

An Exploratory Analysis of Linking Adverbials in Research Articles Across Different Disciplines

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Abstract—Writing empirical research papers that comply with disciplinary conventions is a goal that many students, especially at the tertiary level, aspire to achieve. While playing a crucial role in constructing coherent texts, linking adverbials are typically depicted as a static collection of interchangeable elements lacking inherent meaning, and often receiving minimal consideration for their discipline-specific functions. Most of the previous studies on linking adverbials have focused on the frequency of use across different proficiency levels; there has been little corpus-based research on how these connectives function across different disciplines. This paper examines the potential variations in the use of linking adverbials in Nursing and Applied Linguistics empirical research articles. Using AntConc software, a corpus of eighty research articles, 40 articles in Nursing and another 40 in Applied Linguistics, were compared in terms of their frequency use, function, and placement preferences of linking adverbials. Findings revealed that the two corpora differ considerably in frequency, semantic function, and, to a lesser extent, the placement of linking adverbials in each discipline. Such variations are attributed mainly to the way linking adverbials are used to present and strengthen authors' arguments in each discipline.

Index Terms—discourse analysis, linking adverbials, disciplinary, semantic functions, corpus

I. INTRODUCTION

Linking adverbials (LAs) being a pivotal cohesive device in organizing and connecting written discourse have been and still are the subject of extensive corpus-based research. A great deal of research focuses on identifying differences in the use of linking adverbials between native speakers and non-native speakers writing at various proficiency levels and from various backgrounds. The findings generally point to overuse, underuse, or even misuse of LAs by non-native speakers of English (Altenberg & Tapper, 1998; Field & Yip, 1992; Granger & Tyson, 1996; Hyland & Tse, 1996; Lei, 2012; Shaw, 2009). This is mainly attributed to the teaching practices emphasizing the interchangeable use of LAs, labelling them as distinctive evidence of writing comprehensibility. Such general practices in teaching overlook research-evident differences in the use of LAs among various disciplines. Consequently, recent research has centered on the disclosure of linguistic characteristics pertinent to various disciplines or registers rather than focusing on practices of native versus non-native speakers (Adel & Romer, 2012; Biber et al., 1999; Hyland, 2005). Identifying disciplinary variations contributes to what Hyland (2009) refers to as the need for "specificity" in teaching English for academic purposes (EAP). The fact that writing as a process reflects mutually accepted practices and expectations of a particular community necessitates the need to highlight such community-accepted linguistic choices. Given that the focus of most studies was on natives (Ns) versus non-natives (NNs) via comparative studies at different levels of proficiency, there is still a lack of knowledge on how published written articles reflect their community conventions. Therefore, this paper attempts to expand knowledge about linguistic specificity and community-based written conventions through a corpus-based analysis of disciplinary variations using LAs in research articles in two different disciplines: Applied Linguistics and Nursing. The results of such a study will shed light on the role linking adverbials play in constructing scholarly knowledge across different disciplinary areas, and how their use is restrained by the communicative needs of a particular field.

II. LITERATURE REVIEW

A. Terminology Issues of Linking Adverbials

Different terms have been used to refer to LAs. Carter and McCarthy (2006) referred to them as "linking adjuncts". Hyland (2005) labeled them as transition markers that function as signposts to guide the reader throughout the text. Other terms include "discourse markers" (Liu, 2004), adverbial connectors (Altenberg & Tapper, 1998), and linking adverbials (Biber et al., 1999). Biber et al.'s terms and definitions will be used throughout this paper. Biber et al. (1999) referred to LAs as devices whose primary function is to explicitly project the writer's perception toward the relation between two stretches of discourse, stressing that linking adverbials are "important devices for creating textual cohesion" (p. 875). Based on their semantic functions, LAs were grouped by Biber et al. (1999) into six semantic labels:

1. Enumeration and addition: This category includes adverbs (e.g., *first, second, third...*etc.) or prepositional phrases (*for one thing...*) that are used to guide the reader as additional informational items are added.
2. Summation: This category signals a summary of a previous argument (e.g., *in summary, to sum up, etc.*).

