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Preposition Stranding and Pied-Piping in *Wh*-Relative Clauses by Korean EFL Learners: A Corpus-Based Study*

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ABSTRACT

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This paper presents a corpus-based analysis of preposition stranding (PS) and pied-piping (PiP) structures in English *wh*-relative clauses written by Korean learners of English as a Foreign Language (EFL), a relatively underexplored topic in corpus research. This study uses the Test of English as a Foreign Language11 (TOEFL11) corpus, a learner corpus of nonnative English essays, and the Louvain Corpus of Native English Essays (LOCNESS) as a reference corpus. The study investigates the distribution of PS and PiP structures, the variation across different proficiency levels, and the impact of the three independent variables—(i) the syntactic dependency between verbs and prepositional phrases, (ii) the semantic dependency between verbs and prepositions, and (iii) the restrictiveness of *wh*-relative clauses. The findings indicated that Korean EFL learners used PS more frequently than PiP structures, whereas native English speakers showed the opposite trend. The findings also highlighted that the null-preposition phenomenon was prevalent across all proficiency levels, while PS was significantly more frequent than PiP in the lower-intermediate level. Semantic dependency alone significantly influenced preposition placement in the TOEFL11 (p = .023, φ = 0.60). These results suggest a need to incorporate instruction on register differences (formal versus informal situations) and verb subcategorization into the Korean EFL curriculum.

KEYWORDS

preposition stranding, pied-piping, Korean EFL learners, *wh*-relative clauses, TOEFL11

1. Introduction

In English, *wh*-relative clauses (*wh*-RCs) allow two syntactic structures for preposition placement: preposition stranding (PS) and pied-piping (PiP). PS refers to a structure in which a preposition remains in its original place, stranded, despite the fronting of its complement. PiP refers to a structure in which a preposition is attached to its complement and appears at the beginning of a clause. (1a) and (1b) illustrate PS and PiP structures in English RCs, respectively.

(1) a. That's the house (that, which) she lived ***in*** last year. [PS]
b. That's the house ***in*** which she lived last year. [PiP]
(Klein 1993, pp. 1-2)

As shown in (1a), the prepositions of *zero*- and *that*-relativizers cannot be pied-piped to their complements. However, the *wh*-relativizer *which* allows both PS and PiP constructions.

The preference between PS and PiP in *wh*-RCs is affected by several factors. In terms of processing perspective, the following three factors receive special attention: (i) the syntactic dependency between verbs and prepositional phrases, (ii) the semantic dependency between verbs and prepositions, and (iii) the restrictiveness of *wh*-RCs. First, the syntactic dependency distinguishes complements and adjuncts based on Radford's (1988) criteria. Second, the semantic dependency involves the contrast between bound and free prepositions, as mentioned in Biber et al. (1999). Lastly, the restrictiveness of *wh*-RCs concerns whether the clause is restrictive or nonrestrictive. The first factor was investigated in prior corpus studies by Hoffmann (2011) and Jach (2019), though not specifically with Korean EFL learners. Similar studies on these factors involving Korean EFL learners were experimental and yielded diverging results (Ko 2009, Shin et al. 2016). However, restrictiveness remains unexplored in any Korean learner corpora.

Furthermore, much second language (L2) research, as well as first language (L1) research, has dealt with the acquisition order of preposition placement, testing whether the Markedness Hypothesis explains the learners' acquisition of such structures. According to the Markedness Hypothesis, the unmarked properties are acquired before the marked ones. As PS is considered more marked than PiP (Van Riemsdijk 1978), PiP is presumed to be acquired prior to PS (see details in section 2.3). Contrary to the Markedness Hypothesis, numerous studies have shown that learners acquire PS before PiP (Bardovi-Harlig 1987, Kao 2001, Ko 2009, Park and Lee 2005, Shin et al. 2016). Moreover, in the interim stage of the acquisition of PS and PiP, learners often drop necessary prepositions (i.e., null-prep) or use them redundantly (i.e., doubling). Klein (1993) argued that the null-prep phenomenon is universal, and Bardovi-Harlig (1987) noted that doubling represents the acquisition order of PS and PiP. To the best of my knowledge, no corpus-based study has explored preposition placement specifically focusing on Korean EFL learners' writing. Most of the previous L2 experimental studies in this area tested a limited set of stimuli and reported inconsistent research findings.

To bridge the gap in current research, the present study aims to investigate preposition placement in Korean EFL learners' writing using the Korean component of the Test of English as a Foreign Language11 (TOEFL11) corpus, which is categorized by proficiency levels. The reason for adopting a learner corpus analysis is that it offers the advantage of examining authentic data produced by learners. This approach is crucial for understanding the specific characteristics of learners' interlanguage stage (Granger 2017).

This study addresses the following three research questions regarding preposition placement in English *wh*-RCs produced by Korean EFL learners:

1. Which of the two constructions, PS or PiP, is used more in Korean EFL learners' writing in the TOEFL11 corpus?

2. Do the distributions of PS, PiP, null-prep, and doubling vary depending on the proficiency level of Korean EFL learners?

3. Do the three independent variables—(i) the syntactic dependency between verbs and prepositional phrases, (ii) the semantic dependency between verbs and prepositions, and (iii) the restrictiveness of *wh*-RCs—influence the Korean EFL learners' selection of PS or PiP?

2. Literature Review

2.1 General Context for Preposition Placement Preferences

This section introduces the broader context for understanding the preference between PS and PiP structures in preposition placement before discussing the specific factors in the following section. PS and PiP are generally interchangeable in English *wh*-RCs, but in specific cases, the placement of prepositions exhibits selectively between the two (Huddleston and Pullum 2002, Quirk et al. 1985). First, when a prepositional phrase (PP) is a complement of a prepositional verb or verbal idiom, PS is much preferred over PiP. As illustrated in (2), a verbal idiom like *put up with* is preferable in PS structures where the preposition *with* is stranded.

(2) Complement of prepositional verb or verbal idiom
a. This is the sort of English which I will not put up ***with***. [PS]
b. ?This is the sort of English ***with*** which I will not put up. [PiP]
(Huddleston and Pullum 2002, p. 629)

(2b) is a well-known satirical remark by Winston Churchill, criticizing the extensive restrictions on PS structures in prescriptive grammar (Huddleston and Pullum 2002). Although there is a strong preference for PS in verbal idioms in English, PiP is also acceptable to some native speakers in 'three-word phrasal verbs,' which are phrasal verbs that require a preposition (Lee 2009). Lee (2009) discovered that in the British National Corpus (BNC), the three-word phrasal verb *put up with* is used in a PiP structure. Example (3) illustrates this structure, in which the preposition *with* is fronted.

(3) The British people are fighting back against the shoddy treatment ***with which*** we have ***put up*** for so long.
(BNC) [PiP]
(Lee 2009, p. 269)

However, introspective judgments on such structures vary among native speakers (Lee 2009), and PiP is not very common for these types of verbs.

In contrast, PS is disfavored when prepositions are temporal or abstract-related (Quirk et al. 1985). Instead, PiP is preferred, as illustrated in (4). For example, (4a) shows that the temporal preposition *during* cannot easily be stranded.

(4) Prepositions dealing with temporal and other abstract relations
a. ?That was the meeting (that) I kept falling asleep ***during***. [PS]
b. That was the meeting ***during*** which I kept falling asleep. [PiP]
(Quirk et al. 1985, p. 1253)

Similarly, PS is not permissible when PPs are used with specific head nouns, such as *way*, *extent*, *point*, *sense*, etc. (Johansson and Geisler 1998). In these cases, PiP is obligatory. For instance, (5) illustrates the obligatory use of the PiP structure.

(5) Adverbial expressions with specific head nouns (i.e., *way, extent, point, sense, degree, time, moment*)
a. *at the moment which the accident took place ***at*** [PS]
b. at the moment ***at*** which the accident took place [PiP]
(Johansson and Geisler 1998, p. 74)

In (5), the head noun *moment* necessarily requires a PiP structure. This is because the PP *at which* in (5b) can be substituted with the relative adverb *when*.

Furthermore, Quirk et al. (1985) highlighted the level of formality as the primary factor distinguishing whether PS or PiP is permissible in the structure. PS is commonly used in informal situations, as in (6a), whereas PiP is used in formal ones, as in (6b).

(6) a. The old house (which) I was telling you ***about*** is empty. [informal, PS]
b. The old house ***about*** which I was telling you is empty. [formal, PiP]
(Quirk et al. 1985, p. 664)

In brief, this subsection outlined the general circumstances in which PS or PiP structures are strongly preferred over the other. The criteria discussed above clarify the suitability of each structure in particular contexts.

