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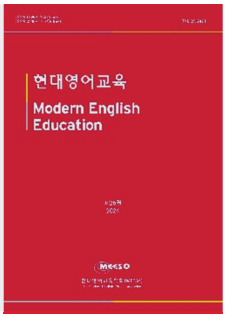


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# Exploring the Efficacy of ChatGPT in Improving L2 Writers' Use of English Conjunctive Adjuncts

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ChatGPT, conjunction, corpus analysis, EFL learner, L2 writing
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**Abstract**

This study explored the impact of ChatGPT on L2 academic writing by focusing on the use of conjunctive adjuncts (or "conjunctions," e.g., *and*, *but*, *since*, *however*, *as a result*, *on the other hand*) among L1-Korean college students. A mixed-methods approach was adopted to compare a treatment group interacting with ChatGPT ($n = 36$) with a control group interacting with peers ($n = 40$) during instructional activities designed to teach these structures' usage. Quantitative results indicated no significant difference in the frequency or types of conjunctions used between the two groups, suggesting that ChatGPT's influence on conjunction usage patterns was minimal. However, a manual analysis revealed that the treatment group demonstrated more formal and structured uses of conjunctions, aligning with academic writing norms, while the control group more frequently deviated from these norms, by, for instance, starting sentences with coordinating conjunctions and using incorrect structures such as sentence fragments. While this study had a small sample size and a narrow focus on only one aspect of grammar, its results suggested a need to more comprehensively assess AI's potential to complement traditional language learning methods.

## INTRODUCTION

The use of computer-assisted tools in language education, which includes online collaborative platforms and automated feedback systems, has significantly transformed the dynamics of the writing process (e.g., Chew et al., 2019; Kessler & Bikowski, 2010; Ma, 2019; Molenaar et al., 2012). These tools facilitate instant interactions and adapt to the diverse needs of students, thereby enhancing both accessibility and the effectiveness of education.

Expanding upon this technological foundation, there is growing interest in the potential of generative AI, such as ChatGPT,

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which leverages advanced natural language processing to support language learning. Recent explorations have begun to reveal ChatGPT's capabilities as a pedagogical resource in interactive learning tasks for second language (L2) learners (e.g., Bolender et al., 2023; Chu & Min, 2021; Crompton & Burke, 2023; Hong et al., 2021; Jin & Fan, 2023; Kim & Han, 2021; Maeng et al., 2023; Park & Maloney, 2023; Voss et al., 2023; Woo & Kim, 2023). ChatGPT's ability to assist in language learning, provide feedback, and evaluate student work is promising and is expected to be increasingly utilized by educators and learners seeking innovative teaching methods. However, despite this interest, there remains a significant gap in empirical research concerning its effectiveness in intact classroom settings.

This study addresses this gap by examining the effects of L2-English college students' engagement with ChatGPT, specifically focusing on their use of conjunctive adjuncts in writing. L2 learners often depend on a limited set of conjunctive adjuncts and struggle to use them correctly in context (e.g., Shin et al., 2019; Yoon & Yoo, 2011), which limits their writing's complexity and affects its overall clarity and coherence. This research explores whether integrating ChatGPT into the learning process has the potential to improve L2 writers' use of English conjunctive adjuncts, as an indicator of how such technological integration might affect the quality and effectiveness of these students' academic writing. The outcomes of the study provide valuable insights into the practical applications of AI in language education, offering guidance on how educators can leverage such technologies to improve students' writing skills and overall language competence.

## LITERATURE REVIEW

### Conjunctive Adjuncts Used by English Learners

Conjunctive adjuncts, or more simply "conjunctions," are essential for cohesive writing, helping to maintain logical flow and connect ideas (Gardezi & Nesi, 2009). Also known as logical connectors (Quirk et al., 1985), conjunctive adverbials (Celce-Murcia & Larsen-Freeman, 1999), linking adverbials (Biber et al., 1999), sentence connectors (Swales & Feak, 2004), and linking adjuncts (Carter & McCarthy, 2006), they can be classified into six semantic categories: enumeration and addition, summation, apposition, result/inference, contrast/concession, and transition (Biber et al., 1999). By signaling various logical relationships between clauses in context, conjunctions help readers understand the connections between different parts of a text (Cater & McCarthy, 2006; Celce-Murcia & Larsen-Freeman, 1999). Given their crucial role in effective writing, conjunctive adjuncts have received much attention from researchers studying ESL/EFL writing (e.g., Altenberg & Tapper, 1998; Appel & Szeib, 2018; Bolton et al., 2003; Koh, 2021; Oktavianti & Sarage, 2022; Park, 2013; Shin et al., 2019; Wong, 2002; Yang & Sun, 2012).