3. Apposition or code glosses (Hyland, 2005): These are used to further explain a previous argument (e.g., *that is, for example, for instance, etc.*).
4. Result/inferences: Devices such as *therefore, as a result*, indicate that the preceding segment is a result of a preceding patch of discourse.
5. Contrast/concession: Such devices are used to attract attention to contradictory or alternative ideas like *to the contrary, anyway, though, etc.*
6. Transitions: These refer to items that are loosely connected to the previous discourse such as *by the way* or *incidentally*.

Given their various semantic functions, LAs reflect not only textual coherence but also communicative needs pertinent to a particular community. Underscoring the need for more specificity in analyzing language, Hyland (2009) called for more detailed research that accounts for disciplinary variations in using cohesive devices. His notion of specificity triggered more interest in the use of cohesive devices, particularly linking adverbials, across various disciplines and registers, as will be discussed below.

B. Specificity and Disciplinary Variation in the Use of Linking Adverbials

Specificity in Hyland's (2009) term emphasizes the idea "that we communicate as members of social groups and that different groups use language to conduct their business, define their boundaries, and manage their interactions in a particular way" (pp. 7-8). He underscored the need for more specificity in researching and designing materials for ESP learners, acknowledging that our "fixation with genre" (p. 7) and the difficulty of specifying the notion of discipline turned our focus from disciplinary variation, which is the basic core of specificity. The findings of Hyland's (2005) analysis of research articles across various disciplines pointed to major differences between research articles under the label of the academic genre. Acknowledging the significance of genre analysis in demystifying the structure of research articles, Hyland (2009) accentuated the need for deciphering disciplinary written conventions, as knowledge of conventions restraining the use of language in a particular community is a prerequisite for effective writing. As such, discipline specificity was found to affect the distribution of linking adverbials across various disciplines. Soft or non-scientific disciplines rely heavily on logical argument to warrant their claims rather than relying on "multimodality" (i.e., graphs, tables, etc.) in presenting proof. Therefore, more transitions were found in soft-science textbooks than in their hard-science counterparts (Hyland, 2005). Biber et al. (1999) found variations in the type, stylistic preferences, and position of LAs across different genres, as will be discussed in the coming section. Unlike other researchers (Crismore et al., 1993; Vande Kopple, 1985) who perceive LAs to be straightforward text connectors, Hyland (2005) contends that they either take experiential/propositional or interpersonal functions. In the former, LAs act as textual devices logically connecting the various patches of the text. In the latter, they are oriented toward promoting reader/writer interaction rather than being purely devoted to textual cohesion. Despite their indispensable role in shaping and organizing academic writing, differences in the use of adverbial connectors were mainly constricted to comparative studies on Ns versus NNs on both novice and professional levels.

C. Previous Empirical Research on Adverbial Connectors

Since Halliday and Hasan's (1976) work on the role of cohesive devices in written language organization and comprehensibility, a substantial body of research has investigated their use in written materials. Three major directions can be identified in this field: comparative studies on the use of linking adverbial between non-native learners and their native peers, studies comparing native versus non-native professionals, and finally, studies on the variation of use across disciplines. Regarding research on natives versus ESL learners, findings pointed to a general tendency toward overusing linking adverbials (Altenberg & Tapper, 1998; Appel, 2020; Field & Yip, 1992; Granger & Tyson, 1996; Hosseinpur & Pour, 2022; Hyland & Tse, 1996; Lei, 2012; Shaw, 2009). The second type of studies, which focused on linguistic variation between native and non-native professionals rather than learners, revealed variations in the frequency of certain types and a relative underuse of certain LAs by non-native professionals (Gao, 2016; Luisa & Pastor, 2013).

Fewer studies, however, were directed to either disciplinary differences or variations of use across different registers. In a large-scale study, Biber et al. (1999) examined four registers in the Longman Spoken and Written English (LSWE) corpus, and findings revealed that more linking adverbials were used in conversation and academic prose than in fiction and news. It was also found that summative, appositional adverbials are more widely used in academic prose than in any of the other registers. Single-word adverbials (e.g., *therefore, however*) were found to be the most common syntactic realization of linking adverbials in the academic register. Regarding stylistic preferences, it was found that *however* is the topmost preferred in all registers whereas result adverbials *therefore, thus, and hence* seem to be interchangeable. The analysis of LAs position preferences in academic register revealed that they were more frequently used in the initial position. Hyland (1998) found a higher density of linking adverbials in textbooks compared to research articles. Liu (2008) found significant differences in LAs use across five registers (spoken English, academic writing, news writing, fiction, and others) in the BNC corpus. Although exhibiting the least use of adverbials, fiction was found to use more sequential type than other registers. News writing was found to have the lowest rate of LAs.

