognition tasks such as lexical decision and naming tasks, compared to word identification during sentence reading. It is well-established that measures of language processing can be systematically impacted by task constraints and processing strategies (Christianson et al., 2006; Ferreira et al., 2002; Ferreira & Patson, 2007). To further explore how the effect of morphological complexity can be modulated by task demands, our study used the same set of target nouns (Thai compound nouns and monomorphemic nouns) across two experiments that employed different tasks. In Experiment 1, the target nouns were embedded in neutral sentence contexts and eye movements were measured during sentence reading, and in Experiment 2, the same words were presented in isolation and lexical decision latencies were measured.

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Reading Thai

The Thai writing system is classified as an abugida, where each symbol represents a consonant-vowel sequence. It consists of 44 consonant letters, 16 vowel symbols, and four tone marks. Thai text typically lacks interword spacing, and the absence of uppercase and lowercase letters can pose challenges for word identification. Winskel et al. (2009) investigated the effect of interword spacing on Thai word identification by analyzing eye movements. They found that while spaced sentences took longer to read overall (due to the increased spatial length of 12.8%), spacing facilitated later stages of word processing. Specifically, gaze durations and total fixation durations on target words were shorter in spaced sentences, though the first fixation duration showed no significant difference. Additionally, interword spacing did not affect the first fixation landing position, indicating no impact on oculomotor control. These findings suggest that while interword spacing aids word recognition, it does not enhance overall sentence readability or influence eye guidance and lexical segmentation. Further research (e.g., Kasisopa et al., 2013) supported these conclusions, emphasizing that spacing primarily benefits certain stages of word processing rather than sentence comprehension as a whole.

Reading Compounds

Psycholinguistic research on compounds focuses on whether they are processed serially or holistically (Allen & Madden, 1990; Gagne & Spalding, 2013; Henderson, 1985; Libben, 1998, 2006; Zwitserlood, 1994). A dual-route model was also proposed which incorporated both processing strategies (Baayen et al., 1997; Coltheart et al., 1993, 2001; Juhasz, 2018; Kuperman et al., 2009). For the proponents of the decompositional approach to compound processing, compound constituents play a key processing role. For instance, it has been argued that semantically transparent compounds (e.g., *birdhouse*) receive a shorter reaction latency than semantically opaque compounds (e.g., *hotdog*) in lexical decision (Gagne & Spalding, 2013; Jarema et al., 1999; Libben et al., 2003). This result can be accounted for by assuming that compounds must be morphologically decomposed, with the compound head defined during the onset of lexical processing. The significance of compound constituents was also confirmed by some eye-tracking studies, which showed that constituent frequency modulated gaze duration when the compound was embedded in a sentence (Hyönä & Pollatsek, 1998; Juhasz et al., 2003; Kuperman et al., 2008, 2009). Visual lexical decision tasks of compounds revealed similar findings, i.e., compounds with high-frequency constituents were recognized faster than those with lower-frequency constituents (Sandra, 1990; Taft & Forster, 1975; Zwitserlood, 1994), though some work also suggested that morphological complexity could increase processing costs (Andrews et al., 2004; Schreuder & Baayen, 1995). The whole-word model, on the other hand, largely neutralized the distinction between simple and compound words and discarded morphological decomposition as the primary word-processing strategy. Several studies have claimed that whole-word representations dominate the processing of both monomorphemic and complex words (Andrews et al., 2004; Bertram et al., 2000; Burani et al., 2008; Vannest et al., 2002). There are also hybrid models which propose simultaneous activation of top-down and bottom-up processing (Coltheart et al., 1993, 2001; McClelland, 1979; McClelland & Elman, 1986; McClelland & Rumelhart, 1981).

As Thai is an isolating language in which most monosyllables carry independent semantic meanings, there exists a large number of bisyllabic compounds. The prevalence of bisyllabic compounds in Thai potentially leads to several theoretical and empirical challenges. Theoretically, it is difficult to distinguish lexical compounds from typical noun phrases formed by two adjacent words (Hongthong et al., 2019; Iwasaki & Ingkaphirom, 2005). Empirically, the absence of interword spacing further complicates the distinction between compounds and phrases in Thai sentence reading.

