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English Compound Meaning Predictability: An Exploratory Cross-Linguistic Study

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ABSTRACT

Compound words are integral to the development of word knowledge in English. This study explored cross-linguistic similarities and differences in compound-meaning inference, focusing on the semantic relation between the modifier and head in noun-noun compounds. Semantic relation specifies how the meanings of the modifier and head are combined. Although some less-established compounds allow multiple semantic relation, causing ambiguity in meaning, L1 speakers of English typically prefer using semantic relation/meaning. This study investigated whether English L2 students would be able to identify the dominant semantic relation of ambiguous novel compounds (e.g., child art). Two groups of English L2 university students, a Thai L1 group and a Vietnamese L1 group, completed a multiple-choice format, compound-meaning inference task, in which they identified the dominant meanings, as preferred by a group of native speakers of English. Results indicated that the Thai L1 and Vietnamese L1 groups did not differ in their overall mean scores for the dominant meanings, although they demonstrated some differences at the item level. This study discusses the need for more cross-linguistic studies in compound words.

Keywords: compound processing; second language; vocabulary; semantics; meaning predictability

INTRODUCTION

During the past decades, our understanding of second language (L2) word learning has dramatically advanced, uncovering cognitive structures and processes involved in the development of L2 word knowledge. One such area of research is concerned with the meaning aspects of word knowledge. Studies have consistently suggested that the conceptual and semantic differences between L1 and L2 words negatively affect the establishment of L2 word meanings in learners' mental lexicons (Jarvis, 2016; Jiang, 2004; Odlin, 2005). Currently, a majority of existing research is conducted using individual words, rather than compound words. The present study aims to contribute to L2 word learning research by offering further findings on the conceptual and semantic factors in learning the meanings of compound words.

Compound words (or compounds) are created by combining two or more individual words, written either with space, without a space, or with a hyphen between the individual constituent words. According to Selkirk (1982), English compounds can be categorised into the following major types: noun-noun (e.g., *bookshelf*), verb-noun (e.g., *playground*), noun-verb (e.g., *window shop*), adjective-verb (e.g., *dry clean*), and verb-particle (e.g., *pick up*). Compounds are particularly important for learners of English because there is a considerable number of compounds in English. Estimates based on dictionary entries suggest that compounds comprise approximately 30% of the English lexicon (Goulden et al., 1990). In addition, compounds, in particular, noun-noun compounds, are productive; namely, an infinite number of new compounds can be created and added to the English lexicon (Bauer, 1987; Semenza & Luzzatti, 2014). To

offer further findings on noun-noun compounds, the present study explored how L2 students would learn (or infer) the meanings of unfamiliar compounds.

The specific theoretical issue addressed in this study is "semantic relation", a factor that is largely under-investigated in L2 lexicon research (Alonso et al., 2016; Lee, 2011; Uygun & Gürel, 2017). As introduced above, the endocentric compounds in English, in most cases, have the head of a compound as the final element of the compound, for example, *right-headed*. For example, in *bookshelf*, the head of the compound is *shelf*, and the modifier, *book*, explains more about the shelf. Moreover, there is a small number of endocentric compounds that are left-headed, for instance, *Attorney-General*, *mother-in-law*, and *grow up*. When students learn new compounds, they are typically instructed to make use of the modifier-head structure to infer the meanings of the new compounds. For example, if students encounter a novel but possible compound, *fruit shelf*, the most likely meaning they would generate is "shelf for storing fruit," applying the same semantic "rule" used for *bookshelf*. The "rule" illustrated in this example is the semantic relation, which specifies how the meanings of the modifier and the head should be combined (a detailed model can be found in Pham & Baayen, 2013).

Students may face difficulty because semantic relations are not always consistent among compounds that share the same head (e.g., Nagy, 1997; Bauer, 2017). For example, *kitchen shelf* most likely refers to "a shelf in the kitchen," in which the modifier explains the location of the shelf, as opposed to referring to items stored on the shelf, as in *bookshelf*. Moreover, some compounds can be ambiguous because multiple semantic relations are possible. The meaning of *stone shelf* can be either "a shelf made of stone" or "a shelf for storing stones," but L1 speakers of English predominantly prefer the former meaning (Yang, 2017). Semantic relation is certainly an important factor in learning or inferring the meanings of novel compounds, yet current findings are still limited in L1 speakers. To explore the impact of semantic relation in L2 compound learning, this study examined whether English L2 learners would be able to identify the dominant meanings (the meanings preferred by native speakers) of ambiguous novel compounds. This study also investigated whether differences existed between learners with similar L1 compound head-modifier structures by comparing the performances of two groups of college students, Thai L1, and Vietnamese L1 groups.