Focusing on the form and function of restatement markers across various disciplines, Hyland (2007) found that these markers have two main functions: exemplification and reformulation. The former was achieved through using examples

whereas the latter was attained through either expansion or reduction of meaning. It was found that exemplification was more often used than reformulation in all disciplines. Although soft disciplines showed a slight tendency to reformulate statements as implications, reformulation through specification was far more common in the whole corpus. Peacock (2010) compared LAs use in four sciences (Chemistry, Computer Science, Material Science, and Neuroscience) versus four non-sciences (Economics, Language and Linguistics, Management, Psychology) research articles. It was found that contrast/concession, addition, and apposition were the most commonly used semantic categories. Although findings revealed that linking adverbials are less frequently used in science, significant variations were detected among the four disciplines of science. The variations were attributed to differences in projecting and consolidating the proposed claims or arguments.

A critical look at the corpus-based studies reveals that the majority of studies are native versus non-native based with more focus on learners' language. Studies on disciplinary-specific use of linking adverbials, are, however, limited and are largely generic with a more quantitative orientation. The focus on frequency of use has to some extent shifted attention from association patterns that LAs may display in different contexts. Hence, there is a need for more research that relies on both quantitative and qualitative analysis to illuminate disciplinary variations in the use of linking adverbials by proficient writers.

III. METHODOLOGY

A. Rationale of the Study and Research Questions

A critical examination of the research on the use of adverbials discloses a shortage of studies on disciplinary variation in the use of LAs and even scarcer research on how written language, particularly research articles, not only manifests disciplinary linguistic variation but also in how reflective it is to the general values and communicative purposes of their corresponding fields. Familiarity with disciplinary conventions is vital in academic writing, especially research articles. As such, the current study aims to expand our knowledge of linguistic variations in the use of LAs across different disciplines by examining their use in two main hypothetically different disciplines: Applied Linguistics (AL) versus Nursing. The rationale behind this selection is twofold: first, most studies on LAs' disciplinary variation focused on the big picture (i.e., arts and humanities versus science rather than specific disciplines). Second, the choice is related to the academic needs of second language learners as both disciplines recruit a large number of EFL students and are primarily taught in English even in countries in which English is not the native language. With this goal in mind, the study aims at addressing the following questions:

1. How does the use of linking adverbials differ in AL and Nursing research articles in terms of frequency and taxonomy?
2. How do AL and Nursing research articles differ in their placement of linking adverbials?
3. How do the linking adverbials function in AL and Nursing research articles?

B. The Corpus

The corpus used in this study consists of 80 research articles: 40 articles in Applied Linguistics and 40 articles in Nursing. Research articles in this study were restricted to empirical research articles published in peer-reviewed journals with traditional sections of Introduction, Review of Literature, Method, Results, and Conclusion. The articles were compiled from four peer-reviewed journals in each discipline. Ten articles were compiled from each of the following AL journals: *TESOL Quarterly*, *Applied Linguistics*, *Language Learning and Technology*, and *English for Academic Purposes*. Another ten research articles were extracted from each of the following Journals: *Applied Nursing Research*, *Journal of Advanced Nursing*, *Journal of Clinical Nursing*, and *Research in Nursing and Health*. The journals in AL were chosen based on my personal experience in the field. Journals in Nursing were selected, however, based on recommendations from informants in the respective field. Each article was then scanned for its match with the operational definition of empirical research articles. The files were then converted to text files using an AntConc converter or the pdf in-built-text converter. Each text was then manually edited, and all page headers, footers, and reference lists were removed.