Most previous studies on this topic examine whether learners tend to overuse, underuse, or misuse conjunctive adjuncts in L2 writing. Appel and Szeib (2018), for example, analyzed 150 argumentative essays to identify differences in the use of English conjunctive adjuncts among writers from three different first language backgrounds (Arabic, Chinese, French). They found that the L1-Arabic writers overused additive adjuncts (e.g., *in addition, also*), the L1-Chinese writers overused contrastive adjuncts (e.g., *however*), and the L1-French writers overused appositional adjuncts (e.g., *in fact, indeed*). Another study, by Liu (2013), investigated the use of conjunctive adjuncts in both academic spoken and written production by L1-Chinese EFL learners, drawing on data from the Chinese Learners' English Corpus and the College Learners' Spoken English Corpus. The results indicated that these learners tended to overuse conjunctive adjuncts in speaking but underuse them in writing.

A study by Eun (2016) analyzed the use of resultative (e.g., *consequently, hence, so, therefore*) and concessive (e.g., *however, in contrast, on the other hand*) conjunctive adjuncts in ten English abstracts of doctoral dissertations in sociology – five written by L1-Korean EFL writers and five by L1-English writers. The results showed that the L2 writers tended to use the conjunctive adjuncts more frequently than their L1-English counterparts. In addition, the L1-Korean writers showed a preference for the resultative adjunct *therefore* and the concessive adjunct *however*, while the L1-English writers showed no particular preferences. Furthermore, the L1-Korean writers were likely to place resultative adjuncts at the beginning of clauses (sentence-initial position) and concessive adjuncts between the subject and verb or at the end of clauses (non-sentence-initial positions).

In a more recent study, Koh (2021) analyzed one-page academic essays written by L1-Korean EFL learners, and published research articles by L2-English expert writers, and L1-English expert writers to identify differences in the use of conjunctive adjuncts among these groups. The results indicated that as the EFL learners' proficiency developed, they used a greater range of conjunctive adjuncts. Over the course of the study, the EFL students increased their use of conjunctive adjuncts by more than twice in general, with their use of sequential conjunctive adjuncts increasing by three times. Meanwhile, there

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was not much difference between the L2- and L1-English expert writers in their use of conjunctive adjuncts. However, the L1 group favored the sentence-initial position, and used four conjunctive adjuncts (*however, therefore, thus, for example*) at high rates in both initial and medial positions, while the L2 group relied heavily on only two conjunctive adjuncts (*also, therefore*) in these two positions.

Understanding the usage of conjunctive adjuncts is crucial in language education, given their pivotal role in crafting clear and coherent writing (e.g., Appel & Szeib, 2018; Crossley et al., 2016; Milton, 1999; Verspoor & de Bot, 2022; Yoon & Yoo, 2011). As highlighted by previous research, effective use of conjunctions is closely linked to the quality of L2 writing, facilitating seamless transitions that enhance both the readability and structural integrity of texts (e.g., Crossley et al., 2016). In academic settings, the ability to construct well-organized arguments using appropriate conjunctions is essential for success. Focusing on the role of conjunctions underscores their importance and addresses the need to improve their usage among L2 learners, whose academic success often hinges on mastering these critical linguistic tools.

## Types and Functions of Conjunctive Adjuncts: A Replication Study

This study employs Yoon and Yoo's (2011) definition of English conjunctive adjuncts, which identifies three primary types: coordinating conjunctions, subordinating conjunctions, and conjunctive adverbials (Table 1). Coordinating conjunctions are used to link independent clauses, as shown in example (1). Subordinating conjunctions serve to connect an independent clause to a dependent clause, as in (2). Conjunctive adverbs also link independent clauses but do not create a grammatical connection between them; they are typically punctuated with a semicolon or period in written text, as in (3). These examples are from writing samples produced by L1-English-speaking university students (Shin et al., 2019, p. 58). Note that in (3), a punctuation error by the student has been corrected. Conjunctions are highlighted in bold in all examples.

(1) I'm fully aware that forced or coerced desegregation most likely relates to this **but** providing benefits to those who wish to participate may have miraculous benefits.

(2) Altogether, the reasons why I would like to knock Decatur down a few notches as far as its image goes is **because** I believe that's only way its faults might ever be addressed.

(3) Growing up in Atlanta, I could only go to certain parts of the town at a certain time; **therefore**, I feel that the places should be in safe parts of town so that parents will allow their kids to go out more […].

Shin et al. (2019) observed that novice academic writers, including native English speakers, often struggle to distinguish between the different types of conjunctions, leading to their misuse, such as the fragment errors displayed in (4) and the punctuation mistakes in (5) (pp. 59-60).

(4) Gaining knowledge from experience can be intimidating because it can be a horrible mistake or a best obsession. **For example**, a romantic movie.

(5) The outlook has caught attention of many and painted a positive perspective of Atlanta**, however,** the failing education system has been overlooked by those who feed into the city.