LITERATURE REVIEW

L1 SEMANTIC INFLUENCE IN L2 WORD LEARNING

Cross-linguistic influence predicts all aspects of L2 learning. Since conceptual and semantic representations vary across cultures and languages, the differences between L1 and L2 representations can lead to conceptual and semantic transfer in L2 word learning (Jarvis, 2016; Odlin, 2005). Pavlenko (2009) suggests that transfer is likely to occur when a representation that exists in one language has no equivalent in another language or has only a partial equivalent in another language (one language having only one representation, whereas another language has multiple representations).

Empirical findings on transfer have been obtained from several studies (Degani & Tokowicz, 2010; Jiang, 2004; Malt, 2020; Pavlenko & Malt, 2011; Wolter et al., 2020). For example, Jiang (2004) examined conceptual and semantic transfer in the processing of L2 words (word recognition). Two groups of college students, Korean L1 graduate students and L1 speakers

of English, judged whether pairs of English words presented on a computer were semantically related. The pairs included a same-translation type (e.g., *chance* – *opportunity*), which had the same Korean translation equivalent, i.e., 기회, and a different-translation type (e.g., *decrease* – *reduce*), which had separate Korean translation equivalents, i.e., 줄이다 or 축소하다 (Jiang, 2004: p. 422). As predicted, the ESL students were faster and more accurate in identifying the same-translation type, presumably because the words in this type were represented by the same word in Korean. However, the L1 speakers of English did not show any difference between the pair types.

More recent studies have demonstrated that conceptual and semantic transfer extends to learning of L2 word meanings. For instance, in Degani and Tokowicz (2010), English L1 college students learned Dutch words in a paired associative learning task, while Bracken et al., (2017) determined how relatedness between translations affects translation-ambiguous word learning from German to English. Their performances on a translation recognition task, which identified whether the English word was a correct translation of the Dutch word, indicated that the students had more difficulty learning words that did not have a one-to-one correspondence between the two languages (e.g., the Dutch near-synonyms, *lucht* and *hemel*, for *sky*), compared to the words that had a one-to-one correspondence. Conceptual and semantic transfer affects L2 word-meaning learning, but some studies suggest that L2 conceptual and semantic representations become more approximate to L1 speakers of English as learners gain higher proficiency and more experience in L2 (e.g., Park & Ziegler, 2014; Wolter et al., 2020). Nevertheless, findings also suggested that transfer may persist even after L2 learners achieve a higher level of proficiency (e.g., Malt, 2020). The language transfer may occur across both languages in the acquisition of a simultaneous bilingual, from a mature speaker's first language (L1) to a second language (L2) they acquire (Jarvis & Pavlenko, 2008; Jarvis, 2016).

CONCEPTUAL COMBINATION OF COMPOUNDS

Theories in conceptual combination clarify the underlying processes involved in the interpretation of compound meanings. The conceptual combination is a dynamic process that involves not only words whose concepts are being combined, but also the contextual information in which the words appear (Muńoz, 2011). Although both words and context are important, research seems to suggest that the initial interpretation is based only on words. Middleton et al. (2011) investigated whether words or context had a significant impact on the meaning interpretation of novel compounds (e.g., *paper dog*). English L1 college students read a short text that included a novel compound that had two possible interpretations. The text provided contextual information supportive of either a most likely interpretation (*a dog made out of paper*) or a less likely interpretation (*a dog trained to fetch the paper*). The reading time data confirmed that the students utilised the information from both the words and contexts, yet the initial meaning interpretation was based on the words (*paper* and *dog*). The researchers concluded that the conceptual combination of compounds was "not fundamentally different when it occurs in context rather than out of context" (Middleton et al., 2011, p. 818), suggesting that how we perceive and process the meanings of the constituent words provide fundamental information when we interpret the meaning of compounds.