C. Method

Data were analyzed both quantitatively and qualitatively. AntConc software was used to examine the frequency and position of linking adverbials in research articles of the disciplines in question. Concordance lines were then examined manually so that only markers acting as linking adverbials were included. The general position tendency was calculated by dividing the raw number of LAs in the inter-sentential position by that of the non-inter-sentential (Shaw, 2009). Inter-sentential position refers to the use of LAs to connect two sentences marked by the use of a full stop (Shaw, 2009). If the ratio is 1, then both positions have equal frequency. If it is larger than one, it means a higher frequency of initial placement whereas less than one indicates a higher tendency to non-initial placement (Shaw, 2009). Given the differences in the size of the two corpora, the frequency was normalized to per/10000 words. A qualitative analysis of findings was conducted based on the semantic functions of LAs, phraseological association, and communicative purposes in the reviewed disciplines. Biber et al. (1999) general classification of LAs was adopted (see Appendix A). However, the category of transition was excluded in this study due to the rare occurrence and almost zero occurrence of

the respective adverbials in both corpora. To make the list more comprehensive, additional linking adverbials were added from various studies (Peacock, 2010; Shaw, 2009).

IV. RESULTS

The total number of linking adverbials used in both corpora was 5,583 out of 569,611 tokens in total. The two corpora revealed sizable differences in their overall use of linking adverbials. Linking adverbials were found to be more common in AL than in Nursing research articles. The total number of linking adverbials in AL was 3,992 with 115.7 frequency as opposed to 1,591 in Nursing research articles with a normalized frequency of 70.8. Differences were found in the distribution of semantic functions, as well as the frequency of individual forms within each semantic category, as will be fleshed out in the coming section. I will first discuss the variations in the frequency of semantic functions. Discipline-based variations in the placement and frequency of linking adverbials will be then highlighted. Analysis of the functions and the common structural patterns of linking adverbials found in Nursing and Applied Linguistics research articles will be further investigated. Finally, a discussion of the findings with relevance to the communicative purposes of the respective disciplines will be conducted.

A. Variation in the Frequency of Semantic Categories

Linking adverbials, as depicted in Figure 1 and Table 1, tend to be more frequently used by AL researchers than their Nursing counterparts across five semantic categories. Applied Linguistics research articles seem to use a larger number of additives, appositives and contrast, results, and summation compared to Nursing research articles. Additives and appositives are considerably higher in AL as their frequency is almost twice that in Nursing (40.35 versus 26.4 per 1000 words). The two fields show similar preferences in the ranking use of specific LA semantic categories with additives being the most frequent category in both fields and categories of “result” and “summation” being the least used in both corpora. Further examination of the use of individual forms within each semantic category points to slight variations in their frequency distribution in the academic articles in the two disciplines, as will be illustrated in the coming section.