**TABLE 1**

*Categories of English Conjunctive Adjuncts (Yoon & Yoo, 2011, p. 227)*

| Categories | Examples |
|---|---|
| Coordinating conjunctions | *for, and, nor, but, or, yet, so* |
| Subordinating conjunctions | *after, although, as, because, before, if, lest, once, since, though, until, unless, when(ever), whereas, where(ever), while, as soon as, even though* |
| Conjunctive adverbials | *additionally, after all, also, as a result, however, in contrast, similarly, consequently, first… second … finally, for example/instance, furthermore, in addition, indeed, in fact, in other words, in sum, likewise, moreover, nevertheless, therefore, on the contrary, on the other hand, otherwise* |

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Despite previous research addressing the difficulties that apprentice academic writers face with conjunctive adjuncts (e.g., Shin et al., 2019), few instructional studies have explored teaching these structures to English learners. Moreover, even fewer studies have examined the potential of AI platforms like ChatGPT as pedagogical tools in classroom settings. Building on the work of Shin et al. (2019), this study serves as a replication. It adopts the same analytical methods to ensure methodological consistency and further validate the original findings. Specifically, this study explores whether ChatGPT can assist L1-Korean university students in utilizing target structures by analyzing their English essays, produced during an instructional treatment, through a corpus-based approach. This dual focus not only enhances the coherence of our research objectives but also strengthens our methodological framework.

### The Present Study

This study integrates two lines of research, combining instructed second language acquisition (SLA) and corpus-based data analysis in order to explore whether ChatGPT could serve as a pedagogical tool for English learners. The study employs a consciousness-raising activity (e.g., Shin & Kim, 2017) to direct participants' awareness toward the conjunctions in their essays. Two intact English writing classes at the university level participated, with one class randomly assigned to be a control group ($n$ = 40) and the other a treatment group ($n$ = 36). The only difference between the two groups in the study was the mode of interaction: the treatment group engaged with ChatGPT, whereas the control group engaged in peer interactions. Despite this difference, the instructional content provided to both groups was identical, allowing for any observed differences in outcomes to be attributed solely to the style of interaction.

This study follows the corpus-based study of Shin et al. (2019) in two ways. First, it compares the frequency of conjunctive adjuncts in the control and treatment groups' written production. Then, it scrutinizes the usage of these conjunctions in context by each group.

## METHOD

### Participants

A total of 76 Korean university students participated in the study. They were enrolled in two classes of an English academic writing course during the spring semester of 2023. This research was conducted as part of their regular coursework, which met twice a week for three hours each session. The two classes were randomly assigned to be either the control group ($n$ = 40) or the treatment group ($n$ = 36). At the start of the semester, a pre-test was administered to evaluate both groups' baseline skills in writing an argumentative essay. For this test, students were instructed to write an essay on a specified topic for 50-minutes, without access to any external resources, including the internet and dictionaries. The results showed no significant differences between the two groups ($t$ = 1.665, $p$ = 0.428), indicating that the two groups were at comparable levels before the instructional treatment began. In addition, to control for instructor effects, both courses were taught by the same instructor.

### Instructional Materials

The instructional method employed for this study consists of an initial presentation phase, followed by a practice phase that uses a consciousness-raising technique (Shin & Kim, 2017). The purpose of this approach is to increase students' awareness of the target structures, in this case conjunctive adjuncts, through explicit instruction. The content of the lessons remained the same across both groups – the only exception being the participants' interactions during the in-class writing activities. The control group interacted with their peers to complete the activities, while the treatment group engaged with ChatGPT.

Over the course of the semester, during three dedicated sessions, the instructor focused on teaching the target grammar structure. Both the control and treatment groups received instruction on English conjunctive adjuncts, including an overview of their definitions; their roles in enhancing discourse functions such as clarity, organization, smooth transitions, and cohesion; and a review of specific types of conjunctions ($n$ = 26) like *however*, *as a result*, *therefore*, *for instance/example*, *in contrast*, and *furthermore*. These were demonstrated within the context of the argumentative essay genre. Moreover, the sessions included detailed explanations of example paragraphs that incorporated these conjunctions. Starting from week three, the course also incorporated lessons on sentence fragments using textbook exercises to further enhance students' understanding. After each session, the instructor reviewed the answers in class to promote clarity and comprehension.