Two theoretical approaches are commonly introduced to explain the mechanism of conceptual combination of noun-noun compounds out of context. The dimension-based approach assumes that the head consists of a set of dimensions, and the meanings of compounds are

constructed because of the modifier adding more explanation to one of the dimensions. More specifically, the schema-modification theory (Murphy, 1988, 1990) and the selective modification model (Smith et al., 1988; Smith & Osherson, 1984) postulate that we interpret the meanings of compounds based on the evaluation of whether the modifier can fill in slots or attributes that belong to the head's schema. For example, in *apple pie*, the modifier, *apple*, fills in the material or ingredient slot (what the pie is made of). These theories underscore the critical role that the head's properties play in interpreting the meanings of compounds, because the modifier's role is essential to supplement the head's concept.

Nevertheless, some researchers maintain that compound interpretation is not bound by prototypical features that belong to the head but depends on our ability to infer the combined meanings of the modifier and head, driven by our knowledge and experience with the modifier and head in various contexts (Connolly et al., 2007). Under this view, compound interpretation is based on a separate entity that serves as a link between the modifier and head. According to the relation-based approach, the semantic relation between the modifier and head is the conceptual link. When we interpret the meanings of unfamiliar compounds, we choose the most probable semantic relation and apply it to combine the meanings of the modifier and head.

Studies in the relation-based approach have offered various classifications of relations (see Downing, 1977; Gleitman & Gleitman, 1970). The present study introduces the classification by Levi (1978: p. 75), which offers a more detailed categorization. The categorization is based on an analysis of "recoverably deletable predicates," which analyses the predicate that supposedly has been deleted during the compounding process (when an original clause is made into a compound). For example, *tax law* can be recovered by adding ABOUT, as in "law about tax." Table 1 summarises the categories and their corresponding relations between the head and modifier with some examples. Note that CAUSE, HAVE, and MAKE allow either the modifier or the head to be the subject of the recovered clause, while the rest of them allow only the head to be the subject of the clause. For instance, *tear gas* refers to "gas that causes tears," whereas *drug deaths* refers to "drug that causes deaths."

TABLE 1. Relation Classifications (adapted from Levi, 1978; Shoben, 1991; and Pham & Baayen, 2013)

Word Category	Semantic Relation	Example
CAUSE: causative	H CAUSES M	*tear gas*
	M CAUSES H (H caused by M	*drug deaths*
HAVE: possessive/dative	H HAS M	*picture book*
	M HAS H	*lemon peel*
MAKE: productive, constitutive, compositional	H MAKES M	*daisy chains*
	M MAKES H (H made of/by/from M)	
USE: instrumental	H USES M	*steam iron*
BE: essive/appositional	H IS M	*soldier ant*
IN: locative (spatial or temporal)	H IN M	*morning prayers (temporal), field mouse (spatial)*
FOR: purposive/benefactive	H FOR M	*horse doctor*
FROM: source/ablative	H FROM M	*olive oil*
ABOUT: topic	H ABOUT M	*tax law*
DERIVE: material, source	H DERIVED FROM M	*peanut butter*
DURING: occur, happen	H DURING M	*summer clouds*
PERFORM: do, present, enact	H USED BY M	*servant language*
LOCATE: localise, situate	M LOCATION IS H	*murder town*
DO: act, accomplish	H BY M	*student vote*
LIKE: similar, identical	M LIKES H*	*age-long*

CONTAIN: comprise, enclose	H OF M*	*bombshell*
CREATE: build, construct, compose	H MADE BY M*	*anthill*
RESEMBLE: be like	H RESEMBLE M*	*arrow-root*

Note. H refers to head; M refers to modifier

The relation-based approach was further examined in the context of word recognition by Gagné and her colleagues. Based on data from compound-word recognition experiments, they proposed the competition among relations in nominals (CARIN) model (Gagné & Shoben, 1997), which clarifies the processes involved in selection of semantic relations during compound-meaning interpretation. The model postulates that relation possibilities compete, but we choose the relation that is most frequently used with a given modifier. For example, for the modifier, *mountain*, the most frequent relation used is the locative (IN) relation, as in *mountain sky* and *mountain resort*. Subsequent studies provided support for the theory (e.g., Gagné, 2001, 2002; Gagné & Spalding, 2009), demonstrating that the modifier plays an important role in identifying the meanings of compounds. An updated model, the relational interpretation competitive evaluation theory (Spalding & Gagné, 2011), further describes the compound interpretation process as a "suggest-evaluate-elaborate process." The modifier first suggests relation candidates according to frequency. Next, plausibility is evaluated for the modifier and head combination, and the full meaning of the compound is created by elaborating on the relation (i.e. the relational availability for snow in *snow hill* is based on snow's previous use as a modifier and is unaffected by snow's history of use as a head).