This study investigated how visual processing of simple and compound words in Thai is influenced by the experimental task. Two experiments were conducted: a sentence reading eye-tracking experiment (Experiment 1) and a lexical decision experiment (Experiment 2). Both experiments used Thai bisyllabic compounds and simple nouns as the target words. In Experiment 1, the words were embedded in sentence frames under two interword spacing conditions: spaced and unspaced. The goal was to determine whether adding interword spacing to Thai sentences (typically unspaced in writing) modulated lexical processing and how this interacted with the processing of simple and compound words. Since compounds are bimorphemic, they may incur a higher processing load than simple (bisyllabic) word processing. This prediction should be reflected by longer reaction latencies in the lexical decision task and longer eye fixation durations. On the other hand, if the compound constituent can facilitate compound recognition, this potentially obviates the need for whole-word processing and minimizes processing load. Alternatively, we may find that there is a reversed morphological complexity effect in which compounds receive longer fixations than simple nouns in sentence reading (Inhoff et al., 1996) but they are responded to faster than simple nouns in the lexical decision task (Bronk et al., 2013; Fiorentino & Poeppel, 2007; Ji et al., 2011), as suggested by some previous research.

Experiment 1

Participants

55 native Thai participants with normal or corrected-to-normal vision participated in the experiment either for course credit or for a chance to win a gift (approximately \$30 each). The experiment received ethics approval from the university's Research Ethics Committee. All participants signed a written consent form.

Stimuli preparation

Seventy-six Thai bimorphemic compound nouns were selected, all of which were semantically transparent. These compounds were matched with 76 Thai simple nouns. Word length was measured by counting individual consonant and vowel characters along the horizontal plane, excluding vowels, tone marks, and diacritics located above or below. The compound nouns ranged in length from 3-8 characters (M = 5.14, *SD* = 0.98), while simple nouns ranged from 3-7 characters (*M* = 4.76, *SD* = 1.02). Word frequency data were obtained from the Thai web corpus (Sketch Engine; Kilgarriff et al., 2014). Simple nouns had an average frequency of 47 per million, while compound nouns averaged 12 per million. The first constituents of compounds ranged from 1-5 characters (*M* = 2.63, *SD* = 0.65) with an average frequency of 310 per million, and the second constituents ranged from 1-4 characters (*M* = 2.51, SD = 0.64) with an average frequency of 209 per million. Since word frequency and word length may not be perfectly matched between the compounds and simple nouns, we included these variables as covariates in the analyses of reading times.

Sentence frames were created for each pair of nouns, ensuring that the target word was followed by 1–2 additional words to avoid sentence wrap-up effects in eye movement measures. Sentences ranged from 8 to 13 words (*M* = 9.68, *SD* = 1.21). Target word predictability, familiarity, and sentence naturalness were normed by native speakers who did not participate in the experiment to ensure the words could not be predicted by context, and each measure was on a Likert Scale ranging from 1-5. The cloze probabilities indicated that both the compound nouns (*M* = 0.02, *SD* = 0.05) and the simple nouns (*M* = 0.02, *SD* = 0.07) were unpredictable from the sentence context, with no significant difference (t = -0.11, p = 0.914). Word familiarity ratings showed that both compounds (*M* = 4.89, *SD* = 0.22) and simple nouns (*M* = 4.92, SD = 0.12) were highly familiar (t = -1.16, p = 0.249). Sentence naturalness was rated as high for both compounds (*M* = 4.29, *SD* = 0.67) and simple nouns (*M* = 4.31, *SD* = 0.50; t = -0.14, p = 0.890). To illustrate, example (1) shows one item set with the unspaced/spaced versions with the simple word and in (2) the same sentence frame contains the compound word:

(1) Simple word
คุณแม่ขอให้คุณพ่อช่วยล้างกระทะให้สะอาด (unspaced)
คุณแม่ ขอ ให้ คุณพ่อ ช่วย ล้าง กระทะ ให้ สะอาด (spaced)
"Mom asked Dad to help clean the pan until it's clean."