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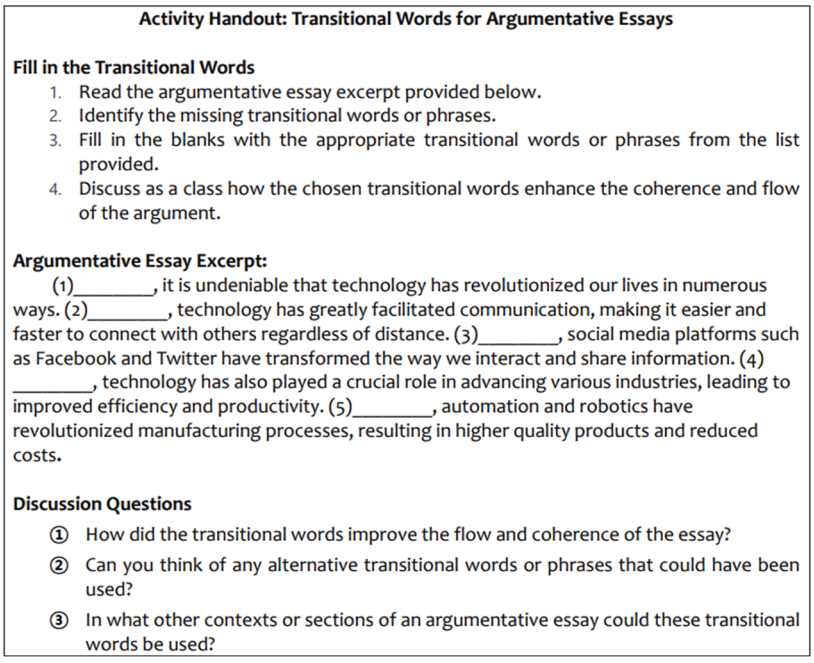
Following this presentation phase, the participants engaged in practice activities using specially designed in-class handouts. For the control group, this activity was conducted with peers, while the treatment group used ChatGPT. One type of handout, shown in Figure 1, involved a fill-in-the-blank task where participants inserted appropriate conjunctions into an argumentative essay excerpt. This was followed by discussions with peers or ChatGPT about their answers and three discussion questions.

Another set of handouts led the participants through an analysis of the use of conjunctive adjuncts in their own argumentative essays. Again, during this activity, the control group collaborated with peers, and the treatment group with ChatGPT. Both groups were asked to answer three questions. The first question involved listing all the conjunctions in their essays; indicating the number used; and discussing their usage, as well as the usage of alternative conjunctions, with their peers or ChatGPT. The second question required them to rewrite the essay by adding a variety of conjunctions. After they had revised the first draft, the third question asked them to list the conjunctions that were familiar to them and those that were new to them. The control group worked with the conjunctions they had originally used or modified, while the treatment group used those suggested by ChatGPT. This exercise was repeated three times, each time after in-class writing, with the goal of reinforcing the students' ability to effectively use transitional words. This iterative approach was designed to gradually improve students' awareness and mastery of effective transitions in preparation for their in-class writing, which were a focal point when scoring students' essays.

Throughout the study, integrating ChatGPT as a learning tool was essential for the treatment group. The instructor began the treatment with a session teaching students how to effectively interact with ChatGPT. Instead of providing specific questions to ask ChatGPT, students were encouraged to create their own inquiries, fostering a deeper engagement with the AI tool. This approach was designed to help students develop a set of 'good' questions through trial and error. If students received unexpected responses from ChatGPT, they were prompted to share these with the class. The instructor then provided feedback on how to refine their questions to elicit more useful answers. Conversely, students who received expected responses were encouraged to share their effective questions with their peers.



**Activity Handout: Transitional Words for Argumentative Essays**

**Fill in the Transitional Words**

1. Read the argumentative essay excerpt provided below.
2. Identify the missing transitional words or phrases.
3. Fill in the blanks with the appropriate transitional words or phrases from the list provided.
4. Discuss as a class how the chosen transitional words enhance the coherence and flow of the argument.

**Argumentative Essay Excerpt:**

(1)_____, it is undeniable that technology has revolutionized our lives in numerous ways. (2)_____, technology has greatly facilitated communication, making it easier and faster to connect with others regardless of distance. (3)_____, social media platforms such as Facebook and Twitter have transformed the way we interact and share information. (4) _____, technology has also played a crucial role in advancing various industries, leading to improved efficiency and productivity. (5)_____, automation and robotics have revolutionized manufacturing processes, resulting in higher quality products and reduced costs.

**Discussion Questions**

① How did the transitional words improve the flow and coherence of the essay?

② Can you think of any alternative transitional words or phrases that could have been used?

③ In what other contexts or sections of an argumentative essay could these transitional words be used?

**FIGURE 1**
*In-class handout*

## Procedure

We assessed the instructional effects over three class periods within the participants' regular course schedule. Each class period lasted 90 minutes, with the first 40 minutes dedicated to instruction and activities, followed by 50 minutes of in-class writing. During this time, both the control and treatment groups received specific instruction on the use of English conjunctive adjuncts from the same instructor. This instruction was supplemented with practical exercises via the tailored

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handouts designed to enhance understanding and usage of the target structures. Data collection spanned three weeks, with each participant composing an argumentative essay weekly, and with both groups responding to identical prompts. An example of such a prompt is: *Do you agree or disagree with the following statement? It is better to be a member of a group than to be the leader of a group.*

### Corpus-based Analysis

We implemented the corpus-based analysis methodology outlined by Shin et al. (2019). Initially, we quantified the frequency of conjunctions in the three sets of essays from both student groups using AntConc software (Anthony, 2024). Each conjunction was categorized as either a coordinating conjunction ("coordinator"), a subordinating conjunction ("subordinator"), or a conjunctive adverb ("adverbial"). This analysis specifically targeted the usage of coordinating conjunctions like *and* and *but* at the clause level, excluding their use at the phrasal level (i.e., to link nominal phrases).