SEMANTIC RELATION AND COMPOUND-MEANING INFERENCE

When students encounter unfamiliar compounds, they are typically instructed by their teachers or by their language intuition to infer the meanings of the compounds by combining the meanings of the modifier and head (Nagy et al., 1987; Nagy, 1997). This is a reasonable strategy because students are likely to encounter novel compounds whose meanings are not yet available in dictionaries, given that compound nouns are highly productive in English (Bauer, 1987). However, what is absent in the current instruction is semantic relation, which specifies how we combine the meanings of the modifier and head. For example, *mailman* and *snowman* both share the same head, but *mailman* refers to a man/person who delivers mail, while *snowman* refers to a man/person-like figure made of snow (not a man/person who delivers snow). *Fire alarm* and *fire-bomb* share the same modifier, but their semantic relations are different: *fire alarm* refers to an alarm which warns of a fire, while *fire-bomb* refers to a bomb that causes a fire. Semantic relation is not always consistent even for compounds that share the same head or modifier, as pointed out by vocabulary researchers (e.g., Nagy, 1997; Bauer, 2017). The inconsistency can make it challenging for L2 students to identify the correct semantic relation, particularly if they have limited L2 proficiency and experience.

At present, only a handful of studies have investigated the impact of semantic relation in compound-meaning inference. Gagné, Spalding, and Gorrie (2005) examined how English L1 college students infer the meanings of ambiguous novel compounds. In Experiment 1, in which the students selected the meanings of the novel compounds from multiple-choice meaning options, the researchers found that some compounds were less ambiguous than others. For example, for *woman judge*, the students selected "a judge that is a woman" 96% of the time,

compared to the alternative meaning, "a judge for a woman." Based on the preference percentage, the former meaning was referred to as a "dominant" meaning, and the latter was a "non-dominant" meaning. In contrast, for *wool basket*, the students did not show a clear preference, selecting at about 50% each for the two possible meanings, "a basket for wool" and "a basket made of wool." Most importantly, findings from L1 children speakers of English and L2 speakers of English have shown that participants who are in the process of developing their language abilities face difficulty identifying the dominant semantic relation. Krott et al. (2009) asked English L1 children (ages 4-5) to infer the meanings of novel compounds (e.g., *apple rings*). The children were able to identify 39.7% of the dominant meanings ("a ring made of apple"), which were the meanings that adult English L1 participants selected. To the best of our knowledge, only two studies existed for L2 speakers of English. In Zhou and Murphy (2011), Chinese L1 EFL college students inferred the meanings of novel and existing compounds. The researchers found that the students were able to identify the dominant meanings 59.87% of the time. The students' errors included various types, together with reversing the modifier-head order and inaccurate choice of semantic relation (e.g., "a burger made of cheese" for *cheeseburger*, rather than "a burger that has cheese").

Similarly, in Yang (2017), college students learning Chinese L2, i.e., students learning Chinese as their second language (L2), inferred the meanings of novel compounds that required the MADE OF and FOR semantic relations (e.g., *fur hat* "hat made of fur" in English equivalent). The students were from various L1 and cultural backgrounds, including the US, England, Australia, Japan, South Korea, Germany, Turkey, Russia, Malaysia, Indonesia, and Thailand. The researcher concluded that overall, the L2 students' performance was similar to their native-speaking counterparts although some students struggled to identify the dominant meanings preferred by their counterparts. For example, for 纸碗 (zhǐwǎn, bowl made of paper) - *paper bowl* in English equivalent, some L2 students of Chinese inferred "a bowl for storing paper" instead of the dominant meaning, "a bowl made of paper." Taken together, these findings suggest that some L2 learners of Chinese found it difficult in identifying L1 speakers of Chinese semantic relations and inferring the meanings of novel compounds.