(2) Compound word
คุณแม่ขอให้คุณพ่อช่วยล้างกรงนกให้สะอาด (unspaced)
คุณแม่ ขอ ให้ คุณพ่อ ช่วย ล้าง กรงนก ให้ สะอาด (spaced)
"Mom asked Dad to help clean the birdcage until it's clean."

The sentences were counterbalanced across four lists using a Latin square design. Each list contained 76 sentences, with 19 sentences in each of the four experimental conditions. Participants were randomly assigned to one of the four lists. Thus, participants saw a particular sentence frame with either the compound noun or the simple noun, but not both.

Apparatus and Procedure

Participants' eye movements were recorded using the Eyelink Portable Duo (SR Research, Ltd.) at 1,000 Hz. A chinrest minimized head movement, and eye movements were tracked from the right eye. Stimuli were presented in 20-point black Browallia New font on a white background on a Lenovo Legion 5S Pro monitor (2560 x 1600 x 60Hz). A fixed-width font was avoided as it distorted the appearance of the Thai alphabet, particularly vowels and tone marks. Participants sat 45 cm from the eye tracker and 65 cm from the screen, where approximately up to two characters subtended approximately one degree of visual angle. Sentences were displayed on a single line. After the initial calibration procedure, during the experiment, participants were asked to read silently for comprehension at their normal pace. After three practice sentences, they read 76 experimental sentences in random order. Each trial began with a fixation dot on the left side of the screen. After reading a sentence, participants pressed the spacebar to move to the next trial. On 19 trials (25%), a true-or-false comprehension question appeared, and participants responded by pressing the "Z" or "M" key.

Results

Reading times for each condition are presented in Table 1. Differences in eye movement measures across spacing and noun conditions were analyzed using linear mixed-effects regression models with spacing, noun conditions, and their interaction as fixed effects, along with by-participant and by-item random intercepts and slopes. Word frequency and length were included as covariates in the analyses on the target word region. All of the variables were mean-centered. The maximal model was fitted first, and in the case of model convergence issues, random effects that captured the smallest variance were removed. Statistical significance was assessed using the *lmerTest* package (Kuznetsova et al., 2017).

Total sentence reading time was significantly longer in the spaced condition compared to the unspaced condition, and longer for compound nouns than simple nouns. The average fixation duration in each sentence was shorter in the spaced condition than in the unspaced condition. These findings suggest that adding spaces to Thai sentences increases processing costs in terms of longer reading times and more fixations, but provides a benefit through faster word recognition. For the target word region, participants had longer first fixation duration, gaze duration, and total fixation time on compound nouns as compared with simple nouns, likely reflecting the processing cost of greater morphological complexity (Table 2). Additionally, there was a significant interaction between spacing and noun conditions for first fixation duration and gaze duration, showing that the spacing effect was more pronounced for compound nouns. These findings suggest that adding spaces to Thai sentences facilitates word recognition, particularly for compound nouns.

Table 1: Mean sentence-level and target word measures by spacing condition and noun condition (*ms*) in Experiment 1 (*SD* in parentheses).

	Compound		Simple	
	Unspaced	Spaced	Unspaced	Spaced
Sentence reading time	3676 (1432)	3804 (1495)	3546 (1385)	3675 (1487)
Average fixation duration	239 (42)	228 (40)	237 (41)	227 (43)
First fixation duration	330 (157)	297 (135)	219 (78)	210 (74)
Gaze duration	352 (180)	315 (149)	272 (137)	260 (129)

Table 2: Effects of spacing condition and noun condition on eye movement measures in Experiment 1.