Subsequently, we identified and scrutinized the ten most frequently used conjunctive adjuncts to detect prevalent errors. In the next phase of the analysis, which involved a manual approach, we thoroughly examined the occurrence of two specific error types across both groups: the placement of coordinating conjunctions at the beginning of sentences, and the presence of sentence fragments and run-on sentences.

## FINDINGS AND DISCUSSION

### Most Frequently Used Conjunctions

This section discusses the frequency of conjunctive adjuncts in the three sets of in-class essays written in response to the same prompts by the control and treatment groups.

As shown in Table 2, the patterns of the two groups' use of conjunctions were very similar. Both groups predominantly used coordinating conjunctions, accounting for slightly less than 60% of all conjunctive adjuncts they produced, followed by subordinating conjunctions at over 20%, with conjunctive adverbials being used the least. The quantitative analysis indicates that these proportions remained essentially unchanged over the study period. This consistency suggests that the instructional intervention did not significantly alter the student writers' existing conjunction usage habits. It also implies that writing habits may be less susceptible to change through direct instructional methods involving new technologies than expected.

**TABLE 2**
*Distribution of Tokens of English Conjunctive Adjuncts*

| | Control Group | Treatment Group |
|---|---|---|
| **Coordinators** | | |
| Types | 7 | 6 |
| Tokens (%) | 1,713 (57.2%) | 1,967 (59.8%) |
| **Subordinators** | | |
| Types | 16 | 16 |
| Tokens (%) | 723 (24.1%) | 768 (23.4%) |
| **Adverbials** | | |
| Types | 22 | 20 |
| Tokens (%) | 558 (18.6%) | 551 (16.8%) |
| Total | 45 types | 42 types |
| | 2,994 tokens | 3,286 tokens |

Table 3 presents the ten most frequently used conjunctive adjuncts by each group. Notably, they are the same between the two groups, albeit in different orders by frequency. These top ten account for around 80% of all conjunctions used by each

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group, indicating that, overall, the participants relied heavily on similar sets of conjunctions in their argumentative essays.

**TABLE 3**
*Top 10 Most Commonly Used English Conjunctions*

| | Control Group | | Treatment Group | |
|---|---|---|---|---|
| 1 | *and* | 750 (30.5%) | *and* | 1,013 (30.8%) |
| 2 | *but* | 340 (13.8%) | *but* | 322 (9.8%) |
| 3 | *so* | 292 (11.9%) | *so* | 258 (7.8%) |
| 4 | *if* | 201 (8.2%) | *if* | 184 (5.6%) |
| 5 | *for* | 181 (7.3%) | *because* | 172 (5.2%) |
| 6 | *because* | 172 (7%) | *for* | 151 (4.6%) |
| 7 | *or* | 147 (6%) | *when(ever)* | 146 (4.4%) |
| 8 | *when(ever)* | 125 (5.1%) | *or* | 139 (4.2%) |
| 9 | *as* | 122 (5%) | *as* | 138 (4.2%) |
| 10 | *also* | 122 (5%) | *also* | 105 (3.2%) |
| Total | 2,462 (82.2%) | | 2,628 (80%) | |

The top four conjunctions used by both groups are identical: the coordinator *and* is the most commonly used, followed by the coordinators *but* and *so*, and the subordinator *if*. An interesting observation is that both groups used *and* to the same extent, comprising over one third of their total usage of conjunctions.

Beyond the top four, the control group employed all of the other conjunctions more frequently than did the treatment group, with significant group differences in the use of *so* and *if*. The following examples illustrate the uses of each type of conjunction by both groups in responses to the same prompts. Examples (6–7) show the use of the coordinating conjunction *so* in the second essay (i.e., book knowledge vs. experience). These examples both begin with the conjunction followed by a comma and *I think that* – a construction frequently found in participants' essays across both groups and all writing prompts.

(6) **So**, I think that reading books is useful when it can be applied to practical experience**.** (Control, Essay 2)

(7) **So**, I think that gaining our knowledge from experience is more flexible than the knowledge gained from books. (Treatment, Essay 2)

Examples (8-9) illustrate the use of the subordinating conjunction *if* in two responses to the third essay prompt (i.e., being a member vs. a leader of a group). It was common to see *if*-conditional sentences describing the two roles, that is, group leader or group member, often with the four-word phrase *if you are a*, in statements supporting the writer's argument. This pattern appears consistently across both groups.