2.2 Factors Affecting Preposition Placement

As discussed by Gries (2002), Hoffmann (2005, 2011), and Quirk et al. (1985), preposition placement is affected by various factors such as type of displaced element, formality, complexity, length of preposition, etc. (Gries 2002, Hoffmann 2005, 2011, Quirk et al. 1985). Of these, (i) the syntactic dependency between verbs and prepositional phrases (PPs), (ii) the semantic dependency between verbs and prepositions, and (iii) the restrictiveness of *wh*-RCs merit special attention in terms of processing perspective on preposition placement (Biber et al. 1999, Hoffmann 2011, Huddleston and Pullum 2002, Ko 2009, Shin et al. 2016).

English prepositions are strongly dependent on verbs with regard to processing and interpretation (Hawkins 1999). As Hawkins (1999) put it, the proportion of PS to PiP should correspond to the degree of dependency between verbs and prepositions because this interdependency is easier to process in PS structures in English. On this account, the syntactic and semantic dependencies between verbs and PPs/prepositions have been regarded as testable variables in numerous prior studies on preposition placement. Similarly, the restrictiveness of *wh*-RCs correlates with the relationship between head nouns and *wh*-RCs. Their interrelation, which is strong in restrictive RCs and weak in nonrestrictive RCs (‘symmetry’ in restrictive RC and ‘asymmetry’ in nonrestrictive; Hawkins 2004), can also contribute to preposition placement. The reduced interdependency of nonrestrictive RCs with the

head noun may induce the use of PS (Hoffmann 2011). These three factors will be discussed in detail below.

First, the syntactic approach to preposition placement concerns the syntactic relation between verbs and PPs: complements and adjuncts. PPs subcategorized by the verb are complements, whereas PPs not subcategorized by the verb are adjuncts. As shown in (7), the *do-so* test has been commonly used for distinguishing complements from adjuncts (Jackendoff 1977, Radford 1988) because the words *do so*, functioning as a pro-V-bar (pro-V'), can replace a V' constituent (Radford 1988).

(7) The *do-so* test
a. John will [$_{V'}$ buy the book on Tuesday], and Paul will ***do so*** as well.
b. John will [$_{V'}$ buy the book] on Tuesday, and Paul will ***do so*** on Thursday.
c. John will [$_{V'}$ put the book on the table], and Paul will ***do so*** as well.
d. *John will [put the book] on the table, and Paul will ***do so*** on the chair.

(Radford 1988, p. 234)

In (7a) and (7b), the words *do so* can substitute [buy the book on Tuesday] and [buy the book], respectively, which are both V' constituents. The PP *on Tuesday* in (7a) and (7b), is an adjunct as it is not subcategorized by the verb *buy*. Therefore, it is a sister of the words *buy the book*, which is also a V' constituent. In contrast, the PP *on the table* in (7c) and (7d), being subcategorized by the verb *put*, is a complement. Unlike adjunct PPs, complement PPs are internal (not external) to the V'. Thus, in (7c), the V' constituent [put the book on the table] can be replaced with *do so*. However, in (7d), the words *do so* cannot replace [put the book], which is not a V' constituent. In fact, in (7d), *put the book* is not a constituent at all: it is just a substring of the V' constituent [put the book on the table].

Huddleston and Pullum (2002), Jach (2018), and Johansson and Geisler (1998) maintained that complement PPs are much preferred in PS constructions, as exemplified in (8a), while adjunct PPs are favored in PiP constructions, as illustrated in (8b).

(8) a. This is the book she was referring ***to***. [PS, complement]
b. That was the party ***at*** which we met Angela. [PiP, adjunct]

(Huddleston and Pullum 2002, p. 626, p. 631)

(8a) shows a PS structure of a complement PP. The PP *to the book* is subcategorized by the verb *refer*, thus functioning as a complement. Contrariwise, (8b) indicates a PiP structure of an adjunct PP. The PP *at which* is an adjunct since it is not subcategorized by the verb *meet*. Johansson and Geisler's (1998) analysis of spoken corpora—the London-Lund Corpus (LLC), the Birmingham Corpus (BIRM), and the BNC—unveiled that most PS structures featured complement PPs (over 85%), while PiP structures primarily comprised adjunct PPs (over 80%). However, the distinction is not necessarily obligatory; rather, it indicates a preference (Johansson and Geisler 1998, Trotta 2000).

A second contributing factor of prepositional placement, namely, the semantic dependency between verbs and prepositions, is grounded in semantic properties. Biber et al. (1999) classified prepositions into two categories based on whether they possess an inherent meaning: bound and free. Bound prepositions have meanings that depend on other elements in the context (e.g., mostly the verb), and they are often specifically selected by the preceding verb. Free prepositions, on the other hand, have their own inherent meanings and are not determined by any other words within the context (Biber et al. 1999). These are illustrated in (9).

(9) a. They've got to be willing to part ***with*** that bit of money. [bound]
b. But the only other thing perhaps, he'll go ***with*** one of the kids, that's a possibility. [free]
(Biber et al. 1999, p. 74)

In (9a), the preposition *with* is a bound preposition, which lacks an independent meaning itself and gains a new meaning combined with the verb *part*. However, in (9b), the preposition *with* is a free preposition, not semantically reliant on the verb *go*.

Biber et al. (1999) contended that PS and PiP constructions are closely correlated with the distinction between bound and free prepositions based on their findings from the Longman Spoken and Written English (LSWE) Corpus. Bound prepositions are typically found in PS structures as they are strongly connected to a preceding verb. In contrast, free prepositions are freely pied-piped. These are exemplified in (10).

(10) a. As soon as Unoka understood what his friend was driving ***at***, he burst out laughing. [bound, PS]
b. the apartments ***in*** which no one lives [free, PiP]
(Biber et al. 1999, p. 105, p. 624)

(10a) illustrates a PS structure having the bound preposition *at*, which gains a new meaning attached to the verb *drive*. By contrast, a PiP structure featuring the free preposition *in* is exemplified in (10b). Here, the preposition *in* has the independent meaning of location unaffected by the verb *live*.

Third, the restrictiveness of *wh*-RCs is another factor influencing preposition placement. RCs can be distinguished into restrictive and non-restrictive RCs. *Wh*-relativizers can appear in both restrictive and nonrestrictive RCs, whereas *that*- and *zero*-relativizers are typically found in restrictive RCs (Huddleston and Pullum 2002, Quirk et al. 1985). The restrictive *wh*-RC is exemplified in (11a), and the nonrestrictive *wh*-RC is presented in (11b).

(11) a. They interviewed every student ***who had lent money to the victim***. [restrictive]
b. They interviewed Jill, ***who had lent money to the victim***. [nonrestrictive]
(Huddleston and Pullum 2002, p. 1058)

In (11a), the antecedent noun phrase (NP) *every student* is defined by the restrictive RC. Without the following restrictive RC, *every student* cannot be fully explained. In (11b), the nonrestrictive RC supplements the proper noun *Jill*, providing additional information about her.

In writing, the use of punctuation marks (e.g., commas, parentheses, dashes, etc.) usually distinguishes between restrictive and nonrestrictive RCs, as shown in (11). Nonrestrictive RCs are often marked by punctuation, while restrictive RCs are not. However, this is not always the case (Huddleston and Pullum 2002, p. 1058). (12) shows a nonrestrictive RC that lacks punctuation marks, identified by Biber et al. (1999) in the written corpus from LSWE.

(12) She went one day to the tiny public library ***which was in a room with stained glass windows at the back of the Town Hall***. [nonrestrictive]
(Biber et al. 1999, p. 637)

Despite the absence of a comma, the RC is still obviously nonrestrictive in (12). *The tiny public library* refers to a specific library, and the RC simply provides additional information.

Hoffmann (2011) tested the restrictiveness of RCs as a variable in preposition placement. By investigating both the spoken and written data from the British component of the International Corpus of English (ICE-GB), he found that the restrictiveness of RCs affected the preposition placement. PS was favored in nonrestrictive RCs, as in (13a), whereas PiP was preferred in restrictive RCs, as in (13b).

(13) a. They've got a throw-in, ***which they'll have to settle for*** on the far side [nonrestrictive, PS]
b. You will need to show your sight test receipt and your AG 3 to the person ***from whom you buy your glasses***. [restrictive, PiP]
(Hoffmann 2011, p. 117)

The three factors discussed in this section constitute a set of independent variables in the third research question, as noted at the end of the introductory section.