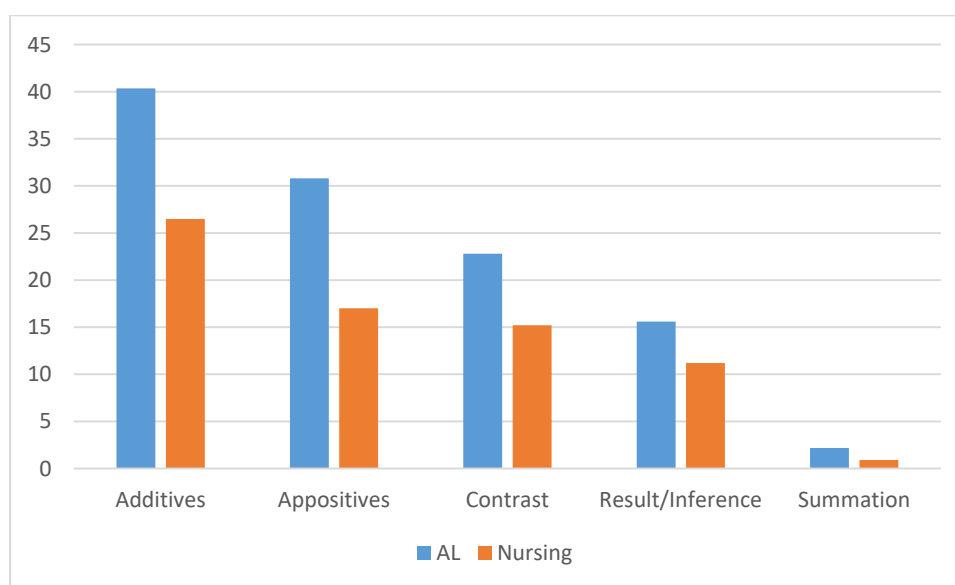


Figure 1. Normalized Frequency of LAs in AL and Nursing Articles

TABLE 1
FREQUENCY RANK OF SEMANTIC CATEGORIES IN AL AND NURSING RESEARCH ARTICLES

Total LAs in Al Corpus	Raw frequency	Per/10000	Total LAS in Nursing	Raw Frequency	Per/10000
Additives	1392	40.35	Additives	595	26.49
Appositives	1203	30.8	Contrast	382	17.0
Contrast	785	22.8	Appositives	342	15.2
Result/Inference	537	15.6	Result/Inference	252	11.2
Summation	75	2.17	Summation	20	0.9
Total LAs in Al Corpus	3992	115.7	Total LAs	1591	70.8

B. Variation in Frequency and the Position of Linking Adverbials

Table 2 shows that three forms of additives are dominantly used in both corpora with different ranking order: *also*, *as well*, and *in addition*. The findings revealed notable differences in the frequency of *also*, *And*, and *finally*. The first is more frequently used in Nursing with a frequency of 26.49 compared to 23.19 in AL. The use of *And* as an intersentential linking adverbial seems to some extent to be acceptable in Al articles, as it occurs six times, though

confined to a single article. In Nursing, only one occurrence of *And* was encountered. Moreover, AL makes greater use of *finally* than Nursing (2.14 versus 0.71). Although having almost the same meaning, *additionally* and *lastly* are rarely used in both corpora compared to their equivalents *in addition* and *finally*.

TABLE 2
FREQUENCY RANK OF ADDITION LINKING ADVERBIALS IN NURSING AND AL

Additives in AL Corpus			Additives in Nursing Corpus		
also	800	23.19	also	304	26.49
as well	142	4.12	in addition	74	3.29
in addition	90	2.61	as well	70	3.12
finally	74	2.14	first	28	1.25
moreover	56	1.62	finally	16	0.71
first	55	1.59	furthermore	28	1.25
furthermore	22	0.64	second	15	0.67
similarly	41	1.19	moreover	15	0.67
second	33	0.96	further	13	0.58
likewise	19	0.55	third	9	0.40
and	15	0.43	similarly	8	0.36
secondly	11	0.32	likewise	4	0.18
third	11	0.32	fourth	4	0.18
next	9	0.26	lastly	4	0.18
besides	7	0.20	next	2	0.09
lastly	4	0.12	and	1	0.04
additionally	1	0.03	besides	0	
thirdly	1	0.03	thirdly	0	
to begin with	1	0.03	to begin with	0	
Total	1392	40.35	Total	595	26.49

Regarding apposition (Table 3), both corpora almost used the same range of appositives with various frequencies. One considerable difference is the zero occurrence of the rephrasing expression *in other words* in Nursing research articles. As for contrast/concession (Table 4), the predominant forms in both disciplines are *however* and *rather*. The other subsequent forms *yet*, *in contrast*, and *but* are more frequently used in AL whereas *still*, *yet* and *instead* are most preferred in Nursing. The AL corpus shows a slight preference for using contrast markers: *in contrast* (1.16 in AL compared to .3 in Nursing) and *but* with 1.6 per 1000 words compared to almost zero occurrence in Nursing articles.

Although the summative function is the least presented in both corpora (Table 5), differences are found in the use of individual summative forms. Applied Linguistics articles seem to use a wide range of summative linking adverbials compared to Nursing research articles, in which only one form (i.e., *overall*) is used in the whole corpus. Some forms (e.g., *all in all*, *or altogether*) show no appearance in both corpora. Others, such as *in conclusion*, are rarely used in AL and have zero occurrence in Nursing articles. As for result/inference (Table 6), the use of *thus*, *so*, and *hence* is considerably higher in AL than in Nursing. The use of *thus* is almost double that in Nursing. In Nursing, however, greater use is made of *therefore* than in AL with a frequency of 5.25 versus 3.4. The least used forms in both corpora were *consequently*, *accordingly*, and *for this reason*. Concerning position, both corpora display a preference for using linking adverbials in the initial position as illustrated by (Table 7). However, Nursing articles often use *thus* and *hence* in the initial position, whereas AL articles tend to prefer non-initial placement. Another difference can be found in the placement of *finally* and *nonetheless*. The former always occurs in the initial position in Nursing, but in AL it appears in both initial and non-initial positions. The latter also always appears initially in Nursing, but it has equal initial and non-initial distribution in AL.