(8) **If** you are a leader, your work is more than members. (Control, Essay 3)

(9) Consequently, **if** you are a group of member, you can more creative person. (Treatment, Essay 3)

These findings align with those reported for L1-English student writers in the study by Shin et al. (2019). In their argumentative essays, the L1-English university students used coordinators most frequently (58.6%), followed by subordinators (33.3%), and then adverbials (8.1%). These proportions closely resemble those shown by the current study's L2 participants, writing in the same genre of argumentative essays. This appears to contradict the suggestion in other L2 writing literature that L2-English learners tend to rely on a more limited number of conjunctions than L1-English writers (e.g., Yoon & Yoo, 2011).

## Errors with Conjunctive Adjuncts

This section discusses the findings from the manual analysis of conjunctive adjuncts in context. Drawing on the qualitative

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analysis approach employed by Shin et al. (2019), the current study investigated the sentence position of two specific coordinating conjunctions, *and* and *but*, as produced by the control and the treatment groups.

Table 4 displays the percentages across the three essays for the two conjunctions when they function as the main coordinator, categorized by sentence position. It indicates variation in the usage patterns of these conjunctions between the two groups, suggesting differences in stylistic or syntactic preferences, possibly indicating the influence of the instructional interventions.

**TABLE 4**
*Sentence Position of And* and *But*

| | Control Group | | Treatment Group | |
|---|---|---|---|---|
| | *And* | *But* | *And* | *But* |
| | Tokens (%) | Tokens (%) | Tokens (%) | Tokens (%) |
| Sentence initial | 111 (14.8%) | 197 (57.9%) | 70 (6.9%) | 150 (46.6%) |
| Between clauses | 639 (85.2%) | 143 (42.1%) | 943 (93.1%) | 172 (53.4%) |
| Total | 750 (100%) | 340 (100%) | 1,013 (100%) | 322 (100%) |

The control group utilized the coordinator *and* more than twice as frequently as the treatment group. Examples (10) and (11) illustrate how participants in both groups commonly employed *and* in structuring their arguments, particularly when substantiating their points – in this case, on the topic of book knowledge versus experience.

(10) **And** learning according to read a book is cheap and fast. […] **And** you can empathize counter argument. […] **And** book made by master of something, so information in book based on many experiences and hard works. **And** books have convenience. (Control, Essay 2).

(11) **And** that means we can save our time. For example, I want to know about U.S.A. Experience about U.S.A takes so much time. **And** I couldn't know the history and details from experience […]. **And** also it has pictures in it. (Treatment, Essay 2)

The corpus-based study by Shin et al. (2019) also analyzed the use of these two conjunctions, and found that the L1-Korean university student participants employed *and* in the initial position in approximately 46% of the word's occurrences in their L2-English argumentative essays. This finding contrasts markedly with that of the present study, where the overall rates of sentence-initial *and* are much lower: approximately 15% for the control group and 7% for the treatment group (Table 4). The difference between the two studies suggests that explicit instruction in conjunctions can significantly influence L2 writing, guiding learners to rely less heavily on one type of conjunction construction. This effect was seen in both groups, although to different extents depending on the instructional treatment.

Scrutiny of the use of *and* across the three essays reveals that the control group placed it sentence-initially in 14.3% of all of their *and* uses in Essay 1, 19.1% in Essay 2, and 11.3% in Essay 3. Meanwhile, in the treatment group, 7.7% of all *and* uses were initial in Essay 1, as were 7.3% in Essay 2, and 6% in Essay 3. The treatment group consistently used *and* in the initial position about half as often as the control group did.

Regarding the conjunction *but*, both groups employed it in the initial position significantly more often than *and*. The control group used *but* at the beginning of sentences approximately 58% of the time, compared to the treatment group's 46%. This trend highlights the control group's consistent preference for starting sentences with coordinating conjunctions. Furthermore, both groups employed *but* far more frequently than *and* in interclausal positions, highlighting a pattern of preference for this conjunction in linking clauses. Examples (12) and (13) illustrate a common pattern in the essays, where *but* coupled with *I don't* precedes a counterargument.

(12) Someone who read this might tell me "Members lack responsibility as they are free as.", **but** I don't agree with this because members must be proud of their specialized tasks although the role of a member is often limited on fulfilling specific roles and tasks within the group's objectives. (Control, Essay 3)

(13) There are some people who claim that being a leader has weakness because it comes with increased responsibility and pressure, **but** I don't consider it as weakness. (Treatment, Essay 3)

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Yoon and Yoo's (2011) study comparing the conjunction use of English learners and native speakers observed that the learners frequently produced short sentences before sentence-initial coordinating conjunctions, while the native speakers rarely did so. According to the authors, in academic settings, native English speakers tend to use such conjunctions after longer sentences, if at all. This pattern may stem from instructional advice to L2 learners to avoid overly lengthy sentences; a common guideline in writing manuals recommends keeping sentences to around 15 words or less.

Table 5 displays the significant variation in the length of independent clauses that precede and follow the two coordinators, *and* and *but*, as used by the two groups.