2.3 Previous L2 Studies on Preposition Placement

Many of the previous L2 acquisition studies on preposition placement have assessed the validity of the Markedness Hypothesis in exploring the developmental sequence of PS and PiP structures. In fact, the examination of this hypothesis, initially conducted within the context of children's L1 acquisition studies, has since been extended to L2 acquisition studies. There are several approaches to markedness, and two frameworks for markedness are discussed in this section: typological markedness and Universal Grammar's (UG) syntactic markedness. Although these two perspectives on markedness differ, their predictions regarding the acquisition of PS and PiP are similar. Typological markedness concerns the cross-linguistic evidence, distinguishing markedness based on whether the linguistic phenomena are universal (unmarked) or language-specific (marked) (Eckman 1985). PS is primarily used in some Indo-European languages, whereas PiP is used more commonly across languages (Van Riemsdijk 1978). Languages with PS structures also feature PiP structures, whereas the reverse is not observed. Hence, PS is more marked compared to PiP. Similarly, UG's syntactic markedness considers the core and periphery distinction of linguistic phenomena (Chomsky 1981, 1986). Core grammar, which has innate, fixed parameters from L1 acquisition, is regarded as unmarked, whereas the periphery, which has parameters departing from the core, is marked. Similar to the typological approach, the Markedness Hypothesis grounded in UG's syntactic approach posits that PS is marked while PiP is unmarked (Hornstein and Weinberg 1981, Van Riemsdijk 1978). In this regard, PiP is expected to be acquired prior to PS.

L2 acquisition studies have reported contrasting results regarding the acquisition of PS and PiP structures. Mazurkewich (1985) presented the results of L1 French and some L1 Inuit learners of English who acquired PiP before PS, confirming the developmental sequence presumed by the Markedness Hypothesis. Conversely, while the Markedness Hypothesis was supported by Mazurkewich (1985), many L2 studies on ESL/EFL learners did not support the Markedness Hypothesis, revealing the opposite acquisition order with PS preceding PiP (Bardovi-Harlig 1987, Kao 2001, Ko 2009, Park and Lee 2005, Shin et al. 2016). Bardovi-Harlig (1987) and Kao (2001) attributed this to input salience, positing that the prevalence of PS input plays a crucial role in the acquisition sequence.

Most of previous studies have indicated that Korean EFL learners prefer using PS structures in RCs, as confirmed by their high acceptance of PS in judgmental tasks (Shin et al. 2016) and frequent use of PS in production tasks (Ko 2009). In Ko (2009), the preference for PS was particularly notable in lower-level learners. In addition to saliency, Ko (2009) attributed this phenomenon to the learners' limited knowledge of PiP structures,

as they tend to replicate the relativizer given in the stimuli before completing the rest of the RCs. In a similar vein, Shin et al. (2016) discovered that even lower-level learners achieved high accuracy scores in PS structures, while the acceptance rates of PiP structures were low across all levels. However, these studies did not include the analysis of errors made by learners, which would have provided a more comprehensive understanding of the acquisition process in preposition placement.

Error analysis is essential for shaping instructional design based on error patterns and uncovering learners' current stage in language acquisition (Corder 1974). Errors reflect learners' internal language systems, particularly grammar, indicating that learners apply their own structural rules rather than merely imitating (Corder 1974). In this context, several L2 studies have observed a prevalent error among some learners, namely, the omission of necessary prepositions (Bardovi-Harlig 1987, Kao 2001, Klein 1993, Shin et al. 2017). Klein (1993) coined the term 'null-preposition (null-prep)' to describe this phenomenon. While the null-prep phenomenon has been ascribed to various causes, such as subcategorization errors (Bardovi-Harlig 1987), relative meaninglessness (Kao 2001), or L1 transfer (Shin et al. 2017), Klein (1993) asserted that it is a distinctive phenomenon in the interlanguage phase, universally observed among learners with diverse L1 backgrounds. Additionally, the use of redundant prepositions (i.e., doubling) was also frequently found in L2 learners' English. Bardovi-Harlig (1987) and Mazurkerwich (1985) interpreted this as a 'transitional strategy' in the acquisition of PS and PiP. The term 'transitional strategy' represents learners' transition from the unmarked to the marked construction. That is, the doubling of prepositions denotes the traces of this transition. Yet the direction of transition diverged between Mazurkewich (1985) and Bardovi-Harlig (1987), who concluded with having different stances toward the L2 acquisition order of PS and PiP, as mentioned earlier.

Several L2 experimental studies have investigated the factors of preposition placement in Korean EFL learners. Ko (2009) discovered that the semantic dependency between verbs and prepositions (bound versus free) significantly influenced preposition placement in native English speakers but not in Korean EFL learners. Yoon et al. (2015) reported that while the level of formality and syntactic variables (complements versus adjuncts) affected Korean EFL learners' choice of preposition placement, the learners did not achieve the accuracy observed in native speakers, particularly for categorical structures. However, Shin et al. (2017) found significant main and interaction effects between proficiency level and verb type (a combination of argumenthood of PP and interpretability of prepositions in L1 Korean) in Korean EFL learners. Since there is inconsistency in the effects of the syntactic and semantic dependencies in previous studies, further examination is needed.

While there have been few L2 corpus-based studies on preposition placement, the investigations by Jach (2019) and Shahriari et al. (2018) have contributed to this area. Jach (2019) analyzed two learner corpora—the International Corpus of Learner English (ICLE) and the Yonsei English Learner Corpus (YELC)—and two native speaker corpora—the Louvain Corpus of Native English Essays (LOCNESS) and ICE-GB. The findings from Jach (2019) revealed that five variables (i.e., proficiency level, native language, syntactic dependency, length and frequency of prepositions, and specific prepositions and lexical strings) had a significant impact on preposition placement. Although Jach (2019) utilized the Korean EFL learner corpus (YELC), the study incorporated it into a broader group of learner corpora, namely the Asian group, and did not investigate Korean learners' errors in detail. Furthermore, Shahriari et al. (2018) analyzed two corpora, the Persian component of ICLE and LOCNESS, and found that both learner and native corpora exhibited a low frequency of PiP structures. The findings contrast with those of Jach (2019), which reported a high frequency of PiP structures in the same native corpus, LOCNESS. This may be because, unlike Jach (2019), Shahriari et al. (2018) examined only a randomly selected small portion of LOCNESS (30 out of 436 essays).

By deploying experimental methods, most of the studies addressed in this section have yielded contrasting

results to those that would be predicted by the Markedness Hypothesis. Only a few corpus studies have investigated L2 learners' preposition placement. The present study adopts corpus-based analysis to delve into Korean EFL learners' use of preposition placement.

3. Methodology

3.1 Learner Corpus

The learner corpus used in the current study is the Korean component of the TOEFL11 corpus. The entire TOEFL11 corpus consists of a total of 12,100 essays written by test takers of the TOEFL iBT from 2006 to 2007. It was classified into three levels by three native English-speaking raters: low (1.0-2.0), medium (2.5-3.5), and high (4.0-5.0) levels (Blanchard et al. 2013). The corpus was produced by speakers of 11 different L1s: Arabic, Chinese, French, German, Hindi, Italian, Japanese, Korean, Spanish, Telugu, and Turkish. The TOEFL11 corpus is available on the Linguistic Data Consortium website (https://catalog.ldc.upenn.edu/LDC2014T06) and is accessible to researchers.

The Korean component of the TOEFL11 corpus, extracted by the author, is composed of 1,100 argumentative essays with a total of 332,429 word tokens: 31,710 word tokens (169 essays) for the low level, 204,813 word tokens (678 essays) for the medium level, and 95,906 word tokens (253 essays) for the high level. In this study, the medium and high levels will be referred to as lower-intermediate (LI) and upper-intermediate (UI) levels, respectively. Considering the errors exhibited by the latter group, the label UI more adequately reflects its genuine level of English proficiency. The subset of common errors found in the high-level subcorpus includes: (a) omission of articles (e.g., *Second, Ø* ***guide*** *knows a lot about the region …*), (b) incorrect verb usage (e.g., *… young people* ***do*** *not be equipped with temperance …; It is merely the age that* ***effect*** *one's events in his …*), (c) incorrect negation order (e.g., *… which they* ***would have not*** *made If …),* (d) unidiomatic usage (e.g., *There are several reasons* ***of*** *my opinion.*), and (e) repetition of spelling errors (e.g., *… the foundation of* ***sucess****; I* ***hasitated*** *a lot but … this course* ***sucessfully***.). According to the Educational Testing Service guidelines for advanced-level writing, high-level learners are expected to exhibit minimal use of ungrammatical, unidiomatic, and unclear English (Educational Testing Service 2021). However, the errors were too frequent to be mere coincidences. Therefore, the labels LI and UI are used instead. In addition, this study only used LI- and UI-level subcorpora because the low-level subcorpus had only two instances of *wh*-RCs with PPs for analysis: one with PiP and one with null-prep. Such structures require advanced proficiency due to their complexity, which was clearly demonstrated by their scarcity in the low-level subcorpus.