TABLE 3
FREQUENCY RANK OF APPPOSITION LINKING ADVERBIALS IN NURSING AND AL

Applied Linguistics Corpus			Nursing Corpus		
Appositives	Raw frequency	Frequency Per/10000	Appositives	Raw freq	Frequency Per/10000
e.g.	336	9.7	such as	120	5.34
such as	259	7.5	e.g.	99	4.41
for example,	242	7.0	i.e.	56	2.49
that is	154	4.5	for example	40	1.78
i.e.	140	4.1	namely	13	0.58
in other words	33	1.0	That is	9	0.40
Specifically	23	0.7	specifically	5	0.22
namely	16	0.5	In other words	0	0.00
Total	1203	25.1	Total	342	15.2

TABLE 4
FREQUENCY RANK CONTRAST/CONCESSION LINKING ADVERBIALS IN AL AND NURSING

Applied Linguistics Corpus	Raw Frequency	Frequency per 10000	Nursing Corpus	Raw Frequency	Frequency per 10000
however	400	11.59	however	226	10.06
rather	170	4.93	rather	41	1.83
yet	41	1.19	still	30	1.34
in contrast	40	1.16	yet	25	1.11
but	40	1.16	instead	14	0.62
instead	22	0.64	nevertheless	9	0.4
nevertheless	21	0.61	conversely	9	0.4
otherwise	18	0.52	in contrast	8	0.36
nonetheless	10	0.29	otherwise	5	0.22
though	10	0.29	on the other hand	5	0.22
after all	5	0.14	nonetheless	5	0.22
still	3	0.09	in spite of	2	0.04
alternatively	2	0.06	after all	1	0.04
conversely	2	0.06	though	1	0.04
in any case	1	0.03	alternatively	1	0.04
Total	785	22.76	Total	382	16.9

TABLE 5
FREQUENCY RANK OF SUMMATION LINKING ADVERBIALS IN AL AND NURSING

Applied Linguistics Corpus	Raw Frequency	normalized	Nursing Corpus	Raw frequency	Frequency per/10000
in sum	24	0.70	Overall	20	0.9
in short	8	0.23	in sum	0	
to conclude	6	0.17	To sum up	0	
To summarize	5	0.14	in short	0	
to sum up	2	0.06	to conclude	0	
in conclusion	1	0.03	to summarize	0	
Overall	29	0.84	in conclusion	0	
altogether	0	0.00	altogether	0	
all in all	0	0.00	all in all	0	
Total	75	2.17	Total	20	0.9

TABLE 6
FREQUENCY RANK OF RESULT/INFERENCE LINKING ADVERBIALS IN AL AND NURSING

Applied Linguistics Corpus	Raw Frequency	Frequency Per/10000	Nursing Corpus	Raw Frequency	Frequency/per10000
thus	185	5.4	therefore	118	5.25
therefore	133	3.9	thus	62	2.76
so	59	1.7	thereby	18	0.80
then	45	1.3	hence	13	0.58
hence	40	1.2	so	13	0.58
as a result	26	0.8	as a result	9	0.40
consequently	18	0.5	then	8	0.36
thereby	16	0.5	consequently	7	0.31
accordingly	11	0.3	accordingly	2	0.09
for this reason	4	0.1	for this reason	2	0.09
Total	537	15.6	Total	252	11.22

TABLE 7
FREQUENCY OF LAS IN INITIAL POSITION

Linking Adverbial	LA Corpus	Nursing Corpus
thus	0.9	1.6
therefore	0.5	0.8
hence	0.2	3.3
also	0.0	0
overall	6.3	4
finally	4.7	All initial
otherwise	1	0.3
nonetheless	1	All initial
however	2.1	3.9
yet	1.6	1.3
TOTAL	18.2	15.2

C. Functions of Linking Adverbials

Linking adverbials in this study seem to display similar functions to those described by Biber et al. (1999). However, some semantic categories seem to be used differently in Applied Linguistics and Nursing. A discussion of the functions of linking adverbials and their structural patterns in both AL and Nursing will be provided below along with illustrative examples. Given the difficulty of covering all instances of use, the analysis of function and phraseological patterns will be restricted to the most commonly used linking adverbials.