CROSS-LINGUISTIC STUDY ON COMPOUNDS

There are some cross-linguistic findings available on compounds, although they are concerned with the modifier and head location (e.g., Nicoladis, 1999, 2002). For instance, Nicoladis (2002) examined whether the structural difference influenced bilingual children's compound production. In French, the head is the first constituent of a compound, which makes the head-modifier ordering the opposite of English. The researcher asked French-English bilingual children and English monolingual children (ages 3-4) to produce/name a compound for a given picture (e.g., a picture of chairs with flowers printed on them). The results indicated that the bilingual children produced compounds at about 70% accuracy in French and 65% accuracy in English. However, compared to the English monolingual children, the bilingual children reversed almost twice as many of their English compounds (e.g., *brush-teeth* for *tooth-brush*), transferring the French modifier-head structure.

At present, there is no cross-linguistic study related to the learning of compound meanings. However, Raybeck and Herrmann (1990), in a large-scale study on the perception pair of words (not compounds), offer findings partially relevant to the cross-linguistic comparison of compound-meaning interpretation. The participants from eight different cultures (e.g., the US,

England, Italy, Pakistan, Vietnam, Hong Kong, etc.) identified the relatedness of the pair of words presented in their native languages. The researchers concluded that there were more similarities than differences between the participants' responses, yet some word pairs were recognised differently between the participant groups. For example, the cause-effect pair, (e.g., *joke-laughter*) was identified as more highly related by the Vietnamese group than the rest of the groups. Although the findings were not from compounds, they offer insights into cross-linguistic variation in how L2 learners may perceive semantic relations for compounds.

The literature reviewed above introduces cognitive factors that affect word-meaning learning in L2, including individual words and compound words. Findings suggest that L1 conceptual and semantic transfer influences L2 word learning (e.g., Degani & Tokowicz, 2010; Jiang, 2004), but it is largely unknown whether the transfer takes place for compound words as well. According to Gagné and her colleagues (e.g., Gagné & Shoben, 1997), the critical information for interpreting compounds' meanings is the semantic relation between the modifier and head, and the selection of semantic relation is dependent on our knowledge about other compounds, specifically compounds that have the same modifier. Although there is only limited research available on semantic relation and compound-meaning inference in L2, the existing findings suggest that some L2 learners encounter difficulty identifying the semantic relations that seem natural and common sense to native speakers (Yang 2017; Zhou & Murphy, 2011). Accordingly, the overall goal of the present study was to advance this area of research by offering cross-linguistic findings on the topic.

THE STUDY

The specific objective of this study was to identify whether cross-linguistic differences existed in how L2 learners perceive the semantic relation of ambiguous novel compounds. This study compared the compound-meaning inference performances between learners with different L1 backgrounds, Thai L1, and Vietnamese L1 college-level EFL learners. The specific questions investigated were:

Are Thai L1 and Vietnamese L1 EFL learners able to identify the dominant meanings of ambiguous novel compounds? Are there any differences between the groups?

Thai and Vietnamese differ in terms of the head-modifier structure. In Thai, the head is the first noun within a compound, dissimilar to English. For example, in the compound ***ชั้นหนังสือ*** ('bookshelf),' the underlined noun (***ชั้น*** 'shelf') is the head (see Iwasaki & Horie, 2005 for more details). Similarly, in Vietnamese, the head is the first constituent within the compound, also dissimilar to the structure in English. For example, in the compound *giá sách* ('bookshelf'), the underlined noun (*giá* 'shelf') is the head (Nguyễn Đình Hoà, 1997).

METHOD

PARTICIPANTS

As mentioned above, the participants were two groups of English L2 college students. All the participants were randomly selected from the pool of the related groups. The tasks were administered individually to each participant in each group on a computer using DmDX (Forster & Forster, 2003) in a quiet classroom at a university. The participants in the Thai L1 group (*n* =

22) were randomly recruited from English majors enrolled in English language and communication courses at a medium-sized university in Thailand (according to Top universities list, a medium-sized higher education institution has an enrolment range: 9,000-9,999 students)[1]. The courses were primarily designated for students in their 3rd year at the university. The participants in the Vietnamese L1 group (n = 22) were randomly recruited from English-majors students enrolled in English lexicology and pragmatics courses at a medium-sized university in Vietnam. The courses were intended for 2nd and 1st year students. According to the demographic questionnaire, their mean ages were 21.76 (SD = 2.54) for the Thai L1 group and 19.08 (SD = 0.87) for the Vietnamese L1 group, and the mean ages that they started English education was 10.84 (SD = 5.30) for the Thai L1 group and 9.27 (SD = 3.70) for the Vietnamese L1 group. None of the participants indicated they had native-like fluency in English or any language other than their native language (Vietnamese or Thai accordingly).