3.2 Native Speaker Corpus

The native speaker corpus used in this study is the Louvain Corpus of Native English Essays (LOCNESS). This corpus was compiled and disseminated by the Center for English Corpus Linguistics (CECL), an institution at UC Louvain (Granger 1998), and is available online (https://www.learnercorpusassociation.org/resources/tools/locness-corpus/). LOCNESS comprises English essays written by native speakers of two English varieties: American English and British English. The corpus is divided into four components according to their characteristics: (a) British essays from British university students, (b) British A-level essays by British pupils, (c) argumentative essays by American university students, and (d) literary-mixed essays by American university

students (Granger 1998). All of the above components were examined in the present study.

Table 1 provides information on the two corpora used in the current study. The TOEFL11 corpus has a greater number of essays than LOCNESS, but the word tokens per essay are less than half of those in LOCNESS. While the TOEFL11 corpus contains all timed essays, LOCNESS is a mixture of both timed and untimed essays, with timed ones taking up 66% of the corpus.

Table 1. Information on Corpora Used in This Study

Corpus	Word tokens	Essays	Word tokens per essay	Time limit
TOEFL11	300,719	931	323	Timed
LOCNESS	324,304	436	743	Timed (287) + untimed (149)

3.3 Data Analysis

The current study used the concordance program AntConc version 4.1.2 for analysis (Anthony 2022). To analyze preposition placement in *wh*-RCs, three *wh*-relativizers, *who*, *which*, and *whom*, were searched in the key-word-in-context (KWIC) search box. Among search results, cases in which the *wh*-relative pronouns are subjects or objects of the predicate in the RCs were excluded. Only those used as the objects of prepositions were selected for analysis.

All data were utilized for the overall distribution analysis; however, only subsets meeting certain conditions were considered for syntactic and semantic factor analyses. Specifically, PPs embedded within VPs were chosen because they correlate with the syntactic and semantic factors and are suitable for measuring the relationship between predicates and PPs/prepositions. For instance, the PS or PiP structures involved with PPs within adjective phrases (APs) (e.g., *… it is better to specialize in one specific subject which you are* ***good at*** *…*) or NPs (e.g., *… therapeutically active substances* ***for*** *which there is no well-defined fatal* ***dose***.) were not the subjects of the syntactic and semantic factor analyses, which examine if PPs/prepositions are closely related to verbs.

Furthermore, specific cases were excluded from the overall analysis: (a) unnecessary prepositions with transitive verbs (e.g., *… experience* ***to*** *which group guided tour may not* ***have*** *such as talking with native residents …),* (b) incorrect verb usage (e.g., *… which I* ***do*** *not interested in*), and (c) obligatory use of PiP structures (e.g., *…* ***the way in which*** *they are portrayed in the course of the plot*.). With regard to (c), expressions such as *the way which* are ungrammatical. These categorical uses of PiP were found only in LOCNESS. Table 2 displays the number and examples of (a) and (b) errors excluded from the analysis. These errors were identified in the LI-level subcorpus of the TOEFL11 corpus. All (a) errors were found in improperly used PiP structures, while (b) errors involved PS and PiP structures.

Table 2. Number and Examples of Excluded Errors

Error	*n*	Example	Structure	Level
(a) Unnecessary prepositions with transitive verbs	6	… "the other side of the world," ***of*** which they have not been able to ***see*** yet. … unique experience ***to*** which group guided tour may not ***have*** such as talking with … … but the energy ***in*** which I ***need*** to focus on my study … … a program ***in*** which the tourist have already ***known*** and ***studied*** from the media … … experiencing unique cultures and foods ***to*** which most group tours ***miss*** as they tend to focus on what mass tourists like and hear in shallow. Thus, it can help grow our thoughts to more delegate and mature ***to*** which often group guided tour cannot ***teach*** as we may spend much of our times with other people …	PiP	LI
(b) Incorrect verb usage	2	… not need to waste time to look and work around which I ***do*** not interested in … … the place for which I'***ve*** ever ***heard been***.	PS PiP	LI
Total	8			

Table 3 shows the number of cases involving (c) obligatory use of PiP structures, all of which are excluded from the analysis in this study. This exclusion is due to the present study's focus on cases where both PS and PiP structures are possible, rather than one being obligatory.

Table 3. Number of Excluded Obligatory Uses of PiP Structures

Collocation	LOCNESS	TOEFL11
… way(s) in which	21	–
… extent to which	2	–
… time in which	1	–
… point at which	1	–
Total	25	–

As shown, all obligatory PiP cases were found in LOCNESS, constituting a total of 25. These include collocations such as *way(s) in which*, *extent to which*, *time in which*, and *point at which*, where the alternative structure, PS, is not permissible. The TOEFL11 did not exhibit these instances.

The selected data were coded based on four categories: (a) the structures (PS, PiP, null-prep, and doubling), (b) the syntactic dependency between verbs and PPs (complements versus adjuncts), (c) the semantic dependency between verbs and prepositions (free versus bound), and (d) the restrictiveness of *wh*-RCs (restrictive versus nonrestrictive). The syntactic dependency was analyzed following Radford's (1988) distinction between complements and adjuncts. The semantic dependency was determined following Biber et al.'s (1999) definition of bound and free prepositions. Lastly, the restrictiveness of *wh*-RCs was determined by their association with antecedents, as discussed in Huddleston and Pullum (2002): if a *wh*-RC provides necessary information to identify the antecedent, it was labeled as restrictive; otherwise, it was considered nonrestrictive. Additionally, the author consulted two native English speakers, who majored in linguistics, to review the validity of the classifications and identify nonrestrictive *wh*-RCs lacking punctuation.

For statistical analysis, R software version 4.3.1 (R Core Team 2023) was used. The independent variables are

native language (Korean versus English), level of proficiency (LI versus UI), the syntactic dependency between verbs and PPs (complements versus adjuncts), the semantic dependency between verbs and prepositions (free versus bound), and the restrictiveness (restrictive versus nonrestrictive). The dependent variable is preposition placement (e.g., PS, PiP). As the independent and dependent variables are categorical variables measured on a nominal scale, Pearson's chi-square test and Fisher's exact test was used to examine the statistical association between the two variables. Pearson's chi-square tests were initially conducted, but due to the low frequency of the data, the current study did not meet the test's requirement of 80% of the expected frequencies being five or higher (Gries 2013, p. 179). Thus, Fisher's exact test was employed as an alternative. Following this, the phi coefficient (φ) and Cramer's *V* were calculated to measure the effect size, which indicates the degree of the correlation between the independent and dependent variables. Additionally, the chi-square test of goodness of fit was used to assess the four structures (PS, PiP, null-prep, and doubling) within a subcorpus (LI-level or UI-level). Given the small sample sizes and low expected frequencies, Monte Carlo simulation was used to obtain more accurate *p*-values. Cohen's ω was calculated to measure the effect size for the goodness of fit test. A one-sample proportion test was used to compare the proportions of binomial variables within each group. Subsequently, Cohen's *h* was calculated to assess the effect sizes for these proportion tests. The odds ratios were also calculated using Fisher's exact test, which provides odds ratios based on the conditional maximum likelihood estimate (Desagulier 2017). Fisher's exact test is particularly suitable for small sample sizes and may yield different estimates compared to those obtained using the unconditional maximum likelihood estimate (Hay-Jahans 2019).

4. Results

4.1 Divergence in the Uses of PS and PiP Between TOEFL11 and LOCNESS

In this subsection, the findings concerning research question 1, which examined the uses of PS and PiP in TOEFL11 in comparison to LOCNESS, are provided. Table 4 presents the distribution of preposition placement observed from both corpora, TOEFL11 and LOCNESS. Fisher's exact test results indicate a significant difference between the distribution of PS and PiP in the two corpora ($p < .001$, $\varphi = 0.57$). The two corpora conditions yielded a large effect size. Korean EFL learners in TOEFL11 used PS structures more frequently than PiP structures (60% versus 40%), while native English speakers used PiP structures more than PS structures (95% versus 5%).