(a). Additives

Biber et al. (1999) indicated that additives are used to add new information or sometimes to show a logical sequence. This was found to be true in the current corpus. For example, *finally* can be used to add additional information (1) or to indicate a logical sequence (2). Interestingly, occurrences of these two functions were found in AL but only the first function (i.e., adding new information) is found in the Nursing corpus (3).

1) **Finally**, German adjectival inflection is somewhat opaque in DeKeyser's (2003, 2005) sense, with the same endings potentially signaling different combinations of numbers (AL).

2) **Finally**, they were asked to rate the level of appropriateness of each underlined request on a 5-point scale (AL).

3) **Finally**, in the hypothesized model, duration of diabetes and education would directly affect knowledge (Nursing).

Moreover, authors of Applied Linguistics and Nursing seem to use forms of additions to serve different communicative purposes. Relying heavily on the validity of methodology, authors in Applied Linguistics, tend to use additives to establish and support the validity of argument through describing and providing more details on rationale as in (1), procedures of the research process (2). Conversely in Nursing articles, additives were used mainly to add new information or to give more elaboration on the pursued issue, with less emphasis on validating procedures (3, 4):

1) **In addition**, by selectively sampling stimuli, input to participants could be limited to items from the domain of interpersonal vocabulary. **Furthermore**, possible confounds such as the number of adjectives describing each noun in the sentence could be controlled, **as well as** the degree of evaluation and potency of the words. (AL)

2) The screen recording program Camtasia Recorder (2004) was used to capture participants' moves through the activity. **In addition**, the whole group was observed by one of the authors. (AL)

3) Education programs with a team of professional healthcare providers can improve glycemic control and the progression of long-term complications of patients with type 2 diabetes. **In addition**, telephone care is a strategy for extending diabetes management services into patients' homes. (Nursing)

4) **Also notable** was that research found that, except for one study with dietitians and one study with physicians, the HCPs' own weight status did not influence the HCPs' attitudes... (Nursing)

One interesting finding in the numeration analysis is the use of the sentence-initial *And*. Although such use is academically non-preferable, it seems to gain some acceptance in Applied Linguistics research articles, but not as much in Nursing articles. Serving seemingly a supportive function of the proposition or argument introduced, it is also used frequently with other additive forms *furthermore*, *further*, *finally* (1, 2, 3), referral expressions (4), and subordinate adverbials (5-6-7). When comes to non-initial position, *finally* is usually preceded by *and*.

1) **And, further**, Hyland (2005, p. 49) argues that.....(AL)

2) **And, finally**, a pedagogical question that has been raised by several researchers but has not been investigated is when learners should.....(AL)

3) **And, moreover**, he points out that he reported to the director of the division...(AL)

4) **And, as mentioned earlier**, recent researchers have extended the study of narrative to encompass small stories which are often fragmented and less coherent(AL)

5) **And when** ESL writers are required to write multi-draft compare-contrast, opinion, and research compositions all in the same semester, they must tend to the rhetorical or generic novelty of each composition... (AL)

6) **And, while** the experiment as a whole encourages learner autonomy in ways that are consistent with Schwienhorst (2003), the empirical study presented limits itself to studying the potential effects of learner autonomy on L2 production. (AL)

7) **And, if** s/he were to approach a message dialog such as that of Figure 2 more than once, his or her repeated message events count would increase (AL)

(b). Contrast/Concession

Contrast items are, as indicated by Biber et al. (1999), used mainly to draw readers' attention to some important points that the author wishes to emphasize. To further attract readers' attention, a noteworthy pattern is supporting contrastive adverbials with evaluative or emphatic expressions (examples 1-4):

1) **Scarce, however**, is research investigating, in a controlled fashion, the impact and interaction between such reader-based factors in L2 lexical inferencing and retention. (AL)