To ensure that the participant groups were comparable in terms of English compound knowledge, a compound-production task, a commonly used task in literacy research (e.g., McBride-Chang et al., 2005), was administered for screening purposes. In the task, the participants were asked to type in a novel compound that matched a sentence description. For example, in the description, *Early in the morning, we can see the sun rising. This is called a sunrise. At night, we might also see the moon rising. What should we call this?* the expected answer was *moon rise*. There were 15 items in the test, and students who scored 10 or lower (67% or lower) were excluded from participation. The mean score for the Thai L1 group was 13.07 (SD = 1.28) and for the Vietnamese L1, the group was 14.05 (SD = 1.13). A two-tailed t-test indicated that the means were significantly indifferent, t (42) = -2.687, p = .010, therefore, these scores were used as a covariate in the analysis below.

In addition to the two groups of L2 speakers of English mentioned above, a group of English L1 speakers, hereafter, the English L1 group (n = 30), participated in a norming task, which was necessary for developing the data collection instrument for the L2 participants. The English L1 group were randomly recruited from students enrolled in undergraduate or graduate programs at a medium-sized university in the US. All of them were monolingual native speakers of English. Although some had studied a foreign language, none had indicated fluency approximate to L1 speakers in languages apart from English.

DATA COLLECTION INSTRUMENTS AND PROCEDURES

Selection of novel compounds. The task used for the dependent measure in this study was a compound-meaning inference task, which measured the ability to identify the dominant meanings of ambiguous novel compounds in a multiple-choice format. First, to select the novel compound candidates, the norming task, comprising 30 novel compounds with their two possible meanings/definitions, was constructed based on the items used in previous studies (Gagné & Shoben, 1997; Gagné, Spalding, & Gorrie, 2005; Pham & Baayen, 2013; Pham & Nguyen, 2018; Štekauer, 2005). Next, the norming task was administered individually to each participant in the English L1 group on a computer using DmDX (Forster & Forster, 2003) in a quiet classroom at a university. In the task, the participants chose the meaning they would most prefer for each compound without using any references or consulting with others. They also type in a new meaning if they disagreed with the meaning options provided in the task. The data from the

[1] https://topuniversitieslist.com/.

English L1 group indicated that there was a range of preference percentages between the possible meanings among the compounds. To compile the items that demonstrated a clear preference for one meaning by the English L1 group, only the items that had a 75% or higher preference percentage for one of the meanings were used for the compound-meaning inference task. A total of 16 novel compounds were selected for this task, and their mean preference percentage was 88.45%.

Compound-Meaning Inference Task. To finalise the compound-meaning inference task, four answer options were provided for each of the 16 novel compounds. The answer options included the two possible meanings (dominant and non-dominant meanings) and two distractors, which did not incorporate the modifier's meaning, following the format used in a literacy study, Zhang (2013). For instance, for the novel compound, *child art*, the following four options were provided: *Art that is made by a child* (dominant meaning), *Art that is created for children* (non-dominant meaning), *Art that is hung on the wall* (distractor), and *Art that is expensive* (distractor). The order of the answer options was randomised in the task.

Two points were taken into consideration in the process of constructing the task for the English L2 groups. To ensure that the novel compounds were in fact novel and not established, we checked against the *American Heritage Dictionary*, *5th edition* and the Corpus of Contemporary American English (COCA), one of the largest English corpora containing over 560 million words (Davies, 2008). None of the novel compounds appeared in the dictionary. As for the COCA, 11 out of the 16 items were listed, but the frequencies were very low (a mean frequency of 5.8). Therefore, it was determined that it would be extremely unlikely that the English L2 participants would be familiar with the meanings of the novel compounds in the task. Another point was the participants' familiarity with the vocabulary and grammar structures used in the multiple-choice options. The teachers of the classes, from which students were recruited to evaluate the task, confirmed that the vocabulary and grammar were at a level that should be familiar to all the participants.