Table 4. The Distribution of PS and PiP Across Two Corpora

Corpus	PS		PiP		Total		
	RF	%	RF	%	RF	%	*p*-value
TOEFL11	15	60	10	40	25	100	
LOCNESS	8	5	145	95	153	100	< .001*
Total	23	13	155	87	178	100	

Note. Percentages are rounded to the nearest whole number. The raw frequency (RF) was used for comparison since the sizes of TOEFL11 and LOCNESS corpora used in this study are similar, with 300,719 word and 324,304 tokens, respectively. RF = raw frequency. *$p < .05$.

The one-sample proportion test further revealed a statistically significant difference between the percentages of PS and PiP in both Korean EFL learners' writing ($p = .033$, $h = 0.40$) and native English speakers' writing ($p < .001$, $h = 2.24$). Cohen's *h* shows a medium effect size for Korean EFL learners and a large effect size for native

English speakers. This indicates that, within the two corpora, PS and PiP exhibit a clear difference in distribution.

Preposition placement in the TOEFL11 corpus reveals an interesting pattern. PPs embedded in APs were all used in PS structures, totaling five cases. Among these instances are expressions such as *be good at* and *be interested in*, which are common and easy for learners to use. The fact that they are familiar and frequently used as fixed phrases may have led learners to strand the prepositions rather than pied-pipe them. The examples of PS structures are presented in (14) and (15).

(14) However, in my opinion, it is better to specialize in one specific subject which you are good ***at***. [PS] (TOEFL11: UI-level subcorpus)

(15) I think it is more important to focus o [*sic*] one specific subject which you are interested ***in*** and make it to your major skill. [PS] (TOEFL11: LI-level subcorpus)

In contrast, the data from LOCNESS show different results. Two cases of PPs embedded in APs were used in PiP and PS structures, respectively. Example (16) shows the use of the preposition *to* with the adjective *near* in a PiP structure, and (17) indicates the use of the preposition *to* with the adjective *indifferent* in a PS structure.

(16) There are also times when foods tend to take on the smells of other foods ***to*** which they are near. [PiP] (LOCNESS)

(17) It is true to say that a computer is able to perform many hundreds of useful tasks which our brains are completely indifferent ***to***. [PS] (LOCNESS)

Moreover, in the TOEFL11 corpus, there was one instance where the trace of the object of the preposition is manifested in the RC, even when the relativizer is moved to the front. This is illustrated in (18).

(18) He was a normal student in the university like other students but suddenly changed his way to find new one$_i$ ***which***$_i$ other people didn't care about ***it***$_i$. [PS] (TOEFL11: LI-level subcorpus)

In (18), the NP *new one*, the relativizer *which*, and the pronoun *it* all refer to the same entity—a new opportunity—identified within the broader context of the corpus. What can be inferred here is that the learner may have forgotten she was using a relative clause, thus filling the gap with the object of the preposition in situ. This phenomenon indicates that even if learners use PS structures, they may have some difficulty in processing longer sentences that involve RCs with PPs. Such a case was not found in LOCNESS.

4.2 Distribution of PS, PiP, Null-Prep, and Doubling in TOEFL11 by Proficiency Levels

This subsection presents the findings from a comparative analysis between the LI- and UI-level subcorpora within the TOEFL11 corpus, addressing the second research question. Figure 1 and Table 5 illustrate the distribution of four constructions (PS, PiP, null-prep, and doubling). Figure 1 displays this distribution in percentages.

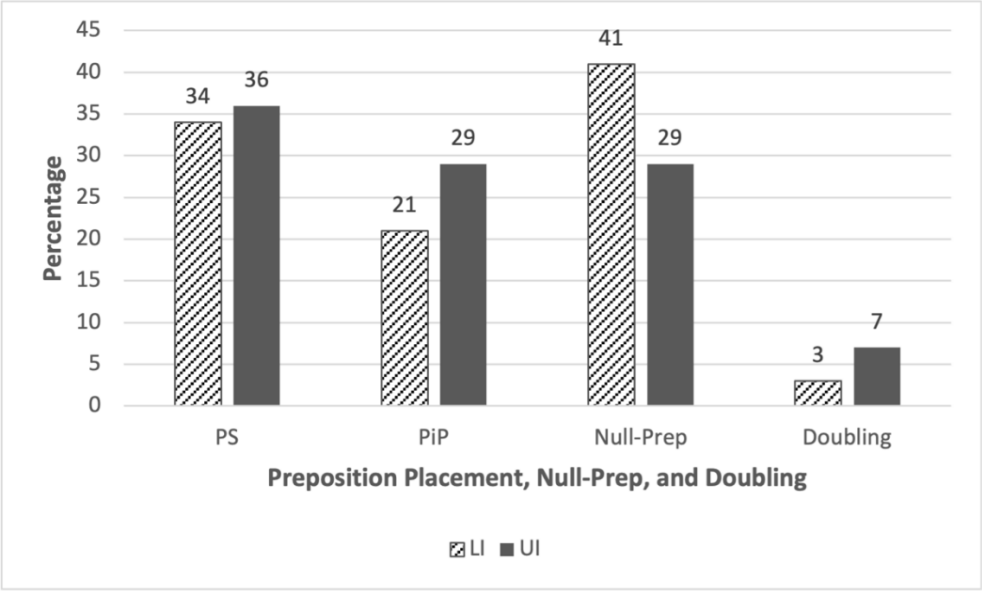

Figure 1. Percentage Distribution of PS, PiP, Null-Prep, and Doubling Across Learners' Proficiency Levels

As shown in Table 5, the results from Fisher's exact test revealed no significant association between the level of proficiency and the four structures (p = .789, Cramer's V = 0.15). In the LI-level subcorpus, the distribution exhibited the order of frequency as follows: Null-prep (41%) > PS (34%) > PiP (21%) > Doubling (3%). The chi-square test of goodness of fit results showed a significant distinction among these structures, $\chi^2(3) = 9.76$, p = .019, ω = 0.58, with a large effect size. In this subcorpus, null-prep had the highest proportion, and PS was more frequently used than PiP. In the UI-level subcorpus, the distribution differed from that in the LI-level subcorpus as follows: PS (36%) > PiP (29%) = Null-prep (29%) > Doubling (7%). However, the chi-square test of goodness of fit results revealed no significant difference among these structures, $\chi^2(3) = 2.57$, p = .584, ω = 0.43, indicating a moderate effect size. Both LI and UI-level learners exhibited a considerable proportion of null-prep and the lowest proportion of doubling.

Table 5. The Distribution of PS, PiP, Null-prep, and Doubling by Learners' Proficiency Levels

Level	PS		PiP		Null-prep		Doubling		Total		
	RF	%	RF	%	RF	%	RF	%	RF	%	*p*-value
LI	10	34	6	21	12	41	1	3	29	100	
UI	5	36	4	29	4	29	1	7	14	100	.789
Total	15	35	10	23	16	37	2	5	43	100	

Note. Percentages are rounded to the nearest whole number. RF = raw frequency.

The null-prep structures found in TOEFL11 are presented in Table 6. Three cases with the intransitive verb *go* lacked the preposition *to*, where a PP is needed instead of a direct object. Examples with the verbs *listen*, *belong*, *specialize*, *transfer*, and *satisfy* did not include the necessary prepositions *to*, *in*, or *with*. Moreover, the examples lacking the preposition *in* were mostly those that required adjunct PPs.

Table 6. The List of Dropped Prepositions in TOEFL11

Prep.	*n*	Example	Level
to	8	… the places which you didn't expected to go.	UI
		… the famous sites and places which visitors want to go …	UI
		… the place which people travel such as popular parks …	LI
		… limited roads available which the car can go.	LI
		… taking care of the sociey [*sic*] which they belongs [*sic*].	LI
		… the company which tour guides are belonged has …	LI
		… music which you want to listen.	LI
		… region of new house which they will transfer for more convenient life.	LI
in	6	… multiple numbers of field which one can do well.	UI
		… the previous period which all the citizens needed to participate on developing communities.	UI
		… the real situation which they only understood ithe [*sic*] concepts.	LI
		… episodes which above characters have spent the time with their communities …	LI
		… some problems which they are not specialized …	LI
		… the world which there are three women and three guys.	LI
with	1	… do something which they can be satisfied in the short-term …	LI
from	1	… many options which they select jobs.	LI
Total	16		

The doubling structures found in TOEFL11 are exemplified in (19) and (20). In (19), the verb *come* only requires the preposition *from*; *in* is unnecessary. Similarly, in (20), the preposition *with* is only necessary; *in* is unnecessary.