**TABLE 5**
*Average Length of Independent Clauses (IC) After And and But*

| | Control Group | | Treatment Group | |
|---|---|---|---|---|
| | *And* | *But* | *And* | *But* |
| IC before coordinator | 10.3 | 7.7 | 16.3 | 8.8 |
| IC after coordinator | 8.2 | 8.2 | 12 | 8.7 |

The table shows that the control group generally used fewer words both before and after the coordinators compared to the treatment group. This usage pattern is consistent with that of native English speakers in academic contexts, according to Yoon and Yoo (2011). On the other hand, the difference between the groups was minimal in the case of *but*: both the control and treatment groups produced around eight words both before and after this conjunction, indicating no significant variation due to instructional approach.

The examples below demonstrate the usage of *and* in interclausal position by both the control group (14) and the treatment group (15), with the latter producing more words preceding and following *and* than the former.

(14) So, it can give more concentration period in project, **and** they learn more creativity perspectives to idea. (Control, Essay 3)
(15) Additionally, leaders have ability to understand the feeling of their team members **and** they try to indulge themselves with other members more openly. (Treatment, Essay 3)

Table 6 presents the results of the analysis of the two error types, sentence fragments and run-on sentences, in the essay samples from both the control and treatment groups. As the table shows, two conjunctions appeared with each error type: *because* and *for example* in fragments, and *however* and *also* in run-on sentences.

**TABLE 6**
*Sentence Fragments and Run-On Sentences*

| | Control Group | | Treatment Group | |
|---|---|---|---|---|
| | Fragments Tokens (%) | Run-on Sentences Tokens (%) | Fragments Tokens (%) | Run-on Sentences Tokens (%) |
| *because* | 74 (172), 43% | N/A | 30 (172), 17.4% | N/A |
| *for example* | 7 (67), 10.4% | N/A | 4 (41), 9.7% | N/A |
| *however* | N/A | 2 (73), 2.7% | N/A | 5 (79), 6.3% |
| *also* | N/A | 0 (97), 0% | N/A | 1 (105), 0.9% |
| Total | | | | |

Almost all of the sentence fragments used *because*, with the treatment group producing a notably lower percentage (17.4%) than the control group (43%). To better understand this difference between the groups, further analysis was conducted on the *because*-fragment errors across the three sets of essays. The findings indicate that the proportion of sentence fragments that included *because* decreased over time in the treatment group only: in Essay 1, 24.6% (15 out of 61 tokens); in Essay 2, 17% (8 out of 47 tokens); in Essay 3, 10.9% (7 out of 64 tokens). This downward trend suggests a progressive improvement in handling complex sentence structures involving *because* as the instructional treatment progressed. No such change was found in the control group; thus, this improvement may reflect the impact of targeted instruction using ChatGPT as opposed to peer interaction.

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As examples (16-17) demonstrate, despite differing error rates, both groups made similar fragment errors with *because*, often starting dependent clauses with it but mistakenly separating these from the main clause with a period. The incorrect use of a comma following *because* seen in example (16) is uncommon in the control group's essays, and absent in the treatment group's. These examples come from essays on the topic of whether young people have anything to teach older people.

(16) **Because,** they can teach wisdom, manners, history and emotional support, etc. (Control, Essay 1)

(17) **Because** they can give good advises by interaction. (Treatment, Essay 1)

Regarding the phrase *for example*, the control group utilized it in 10.4% of the sentence fragments they produced, while the treatment group employed it slightly less often, at 9.7%. Such errors are typical of the writings of English learners in academic settings, as noted by Yoon and Yoo (2011), and are exemplified in (18–19). It appears that, unlike the case of *because*, the instructional intervention with ChatGPT had no significant effect on this particular usage. However, as shown in the examples, the control group tended to list individual nouns after the conjunction, as in (18), whereas the treatment group produced more complex nominal phrases with postmodification, including relative clauses that provide additional information about the noun, as in (19).

(18) **For example,** poetry, essays. (Control, Essay 2)

(19) **For example**, all inventors, who invented and discovered different things from their own experiments and creative minds (Treatment, Essay 2)

As for the run-on sentences, the treatment group employed *however* in such sentences in 6.3% of their uses of this conjunction (5 out of 79 tokens), while 0.9% of their *also* uses were in run-on sentences (1 out of 105 tokens); these rates are slightly higher than those of the control group. However, the number of run-on errors – from 1 to 5 tokens across the groups – is too small to draw broad conclusions from these findings. Overall, the information in the table reflects the differences in grammatical errors related to sentence structure, with the control group producing significantly more fragments than the treatment group, but little distinction between the groups in the production of run-on sentences.