	Sentence reading time			
Predictors	Estimates	*SE*	*t*	*p*
(Intercept)	3675.05	140.83	26.10	**<.001**
Spacing	132.46	34.61	3.83	**<.001**
Noun type	127.42	38.18	3.34	**<.001**
Spacing* Noun type	0.66	63.04	0.01	.992
	Average fixation duration			
Predictors	Estimates	*SE*	*t*	*p*
(Intercept)	232.62	3.97	58.63	**<.001**
Spacing	-10.36	1.08	-9.63	**<.001**
Noun type	1.08	1.12	0.96	0.336
Spacing* Noun type	-1.53	1.86	-0.82	0.413
	First fixation duration (target word)			
Predictors	Estimates	*SE*	*t*	*p*
(Intercept)	261.43	15.41	16.97	**<0.001**
Spacing	-21.09	4.62	-4.57	**<0.001**
Noun type	93.74	7.30	12.83	**<0.001**
Word frequency	-7.38	3.99	-1.85	0.064
Word length	1.74	2.69	0.65	0.518
Spacing* Noun type	-24.15	7.27	-3.32	**0.001**
	Gaze duration (target word)			
Predictors	Estimates	*SE*	*t*	*p*
(Intercept)	239.84	20.54	11.68	**<0.001**
Spacing	-24.95	5.62	-4.44	**<0.001**
Noun type	55.20	7.60	7.26	**<0.001**
Word frequency	-13.31	5.26	-2.53	**0.011**
Word length	14.14	3.54	3.99	**<0.001**
Spacing* Noun type	-25.22	9.18	-2.75	**0.006**
Bold values indicate statistical significance at $p < 0.05$.				

Experiment 2

Participants

Another 81 native Thai participants with normal or corrected-to-normal vision were recruited from Chulalongkorn University. They received course credit or 100 baht (~3 USD) for their participation.

Stimuli preparation

Stimuli consisted of the same 76 Thai compound nouns and 76 matched Thai simple (monomorphemic) nouns from Experiment 1. The compounds' constituents (92) were also included. All experimental items were counterbalanced across two lists. In each list, participants would see 122 experimental items, comprising 38 compound nouns, 38 simple nouns, and 46 constituents. In addition, another 122 nonce filler items were constructed: 76 were bisyllabic nonwords (e.g., *ปะโด* [pàdoo]), whereas the remaining 46 were monosyllabic nonwords (e.g., *ปลอน* [plɔɔn]).

Apparatus and Procedure

Participants were tested individually in a laboratory room at Chulalongkorn University. The stimuli were presented in a black Sarabun font, size 70px, on a white background, hosted on PCIbex Farm (https://farm.pcibex.net/; (Zehr & Schwarz, 2018). Trials were viewed from a comfortable distance (approximately 60 cm) on a 21.5 inch Lenovo desktop monitor with screen resolution 1920 x 1080. On each trial, a fixation cross was present for 1,000 ms before the stimulus was presented at the center of the screen (Figure 1). At the bottom of the screen was a line of text saying "Is it a real word or not?", and on another line below that was a line of text saying "Press the left button if Yes; press the right button if No". Participants were instructed to respond by pressing either the "Z" or "M" key on a keyboard, and they were told to respond as quickly and accurately as possible. The instructions clarified that participants should judge whether the overall word has a meaning in Thai. The 244 experimental items (122 words, 122 nonce filler words) were presented one at a time, in a different random order for each participant. The experimental block was divided into 5 sub-blocks, allowing the participants to take breaks in between. Before the experimental block, participants completed 8 practice trials (5 words, 3 nonce filler words) to become familiar with the task. Each session lasted approximately 20 minutes.

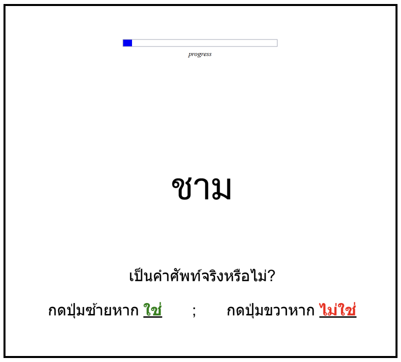

Figure 1: Example trial screen from Experiment 2

Results

Accuracy was uniformly high across all the experimental conditions (*M* = .99 and *SD* = 0.1 for the Compound, Simple, and Constituent noun conditions). Accuracy was also high for the nonce fillers (*M* = .93, *SD* = 0.25). Reaction times (RTs) from trials on which no response key was pressed within five seconds (0.02% of the data), responses from incorrect trials (approximately 4% of the data), and responses differing more than 2 standard deviations from the condition means (5% of the data, with 4-4.5% of the data uniformly trimmed in each condition) were removed from the analyses. The descriptive statistics from Experiment 2 are summarized in Table 3.