(19) … different backgrounds ***in*** which the person came ***from***. (TOEFL11: LI-level subcorpus)
(20) The textbooks ***in*** which the students study ***with*** are listed with facts. (TOEFL11: UI-level subcorpus)

4.3 Three Factors Affecting the Structures of PS and PiP

This subsection provides the findings in relation to three factors on preposition placement: (i) the syntactic dependency between verbs and PPs (complements and adjuncts), (ii) the semantic dependency between verbs and prepositions (bound and free), and (iii) the restrictiveness of *wh*-RCs (restrictive and nonrestrictive).

Table 7 displays the PS and PiP distributions of the syntactic dependency in TOEFL11 and LOCNESS. Fisher's exact test results indicate that there is a statistically significant relationship between the syntactic dependency and preposition placement in LOCNESS ($p = .002$, $\varphi = 0.30$), with a medium effect size. In contrast, TOEFL11 showed no statistically significant association between the syntactic dependency and preposition placement ($p = .057$, $\varphi = 0.52$), although the effect size for this nonsignificant association was large. This indicates that the native English speakers are sensitive to the syntactic dependency between verbs and PPs when placing prepositions, whereas it may be premature to conclude that Korean EFL learners exhibit similar sensitivity. The results in LOCNESS revealed that the proportion of PS structures in complement PPs was higher than that in adjunct PPs (15% versus 1%), and the proportion of PiP structures in adjunct PPs was higher than in complement PPs (99% versus 85%). Similarly, in TOEFL11, the proportion of PS in complement PPs was higher than in adjunct PPs (69% versus 14%), and the proportion of PiP was higher in adjunct PPs than in complement PPs (86% versus 31%). These patterns were also reflected in the odds ratios: the odds of stranding prepositions in complement PPs were 19.29 times greater compared to adjunct PPs in LOCNESS (OR = 19.29, 95% CI [2.05, 940.30]), and 11.64 times greater in TOEFL11 (OR = 11.64, 95% CI [0.95, 684.42]).

Table 7. The Distribution of PS and PiP According to Syntactic Dependency in Two Corpora

Corpus		PS		PiP		Total		
		RF	%	RF	%	RF	%	*p*-value
TOEFL11	complements	9	69	4	31	13	100	.057
	adjuncts	1	14	6	86	7	100	
	Total	10	50	10	50	20	100	
LOCNESS	complements	5	15	28	85	33	100	.002*
	adjuncts	1	1	111	99	112	100	
	Total	6	4	139	96	145	100	

Note. Percentages are rounded to the nearest whole number. RF = raw frequency. *$p < .05$.

The following examples illustrate how the syntactic dependency between verbs and PPs influences the choice between PS and PiP in both corpora.

(21) This raised several questions on the spheres ***in which*** the President could operate. (LOCNESS)
(22) Sometimes we can see the article from newspaper, ***in which*** the successful company or person is introduced. (TOEFL11)
(23) with the hope that he will marry her despite all the trouble ***which*** he has gone ***through***, (LOCNESS)
(24) then you will be beaten by financial situation, co-worker, even freinds [*sic*] ***whom*** you rely ***on*** (TOEFL11)

(21) and (22) illustrate PiP constructions of *wh*-RCs with PPs as adjuncts to the verb, while (23) and (24) show PS structures with PPs as complements to the verb. These examples align with the predicted patterns indicating that PiP is more prevalent in adjunct PPs compared to complement PPs, whereas PS is more common in complement PPs compared to adjunct PPs.

There are also instances, such as examples (25) to (28), where the observed patterns diverge from the predictions in the literature.

(25) … it makes people get tired to study more about the subjest [*sic*] ***in which*** they specialize. (TOEFL11)
(26) However there is a tragic side to the sport, ***upon which*** the anti-boxing lobbyers base their opinions. (LOCNESS)
(27) … people don't need people ***whom*** we enjoy time ***with*** becasue [*sic*] people can enjoy enough their time using this equipment. (TOEFL11)
(28) He said no because he wanted to keep the tradition of playing in the Cleveland Municipal Stadium ***which*** the Browns have played ***in*** for over 54 years. (LOCNESS)

(25) and (26) are PiP structures used with complement PPs. Although the PPs *in which* and *upon which* are complements to the verbs *specialize* and *base*, they are pied-piped. On the other hand, (27) and (28) illustrate PS structures used with adjunct PPs. The PPs *with whom* and *in which* are adjuncts, but the prepositions are stranded in these cases.

Moreover, Table 8 displays the distribution of preposition placement with regard to the second factor (i.e., the semantic dependency between verbs and prepositions) in two corpora. Fisher's exact tests revealed a significant association between the semantic dependency and preposition placement in both the TOEFL11 corpus ($p = .023$, $\varphi = 0.60$) and LOCNESS ($p = .005$, $\varphi = 0.30$), with a large effect size observed in TOEFL11 and a medium effect size in LOCNESS. In TOEFL11, the proportion of PS structures with bound prepositions was significantly higher

than that with free prepositions (80% versus 20%). Similarly, in LOCNESS, the proportion of PS structures with bound prepositions was notably higher than that with free prepositions (18% versus 2%). These results were further supported by the odds ratios, which indicated that the odds of stranding prepositions with bound prepositions were 13.25 times greater than those with free prepositions in TOEFL11 (OR = 13.25, 95% CI [1.31, 239.40]), and 13.03 times greater in LOCNESS (OR = 13.03, 95% CI [1.73, 153.69]).

Table 8. The Distribution of PS and PiP According to Semantic Dependency in Two Corpora

Corpus		PS		PiP		Total		
		RF	%	RF	%	RF	%	*p*-value
TOEFL11	bound	8	80	2	20	10	100	.023*
	free	2	20	8	80	10	100	
	Total	10	50	10	50	20	100	
LOCNESS	bound	4	18	18	82	22	100	.005*
	free	2	2	121	98	123	100	
	Total	6	4	139	96	145	100	

Note. Percentages are rounded to the nearest whole number. RF = raw frequency. *$p < .05$.

The following examples illustrate how the semantic dependency between verbs and prepositions affects preposition placement in both corpora. Examples (29) to (32) follow the expected patterns in which PS structures are more likely to be used with bound prepositions than with free prepositions, while PiP structures are more likely to be used with free prepositions than with bound prepositions.

(29) a job ***which*** he was not trained ***in*** (LOCNESS)
(30) Cars will soon be a necessary object, ***which*** the population of the world will rely heavily ***on***. (TOEFL11)
(31) Visitation can be an arena ***in which*** the ex-spouses continue the conflicts they experienced before the divorce. (LOCNESS)
(32) For mass media, advertisements are the main sourse [sic] ***in which*** they make a profit. (TOEFL11)

(29) and (30) show PS structures where the bound prepositions, *in* and *on*, are found. The meaning of these prepositions greatly depends on the preceding verbs. (31) and (32) illustrate PiP structures where the free preposition *in* is used. In (31), the preposition *in* holds a meaning associated with location, and in (32), the same preposition possesses a meaning related to the space where the profit is made.

Examples (33) to (35) illustrate different patterns compared to those predicted in the literature.

(33) … see the place ***which*** people don't need to go ***to***. (TOEFL11)
(34) … but there is a possibility that 'super' viruses or bacteria could be produced ***which*** our bodies could not defend ***against*** and could wipe out entire populations. (LOCNESS)
(35) The flies, ***after which*** the play is named, are continual reminders of the crime and plague the people … (LOCNESS)

In (33) and (34), the free prepositions *to* and *against* are used in PS structures. In (33), the preposition *to* retains its directional meaning towards a location, independent of it use with the verb *go*. In (34), the preposition *against* denotes opposition to something, regardless of its use with the verb *defend*. These free prepositions are typically

expected to be used in PiP structures, but these examples show their use in PS structures. Contrariwise, (35) shows that the bound preposition *after* is pied-piped to the fronted relativizer *which*.

The final factor tested in this study was the restrictiveness of *wh*-RCs. Table 9 presents the distribution of PS and PiP structures in restrictive and nonrestrictive *wh*-RCs in each corpus. Fisher's exact test results indicated no significant relationship between the restrictiveness of *wh*-RCs and preposition placement in either of the two corpora (p = .659 for TOEFL11, p = .631 for LOCNESS). The effect sizes for these statistically nonsignificant interactions were small in TOEFL11 (φ = 0.15) and negligible in LOCNESS (φ = 0.05). Consequently, neither the Korean EFL learners nor the native English speakers exhibited sensitivity towards the restrictiveness of *wh*-RCs when choosing either PS or PiP structures. In both corpora, the proportion of PS structures was higher in nonrestrictive than in restrictive *wh*-RCs (71% versus 56% in TOEFL11, 7% versus 5% in LOCNESS), while the proportion of PiP structures was higher in restrictive than in nonrestrictive *wh*-RCs (44% versus 29% in TOEFL11, 95% versus 93% in LOCNESS). The odds ratios reflected these trends: the odds of stranding prepositions in restrictive *wh*-RCs were approximately half of those in nonrestrictive *wh*-RCs in TOEFL11 (OR = 0.51, 95% CI [0.04, 4.28]), indicating a 49% reduction in the likelihood of stranding. In LOCNESS, the odds of stranding prepositions in restrictive *wh*-RCs were 0.63 times those in nonrestrictive *wh*-RCs (OR = 0.63, 95% CI [0.10, 6.71]), representing a 37% decrease. However, given the statistically nonsignificant results, the odds ratios did not provide strong evidence of a meaningful difference.