## CONCLUSION

This study is one of the few that have integrated instructed second language acquisition with corpus-based analysis. As part of a larger project, we investigated the impact of generative AI on L2 academic writing, specifically focusing on the usage of English conjunctive adjuncts. We conducted a comparison between a treatment group that utilized ChatGPT for writing activities and a control group that interacted with peers during these activities. For both groups, the instructor, course procedures, content, and activities were consistent. The only variable was the interaction partner during the activities – ChatGPT for the treatment group and peers for the control group.

The analysis of three sets of essays from both groups takes two approaches. The first part of the study examined the frequency of conjunctions used by the control and treatment groups. The results showed remarkably similar patterns between the two groups. The distribution of the three types of conjunctions demonstrated a predominant use of coordinators, accounting for about 58% of all conjunctions used by both groups, followed by subordinators at just over 23%, with adverbials the least used by both groups. Furthermore, the ten most frequently occurring conjunctions were identical in the two groups, although they appeared in different orders of frequency. However, the top four – *and*, *but*, *so*, and *if* – remained consistent. At first glance, such similar patterns observed through the quantitative analysis suggest that there were no significant differences between the group interacting with ChatGPT and the group interacting with their peers.

However, the second part of the study, which employed a qualitative approach, provided a more comprehensive picture of how the two groups used conjunctions. The study's findings regarding the usage of conjunctions reveal significant differences between the control and treatment groups, reflecting their distinct experiences of interaction during the instructional intervention. The treatment group, interacted with ChatGPT, demonstrated a more formal and structured use of conjunctions, closely adhering to academic writing standards. This group showed a tendency to employ conjunctions within clauses rather than initiating sentences with them, producing sentence constructions typical of English academic prose (e.g., Eun, 2016; Shin et al., 2019), presumably influenced by AI feedback. In contrast, the control group, interacting with peers, exhibited a more varied and less structured use of conjunctions; for example, they often started sentences with

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*and* and *but*. This pattern indicates a less formal style (Yoon & Yoo, 2011), likely fostered by the peer-based learning environment. This divergence highlights the influence of instructional methods on the adoption of academic language norms, and points to the potential of AI-driven learning tools for shaping student writing to meet academic expectations.

The findings of this study have significant pedagogical implications for integrating AI tools like ChatGPT into L2 language learning environments. While ChatGPT shows promise for reinforcing the formal and structured use of conjunctions, consistent with academic writing norms, its limited impact on habitual usage patterns suggests it should complement traditional teaching methods. Educators might consider using ChatGPT to provide additional practice and feedback, helping students recognize and correct grammatical errors, especially in complex sentence constructions. Moreover, the contrast between the treatment and control groups underscores the need for careful curriculum design that incorporates AI tools in a way that enhances – rather than replaces – the interactive learning experiences provided by peer feedback. This balanced approach could lead to improvements in students' writing proficiency by offering a diverse array of instructional strategies that cater to various learning styles and needs.

Furthermore, the findings suggest that explicit instruction using AI can significantly enhance students' understanding and application of conjunctions in academic writing. To maximize the effectiveness of such tools, they should be integrated with implicit instructional strategies targeting the structures in focus that promote natural usage and understanding through peer interactions and practical application. Educators should consider blending explicit AI-driven grammar instruction with implicit learning opportunities that encourage exploratory and conversational use of language. This dual approach could better address the diverse learning needs of students, making instruction in specific grammatical elements more comprehensive and effective. In addition, while the present study is limited to comparing two groups, future research should compare additional groups, such as those engaging in both ChatGPT and peer interactions, to determine if a combined approach could outperform methods using either strategy alone. This could provide deeper insights into the optimal integration of technology and human interaction in language education.

Another limitation of the study is its focus on a single aspect of L2 writing (i.e., conjunctive adjuncts); its findings cannot be generalized to the broader effects of integrating generative AI platforms into L2 writing education. Future research on AI in L2 writing should analyze the participants' essays more comprehensively, including grammatical accuracy, lexical richness, language use, and overall quality. Another limitation is the small number of essays, only three, investigated in the study, due to the challenges of collecting data in real-life classroom settings. In the future, efforts should be made to collect larger sample sizes and to include multiple data points from a wider array of educational contexts to enhance the robustness of the findings. In addition, while the study's intervention focused on teaching English conjunctions, research could provide a more accurate picture of such interventions' effects if the instruction took a more holistic approach; for example, the lessons could explicitly address the integration of conjunctions into complex sentence structures, the variety of discourse markers, and their impact on the coherence and cohesion of texts. Such an approach could better assess learners' depth of understanding and ability to apply the targeted grammatical concepts in academic writing.

In sum, this study highlights the potential role that generative AI could play in language education, especially in improving L2 writing. The findings suggest a need for further research that investigates the combined effects of AI tools and traditional teaching methods. Future studies should include a broader range of linguistic features and explore different models of student interaction to gain a better understanding of effective educational practices as interest in AI's role in educational settings grows. Such an expanded research focus is crucial for developing approaches that enhance grammatical skills while also encouraging critical thinking and adaptability in language use, which are essential for both academic success and real-world communication.

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