Procedures. The demographical data collection was carried out online via Google form. In the online format, the participants first completed the demographic questionnaire. Then, the participants completed the compound-production task (screening task) and the compound-meaning inference task with a DMDX task as mentioned above. Including the instructions, it took approximately 45 minutes to complete the data collection. During the data collection, in the presence of an experimenter, the participants were asked to work independently without relying on any other source of information such as a dictionary.

RESULTS

Table 2 displays the means and standard deviations for each of the answer options from the compound-meaning inference task. The dominant option was the correct answer, given that it was the option most preferred by the English L1 group. To test whether there were any differences between the Thai L1 and Vietnamese L1 groups in choosing the correct answer, a two-tailed *t*-test was first performed on the means for the dominant option, which was 10.14 (*SD* = 2.78) for the Thai L1 group and 11.32 (*SD* = 1.76) for the Vietnamese L1 group, with a max score of 16. The *t*-test indicated that the group difference was non-significant, t (42) = -1.685, p = .099. As

mentioned earlier, the means from the compound screening test were significantly different between the two groups. Therefore, an analysis of covariance (ANCOVA) was also performed to test the difference in choosing the dominant option between the groups using the test scores as a covariate. The test verified that the groups were non-significant, F (1, 41) = .548, MSE = 2.681, p = .463, with the adjusted means being 10.46 for the Thai L1 group and 10.99 for the Vietnamese L1 group.

TABLE 2. Means and Standard Deviations from the Compound Inference Task

	Dominant	Nondominant	Distractor	No Answer
Thai L1	10.16 (*SD* = 2.78)	4.93 (*SD* = 2.35)	0.88 (*SD* = 0.83)	0.11 (SD = 0.29)
Vietnamese L1	11.34 (*SD* = 1.76)	4.11 (*SD* = 1.57)	0.61 (*SD* = 1.10)	0

To further analyse group differences for individual items, a chi-square test of association was performed on the counts for each answer option (dominant, non-dominant, and distractor). See Table 3 for by-item data for the dominant answers. The results indicated that three items were significantly different between the groups. For *truck house*, the Vietnamese L1 group scored higher than the Thai L1 group for the dominant option, whereas the Thai L1 group scored higher than the Vietnamese L1 group for the distractor option, X^2 (2, N = 44) = 7.5, p = .024. For the *student story*, the Thai L1 group scored higher than the Vietnamese L1 group for the dominant option, whereas the Vietnamese L1 group scored higher than the Thai L1 group for the nondominant option, X^2 (2, N = 44) = 8.4, p = .015. For *woman managers*, the Vietnamese L1 group scored higher than the Thai L1 group for the dominant option, whereas the Thai L1 group scored higher than the Vietnamese L1 group for the nondominant option, X^2 (2, N = 44) = 9.955, p = .007.

TABLE 3. The proportion of Dominant Answers

	Thai L1		Vietnamese L1	
Valid N = 22	*M*	*SD*	*M*	*SD*
plastic plant	.91	.294	.86	.351
stone plate	.91	.294	.91	.294
mountain magazine	.86	.351	.95	.213
apple bowl	.82	.395	.77	.429
child art	.77	.429	.77	.429
coffee card	.77	.429	.95	.213
teacher breakfast	.73	.456	.82	.395
money scholar	.64	.492	.77	.429
beach office	.59	.503	.77	.429
woman manager	.55	.510	.95	.213
student story	.55	.510	.14	.351
computer photo	.50	.512	.59	.503
snow chair	.45	.510	.73	.456
garden meal	.45	.510	.41	.503
truck house	.36	.492	.73	.456
bread cup	.27	.456	.18	.395
Overall	.63	.199	.71	.255

DISCUSSION

The research questions examined were whether differences existed in the ability to identify the dominant meanings of ambiguous novel compounds across English L2 learners with different L1 backgrounds. The results from the compound-meaning inference task demonstrated that the means for the dominant answer option did not differ statistically between the two groups, with the Thai L1 group indicating a 63.37% preference and the Vietnamese L1 group indicating a 70.75% preference for the dominant meanings. These percentages were comparable to the percentage reported in another English L2 study, Zhou and Murphy (2011), but higher than the percentage reported in Krott, Gagné, and Nicoladis (2009), a study with English L1 children. Overall, the means for the dominant answer option seem to suggest that the English L2 students were able to identify the semantic relations of English for a majority of the novel English compounds. Although the modifier-head structure in Thai is incongruent with English, the structural difference does not seem to have affected their overall performance, unlike the negative transfer reported in previous studies with bilingual children (e.g., Nicoladis, 1999, 2002).