Table 9. The Distribution of PS and PiP Based on Restrictiveness of *Wh*-RCs in Two Corpora

Corpus		PS		PiP		Total		
		RF	%	RF	%	RF	%	*p*-value
TOEFL11	restrictive	10	56	8	44	18	100	.659
	nonrestrictive	5	71	2	29	7	100	
	Total	15	60	10	40	25	100	
LOCNESS	restrictive	6	5	120	95	126	100	.631
	nonrestrictive	2	7	25	93	27	100	
	Total	8	5	145	95	153	100	

Note. Percentages are rounded to the nearest whole number. RF = raw frequency.

Examples (36) to (41) illustrate how restrictive and nonrestrictive *wh*-RCs influence preposition placement in the two corpora. Examples (36) to (39) are consistent with the pattern observed in the prior literature. (36) and (37) show the use of restrictive *wh*-RCs in PiP structures. The RCs provide necessary information about their antecedents, *a doll* in (36), and *the areas and amounts* in (37).

(36) … I really wished I could have had such a doll ***with which*** I could dance and play. (TOEFL11)

(37) The lottery was also criticised for misrepresentation of the areas and amounts ***into which*** the lottery money would be broken down. (LOCNESS)

In (37), the three-word phrasal verb *break down into* is used in a PiP structure, similar to example (3) presented earlier.

(38) and (39) illustrate nonrestrictive *wh*-RCs in PS structures. In both examples, the RCs modifying the proper nouns *Roman catholic* and *AIDS* are punctuated with a semicolon or comma. In (38), however, the preposition *against* fits more appropriately than *to*.

(38) For example, the famous scientist Galileo could prove the truth, 'the earth is spining [*sic*] around the

sun', indirectly by the idea based on Roman catholic; ***which*** he argued ***to***. (TOEFL11)

(39) … it is one of the many vaccines we received as a child and for us the new dreaded ailment is AIDS, ***which*** we have no cure ***for*** - (LOCNESS)

In contrast, example (40) diverges from the prior literature by illustrating a nonrestrictive *wh*-RC in a PiP structure. In (40), despite the omitted comma, the RC remains nonrestrictive as it is clear that helicopters or airplanes allow people to save time.

(40) I agree that there will be fewer cars in use that there are increasing demand for private helicopters or airplanes ***by which*** people can save the time of waiting for the traffic congestions. (TOEFL11)

Example (41) illustrates a PS structure of a restrictive *wh*-RC in the TOEFL11 corpus, which differs from the previous literature.

(41) Because the travel company ***which*** the guide is associated ***in*** always suggests … (TOEFL11)

It is worth noting that in (41), the preposition *with* should be used instead of *in* to enhance clarity and appropriateness.

To close section 4.3, in the TOEFL11 corpus, only the semantic factor significantly influenced preposition placement (p = .023, φ = 0.60), contrasting with LOCNESS, where both semantic and syntactic factors played a role.

5. Discussion

This section provides responses to the research questions based on the obtained results. The current paper examined three main questions: (i) which of PS or PiP structures prevails in Korean EFL learners' writing, (ii) whether there are variations in the distribution of PS, PiP, null-prep, and doubling depending on the proficiency levels of Korean EFL learners, and (iii) whether the three factors (i.e., syntactic dependency, semantic dependency, and the restrictiveness of *wh*-RCs) influence preposition placement in Korean EFL learners' writing.

In addressing the first research question, Korean EFL learners used PS structures more frequently than PiP (60% versus 40%), while native English speakers primarily used PiP structures in their writing (95%). This aligns with previous L2 research results that contradict the predictions from the Markedness Hypothesis (Bardovi-Harlig 1987, Kao 2001, Kim 1996, Ko 2009, Park and Lee 2005, Shin et al. 2016). Although PS is regarded as a marked structure in the Markedness Hypothesis, Korean EFL learners in the TOEFL11 corpus commonly exhibited this structure in their L2 writing. This raises the question of whether marked structures are indeed difficult to learn, and, more broadly, whether the Markedness Hypothesis is applicable to the acquisition of preposition placement. Consequently, there is a need to explore alternative explanations for the acquisition order of PS before PiP.

The learners' preference for PS structures can be attributed to two possible reasons: the salience of PS in L2 input and a lack of awareness of register differences. As noted by Bardovi-Harlig (1987) and Kao (2001), the salience of PS input matters in L2 learners' acquisition of preposition placement. This holds true for Korean EFL learners, who are predominantly exposed to PS contexts in their learning environments. Shin et al. (2016) confirmed this through textbook analysis, revealing that middle and high school EFL textbooks in Korea generally

lack PiP structures. Shin et al. (2016) further showed that PiP structures began to appear only after the ninth grade, but even then, their occurrence remained significantly low. Therefore, the prevalence of PS structures in school materials directly influences the learners' tendency to favor PS over PiP, which highlights the role of input in shaping learners' grammar. The input provided in textbooks and learning materials are likely to affect how learners develop target language structures (Ellis 1994, Kao 2001, Shin et al. 2016).

In addition, the preference for PS in the findings can be explained by Korean EFL learners' lack of register awareness, which involves applying appropriate formality levels in different situations. The two corpora, TOEFL11 and LOCNESS, used in this study consist of writing in academic contexts, which is considered formal. In line with prior studies reporting that the high formality elicits PiP structures (Biber et al. 1999, Hoffmann 2005, 2011, Quirk et al. 1985), the results of this study confirm that native English speakers are inclined to reflect register differences when placing prepositions in writing. In prescriptive grammar, it has traditionally been regarded as a general principle that sentences should not end with prepositions (Huddleston and Pullum 2002). This rule, which disfavors PS, may persist in educational and formal writing contexts, accounting for the more prevalent use of PiP in LOCNESS. However, Korean EFL learners in this study do not exhibit this pattern, which aligns with the findings from Yoon et al. (2015), where such a difference is attributed to the absence of register instruction in Korean EFL learning environments. The findings of this study also indicate a lack of register awareness among the Korean EFL learners. Such awareness can be reinforced through extensive exposure to diverse contexts of PS and PiP structures. Nonetheless, Korean EFL textbooks and learning materials have not adequately addressed these register differences (Yoon et al. 2015). This scarcity is evident in studies by Kwon and Rhee (2019) and Im (2023), which highlighted the limited range of genres in English textbooks used in Korea. This may have led learners not to consider register differences, as they are unfamiliar with such variations.

In response to the second question, the distribution of PS, PiP, null-prep, and doubling varied between the two proficiency levels of Korean EFL learners. In the LI-level subcorpus, there was a distinct difference in the use of PS and PiP, with PS being more frequent than PiP. Additionally, the null-prep phenomenon stood out as the most common structure among the four. This suggests that Korean EFL learners at the LI level exhibit a clear preference for PS over PiP, and their errors regarding the omission of prepositions should not be neglected. Furthermore, these patterns indicate that learners' performance diverges significantly from that of native speakers. Conversely, in the UI-level subcorpus, there was a more even distribution of the four structures, with statistically nonsignificant differences, showing that the learners did not exhibit a strong preference for PS over PiP. This suggests that learners at advanced proficiency levels are more likely to exhibit a native-like pattern, using PiP more frequently. This result lends support to the findings of L2 acquisition studies where low-level students showed a higher frequency of PS in RCs, while high-level learners demonstrated an increased use of PiP (Bardovi-Harlig 1987, Kao 2001, Ko 2009, Jach 2019).

The phenomenon of null-prep merits further discussion. The high occurrences of null-prep observed in the LI-level subcorpus align with previous L2 research, which indicated that the occurrence of null-prep is more common among lower-level learners (Kim 1996, Klein 1993, Shin et al. 2017). Moreover, the finding that null-prep constitutes 29% of the distribution in the UI-level subcorpus demonstrates that this phenomenon persists in the writing of advanced-level learners. This contrasts with L1 studies where null-prep tends to become negligible with the acquisition of PS and PiP (Hildebrand 1987, McDaniel et al. 1998). As Klein (1993) claimed, the results of this study corroborate the idea that null-prep is a universal phenomenon observed in various L2 learners in their interlanguage grammar.