Since RTs were highly positively skewed, log transformation was applied to reduce skewing. RTs were compared among the compound nouns, simple nouns, and constituents. We fitted linear mixed-effect regression models using log response times as the dependent variable, noun type as a predictor variable, and subject and item as random effects. Log whole-word frequency and word length (in the number of characters) were included as covariates. The maximal random effects structure was initially fitted, but convergence issues necessitated the removal of all random slopes. Thus, the final model retained only the random intercepts. In this model, the variance inflation factors (VIF) were smaller than 4, indicating that there were no severe issues of multicollinearity.

The linear-mixed effect analysis of the response times are summarized in Table 4. These analyses revealed that compared to compound nouns, response times were slower for simple nouns and response times were faster for constituents. Response times were also faster for words with higher word frequency compared to words with lower word frequency. Word length was not a significant predictor of response times.

Table 3: Means (standard deviations) of accuracy and response times by noun condition from Experiment 2.

Dependent measures	Condition		
	Compound	Simple	Constituent
Accuracy	0.99 (0.08)	0.99 (0.09)	0.99 (0.10)
Response Times (ms)	654.02 (141.92)	663.76 (150.46)	640.82 (149.19)

Table 4: Effects of noun condition on response times from Experiment 2.

	Response Times (RT)			
Predictors	Estimates	*SE*	*t*	*p*
Compound: simple	0.04	0.01	3.92	**<.001**
Compound: constituent	0.05	0.01	3.68	**<.001**
Word frequency	-0.02	0.00	-8.29	**<.001**
Word length	0.01	0.00	1.92	.057
Bold values indicate statistical significance at $p < 0.05$.				

General Discussion

Two experiments on the same set of stimuli revealed the opposite pattern of results: Experiment 1 found that first fixation duration and gaze duration on compounds were 55-94 ms longer for compounds than for simple words in sentence reading, whereas Experiment 2 found that response times to compounds were 10 ms faster than to simple words. This reversal of morphological complexity effects across the two tasks concur with previous research which has also found processing costs for compounds in terms of longer reading times compared to simple words in sentence reading, and a processing advantage for compounds in terms of shorter lexical decision and naming latencies for compounds compared to simple words (Hyönä et al., 2002; Inhoff et al., 1996).

This disparity likely arises from the differing cognitive demands of the tasks involved which have been claimed from various perspectives and task-specific processing models (Declerck & Kormos, 2012; Johnsrude & Rodd, 2015; Lewis et al., 2006; among many others). Sentence reading requires integration of lexical semantics and syntactic processing for full comprehension (Boland, 1997; Ferreira & Clifton, 1986; Ferreira & Henderson, 1991), with compounds necessitating additional semantic integration compared to simple words (Juhasz, 2008, 2018; Kuperman et al., 2009; Schmidtke et al., 2018). Conversely, lexical decision tasks focus on rapid word identification, where lexical semantic processing may not be fully activated, which in turn provides compound words with a processing advantage.