Although the overall means did not differ, by-item analyses using chi-square tests revealed that the groups performed differently on the following three items: *truck house*, *student story*, and *woman manager*. As for *truck house*, the Vietnamese L1 group selected the dominant meaning (‘a camping truck’ or ‘a mobile home built on a truck or a van’) more frequently, whereas the Thai L1 group selected the distractors (‘a building used to store articles’) (the options that did not incorporate the modifier’s meaning) more frequently. Yang (2017) reported that some of the erroneous meanings her L2 speakers of Chinese students generated were based only on one constituent’s meaning (e.g., *bowl* for “bowl made of paper”) or neither constituents’ meanings (e.g., *socks* for “shoe made of fur”). Thus, it seems not uncommon for L2 learners to find difficulty incorporating both constituents’ meanings in inferring the meanings of novel compounds.

For *student story* and *woman manager*, the two groups performed in a contrasting manner with one group preferring the dominant answer while the other preferring the non-dominant answer. For *student story*, the Thai L1 group preferred the dominant answer (‘a story about student’s life), while the Vietnamese L1 group preferred the non-dominant answer (‘a story told or written by student’). For *woman manager*, the Vietnamese L1 group preferred the dominant answer (‘a manager of a store or company who also happens to be female’), while the Thai L2 group preferred the non-dominant answer (‘a woman member who performs chores works’ or ‘a manager who manage women staffs’). It is beyond the scope of this study to attribute these group differences to L1 conceptual and semantic transfer, yet these findings offer insights into possible L1 conceptual and semantic transfer in compound-meaning inference given that Raybeck and Herrmann (1990) found that participants with diverse linguistic and cultural backgrounds perceived semantic relations between pairs of words differently. According to the CARIN model (Gagné & Shoben, 1997), language users’ experience with compounds influences the selection of semantic relations. It would not be unreasonable to predict that there are cross-linguistic variations in semantic relations perceived by L2 learners with diverse linguistic and cultural backgrounds. The results of this study also showed that L1 speakers of English preferred to interpret novel compounds based on function relation. The results also demonstrated that although L2 speakers of English provided far more deviating interpretations than L1 speakers of English, they shared more similarities than differences in their interpretation patterns with L1 speakers. Further research is warranted to expand on the current findings.

CONCLUSION

This study explored how L2 students infer the meanings of novel compounds, focusing on the semantic relation between the modifier and head. The mean scores from the compound-meaning inference task demonstrated that the two English L2 groups (the Thai L1 and Vietnamese L1 groups) did not differ in their abilities to identify the dominant meanings of the novel compounds. Nevertheless, the item-based analyses revealed that the groups performed differently on three of the novel compounds. L1 conceptual and semantic transfer has been well investigated in studies using individual words (Degani & Tokowicz, 2010), yet transfer research in compounds is still scarce. As introduced earlier in this article, compounds are integral to the development of word knowledge in English, because they comprise approximately one-third of the English lexicon (Goulden, Nation, & Read, 1990). Further research is necessary to reveal the factors and processes involved in learning new compounds in L2.

Finally, limitations and a future research agenda are addressed. This study examined the impact of semantic relation in compound-meaning inference in L2. To examine L1 conceptual and semantic transfer in L2 compound-learning, it will be necessary to examine the dominant semantic relations of L1 compounds, as students may transfer the semantic relation preferred in their L1 into L2 compound-meaning inference. It is also possible that other cultural factors play a role in L2 compound-meaning inference. In addition, it would be interesting to focus on specific semantic relations (e.g., FOR, MADE) as well as to collect qualitative data such as asking students to type in meanings rather than choosing from multiple-choice options to improve the types of data collection. Subsequent studies on semantic relations and compounds might better be considered to clarify the issues that are not answered in this study.

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