Another plausible explanation for null-prep, particularly in Korean EFL learners, could be attributed to L1 transfer. In Korean oblique RCs, postpositions or the oblique-case markers are omitted (Min and Lee 2023), as

exemplified in (42).[1]

(42) Korean oblique RC

[$_{RC}$ John-i [$_{VP}$ ___$_i$/-*ey cangnankam-ul neh-nun]] sangca$_i$
John-NOM toy-ACC put-ADN box
'the box which/that John puts the toy in'

(Min and Lee 2023, p. 358)

In (42), the postposition *-ey* ('in') with the coreferential noun *sangca* is omitted in the grammatical Korean oblique RC. However, in English, the oblique RC requires the preposition *in* in either PS or PiP structure to form a grammatically correct clause.

Additionally, the null-prep involving the preposition *to* (most common among learners, as shown in Table 6) may suggest evidence of negative L1 transfer. The majority of cases involved the verb *go* (three out of eight), followed by the verb *belong* (two out of eight), with one case each for the verbs *travel*, *listen*, and *transfer*. Of these, in terms of their Korean counterparts, the Korean verb *tutta* ('listen') is transitive, and the verbs *kata* ('go') and *yehaynghata* ('travel') can also be used with nouns that have the accusative case marker *-(l)ul* in certain contexts. The accusative case markers are omitted in Korean direct object RCs since Korean RCs drop case particles with a coreferential noun (Jeon and Kim 2007). This is illustrated in (43).

(43) Korean direct object RC

[$_{RC}$ Nay-ka [$_{VP}$ ___$_i$/-*ul tul-un]] umak$_i$
I-NOM listen-ADN music
'the music which/that I listened to'

In (43), the accusative case marker *-ul* is deleted with the coreferential noun *umak* in a Korean direct object RC. Examples (42) and (43) clearly show that Korean RCs drop case markers and postpositions, whereas English RCs in the same context require prepositions either in situ or fronted. Due to this difference, the null-prep phenomenon in Korean EFL learners may suggest a negative transfer of L1. As Brown (2000) pointed out, L2 prepositions that are absent in the same L1 contexts can induce such 'interlingual errors' with the lack of L2 grammatical knowledge. Although this is typically observed in novice learners, the present study revealed that null-prep exists even in UI-level learners.

The findings of the current study also demonstrated learners' lack of knowledge in verb subcategorization. The verbs in null-prep cases are basic-level verbs that learners frequently encounter while learning English. Although the verbs are simple, learners still exhibit high rates of null-prep errors when using them in RCs. This was also evident in learners' misuse of prepositions, as seen in examples (38) and (41). Thus, learners may not have fully systematized or learned verb subcategorization in English. Therefore, to address these errors, learners need more thorough grammar lessons regarding prepositions, such as verb subcategorization that involves PPs.

As for the third question, among the three factors, Korean EFL learners from the TOEFL11 corpus only

[1] The underscore in (42) and (43) denotes a gap where the head noun of RC would normally appear in declarative sentences. The abbreviations used in (42) and (43) are as follows:

(i) ACC: accusative, (ii) ADN: adnominal, and (iii) NOM: nominative

displayed sensitivity to the semantic dependency between verbs and prepositions when placing preposition in their writing. In contrast, the native English speakers from LOCNESS were sensitive to both the syntactic dependency between verbs and PPs and the semantic dependency in their preposition placement. This indicates that Korean EFL learners may not have fully considered the varied syntactic dependency between verbs and PPs when choosing between PS and PiP, consistent with the results reported by Yoon et al. (2015). Although the effect size of the syntactic factor was large in TOEFL11, the results were not statistically significant (p = .057, φ = 0.52). This suggests that the observed difference may be coincidental due to the small sample size, thus limiting the generalizability. In addition, the effect size of the semantic factor was large in the learner corpus (φ = 0.60), indicating that Korean EFL learners relied more on the distinction between free and bound prepositions in preposition placement compared to native speakers. This finding is intriguing because it indicates that Korean EFL learners are familiar with the semantic relations of prepositions, whereas their L2 proficiency in syntax, particularly in verb subcategorization, may not have reached a highly competent level. The substantial use of null-prep by learners and their relevant errors further support this conclusion. Neither of the two corpora exhibited sensitivity to the restrictiveness of *wh*-RCs in preposition placement, unlike Hoffmann (2011). A possible reason for this is that ICE-GB (which was used in Hoffmann 2011) has more diverse genres of writing than LOCNESS, which consists of essays written in academic settings. The restrictiveness as a variable on preposition placement should be further examined in future research by incorporating *zero*- and *that*-relative clauses for a more comprehensive analysis.

From a pedagogical perspective, the findings of this study raise implications for preposition placement instruction with Korean EFL learners. First, incorporating various types of texts with PS and PiP structures into Korean EFL curricular materials would effectively address the scarcity of PiP use in Korean EFL learners' writing. This can naturally enhance learners' familiarity with PS and PiP structures in diverse contexts, offering an expanded variety of input. An additional implication is that providing explicit lessons on register differences in EFL classrooms may encourage Korean EFL learners to consider the level of formality when placing prepositions. To address null-prep errors and a lack of sensitivity to the syntactic dependency, integrating instruction that assists students in learning verb subcategorization is recommended within the Korean EFL curriculum.

Admittedly, there are several limitations of this study. One major limitation is the small sample size, which poses a challenge for the study to generalize its findings. As this study focused on *wh*-RCs with PPs, a highly specific structure, the instances of PS and PiP in the learner corpus were notably limited. This may be due to the complexity involved in constructing such structures. Given the small sample size, each instance in the data may significantly impact both the statistical significance and the width of the confidence intervals. Thus, using a larger corpus in subsequent studies is recommended for more robust generalization. Additionally, the skewed raw frequencies toward PiP in LOCNESS may influence the reliability of the observed effects of the factors discussed. Another limitation is the differences between the TOEFL11 corpus and LOCNESS in essay topics, genres, and time constraints, which may have influenced the outcomes, including the total number of PS and PiP structures. Finally, the present study relied on corpus data alone as its sole evidence base. In any future studies, a combination of experimental methods (e.g., grammaticality judgment test, sentence completion test, etc.) and corpus analysis would lead to a more comprehensive study on the acquisition of preposition placement (Greenbaum 1984, Gilquin and Gries 2009).

6. Conclusion

The current study investigated PS and PiP constructions in *wh*-RCs in Korean EFL learners' writing, employing the Korean component of the TOEFL11 corpus with comparison to the native speaker corpus, LOCNESS. The findings of this study showed that PS was more commonly used than PiP in Korean EFL learners' writing, whereas PiP was predominant in native English speakers' writing. The prevalence of PS among Korean EFL learners contradicts the prediction of the Markedness Hypothesis, which posits that PiP is acquired before PS. Instead, the study attributed this tendency to the input salience of PS in the Korean EFL learning materials and a lack of register awareness among the learners. Additionally, the results revealed that within the LI-level subcorpus, PS was significantly more prevalent than PiP, while null-prep was frequently observed in both LI- and UI-level subcorpora. The nonsignificant difference between PS and PiP in the UI-level subcorpus shows that advanced learners progress towards native speaker proficiency. However, the finding that null-prep still exists in UI-level learners indicates that null-prep is indeed universal among learners (Klein 1993) and potentially influenced by negative L1 transfer from Korean. Lastly, among the three examined factors, statistically significant sensitivity among Korean EFL learners was observed only towards the semantic dependency between verbs and prepositions.

Despite some limitations, such as the small sample size, the current study lends support to the claim that the Markedness Hypothesis fails to explain the developmental sequence of PS and PiP in L2 learners. By utilizing corpus-based analysis, this study examined PS and PiP structures in the writing of Korean EFL learners, demonstrating their developmental stage of English preposition placement. It underscored the prevalence of PS use and the ongoing presence of null-prep among learners at all proficiency levels, alongside their insensitivity to the syntactic dependency discussed. In order to address these patterns among Korean EFL learners, it is necessary to incorporate register differences and verb subcategorization into the Korean EFL curriculum. Furthermore, it is hoped that this study might stimulate further L2 corpus research on preposition placement, a relatively understudied yet important area, as well as provide insights into effective pedagogical strategies in L2 learning settings.

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Examples in: English
Applicable Languages: English
Applicable Level: Tertiary