Various studies using lexical decision tasks on lexical compounds have strongly revealed that compound processing involves morphological segmentation (Fiorentino & Fund-Reznicek, 2009; Fiorentino & Poeppel, 2007; Zwitserlood, 1994). Unsurprisingly, results from various sentence reading experiments also showed that when lexical compounds were embedded in sentence frames, the compound constituents (especially the first constituent) exerted a significant effect on various eye movement measures (e.g., gaze duration) of the compound words compared to simple words (Hyönä & Pollatsek, 1998; Juhasz et al., 2003; Kuperman et al., 2009; Libben et al., 2003). However, it is also evident that lexical decision tasks involve nothing more than identifying words or nonwords in isolation as soon as possible. In contrast, during sentence reading, the processing load for individual words is higher, as word recognition is contextually driven. While lexical factors such as frequency, familiarity, age of acquisition, word length, etc, can be examined in both tasks, they differ significantly in highlighting distinct cognitive task demands in word identification. The distinct cognitive load implies a concomitant processing model. For instance, Plaut et al. (1996) proposed a connectionist model which aimed at describing the processing of regular and quasi-regular English words and non-words. The model provided a way to map orthographic (written) representations to phonological (spoken) representations. Alternatively, Coltheart et al. (2001) introduced the Dual Route Cascaded model, a computational framework for depicting visual word recognition and the processing of reading aloud. Thus, depending on the type of stimuli and experimental method (words vs. non-words, high-frequency vs. low-frequency words, silent reading vs. reading aloud, etc.), a particular processing route can be activated, which in turn leads to different outcomes across measures of word recognition.

The incongruent results between Experiment 1 and 2 may stem from the interaction between word length and processing, as well as the specific experimental method. Thai bisyllabic words (both simple and compound) are significantly shorter than those in other languages (e.g., Finnish), which can lead to several processing consequences in visual word recognition. First, there is always an orthography-phonology mismatch in Thai in the sense that the abugida system contains inherent (i.e., unexpressed) vowels and tones. For instance, the word *สด* ('fresh') is pronounced [sòt], in which the vowel and tone are part of the consonant *ส*'s inherent feature. Second, the vowels are always written as diacritic marks above or below the consonant, further shortening the written word. For example, *ปิด* ('close') is pronounced [bìt], and *ผู้* ('person') is pronounced [p^hûu]. It is therefore highly likely that foveal vision (approximately 2 degrees of visual angle) can completely cover the entire word (especially since the font size was 20).

The longer fixation durations observed for Thai compounds (compared to simple words) in Experiment 1 may also arise from the fact that the semantic meanings of both compound constituents could be processed alongside the processing of the entire compound. This is especially true for sentence reading experiments in which readers utilize the left-to-right gazing direction and the first compound constituent must be foveally/parafoveally processed. In cases where the semantics of the (first) compound constituent may not fit in the sentence context and the compound's meaning cannot be fully decomposed to its constituents' meaning (e.g., opaque compounds), the compound's meaning always wins out as it is semantically required by the sentence context, hence more processing load would be incurred which resulted in a longer processing time for the entire compound recognition. On the other hand, lexical decision tasks examine rapid lexical access, often without deep semantic processing. The font size (in Experiment 2) was 70 and foveal vision cannot cover more than one character. In the absence of sentence context, foveal processing will be emphasized, and the information provided by parafoveal processing also becomes less relevant in the current task (since there were no flanking letters around the centrally displayed stimuli). Since interword spacing is not part of Thai orthography, when presented with compounds in large font size, Thai readers would likely parse the word serially, a strategy that also applies to simple word processing. As a result, the first compound constituent (which is orthographically short and also has a higher word frequency than the simple words) would be recognized faster than other bisyllabic (but simple) words.

The result of our lexical decision task is corroborated by previous works in favor of the decompositional approach to compound processing using lexical priming and masked priming paradigms (e.g., Fiorentino & Fund-Reznicek, 2009; Libben et al., 2003; Shoolman & Andrews, 2003; Zwitserlood, 1994). Although our results do not offer conclusive evidence regarding the impact of individual constituents on the processing of compounds, we have demonstrated that the seemingly conflicting results from the two experiments were primarily due to differences in experimental methodology and the task demands they imposed. While the overarching research objectives are identical across the two experiments, the specific task demands for participants were distinct, hence different performance across tasks were observed, a finding which has been well documented in previous research (Bookheimer, 2002; Friederici, 2011; Robinson, 2001; Wagner et al., 2000)

In conclusion, our results showed that the morphological complexity of bimorphemic compounds incurred a processing cost in sentence reading but it facilitated lexical decision response times, relative to monomorphemic controls. We suggest that this striking reversal of morphological effects could be explained by the distinct task demands and processing strategies induced in the two tasks. Future research should carefully consider how task demands can systematically influence morphological processing across different tasks of word recognition.

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