2) **Clearly, however**, this conjecture requires further substantiation. (AL)

3) It is **noteworthy, however**, that while reference to the theoretical notion of language-analytic ability is relatively widespread, the operationalization of the construct has varied somewhat. (AL)

4) *The focus in this review, however, is not on task complexity per se but on how this variable interacts with strategic planning.* (AL)

In the AL corpus, contrastive forms were apparently used to highlight particular research procedures and conclusions (5), and they were also used to display a writer's knowledge and familiarity with the key issues in the field (6). When used in a medial position, *however* seems to prepare the reader for a piece of unexpected information or conclusion (7-8) or to justify particular results (9). In example (7), the reader is informed unexpectedly that learners can cope with listening tasks without explicit instruction. For example, (9) the concessive adverbial is used to soften the impact of the seemingly unexpected findings. In Nursing research articles, however, contrast forms are used mainly to constrain the generalizability and highlight the limitations of the proposed conclusions (10-11). A similar function can also be found in AL articles but mainly when referring to limitations of previous work as in example (6):

5) *However, due to the high Pearson correlation between the passage sight vocabulary scores for the more and less familiar passage ($r = .944$, $p = .0001$) I calculated the average of the two scores.*

6) *He concluded that participants were attending to audio; however, it is not clear whether the same would be true for lower-level learners.* (AL)

7) *Participants in problem-solving and structured input tasks without explicit information groups, however, were still able to cope with the demands of the listening test because their explicit knowledge was firmly entrenched.*

8) *June initially showed an unfavorable attitude toward corpora. Her attitude, however, became positive.*

9) *The conditions in this experiment had no measurable impact on comprehension accuracy, however, the instrument was not designed with that purpose in mind.* (AL)

10) *Evidence that these activities effectively treat POI remains unconvincing. However, there is consensus other positive benefits occur for the postoperative patient to include reducing pulmonary complications.* (Nursing)

11) *The results indicated that psychologists were negatively influenced by a client's weight and were more likely to rate obese clients negatively on appearance. However, they did not stereotype the energy level of clients, nor did the negative impressions of the clients' appearance generalize to more negative diagnoses or treatment recommendations.* (Nursing)

(c). Result/Inference

The function of these linking adverbials is to signal results or consequences (Biber et al., 1999). This function appears evident in both corpora with a common pattern of using *and* with (*thus, hence*) in the medial position (1-3). When used in the medial position, *thus, thereby* can also be followed by an *ing*-clause of result (4-6). However, no instances of such occurrences were found with *therefore* in either corpus. Concerning 'hence+ resulting clause' construction, only one instance was found in both corpora (7):

1) *Parents and children from both the experimental and control groups received NEEP and some form of exercise training, and thus, outcomes improved in both groups.* (Nursing)

2) *Group 4 was the control group and therefore did not receive WCF.* (AL)

3) *Participants were recruited from the endocrinology out-patient department of a university-affiliated hospital and hence are unlikely* (Nursing)

4) *However, the authors of the original TNQ claimed that the instrument collected data in a semi-opaque (indirect) way, thus avoiding this distortion.* (Nursing)

5) *Rude is more negative in effect than awkward or ungainly, thus capturing the affective meaning of hobbledehoy better than the definition provided by the non-corpus-based dictionary.* (AL)

6) *Participants in the problem-solving tasks had the opportunity to discuss the metapragmatic features of target structures, thereby reinforcing pragma linguistic... connections.* (AL)

7) *Because they can add redundancy to the aural input by changing the input mode from its aural form in the video into the textual form of subtitles and a transcript, hence addressing different learning styles* (AL).

(d). Summation

One noteworthy finding of this study is the variation displayed in using summatives, as they are relatively rare in Nursing research articles, with *overall* being the only form used in the current corpus. Summative adverbials are used in AL research articles mainly to attract the reader to the significance of the study in hand by summarizing and pointing to gaps in previous arguments or previous research. Thus, the most frequently used expressions are used mainly to introduce a summary of the findings or literature review (1-2). On the other hand, the use of the only summative form in Nursing articles (i.e., *overall*) seems to act as a phrase of generalizability rather than summation (3-4).

1) *In sum, research investigating the relationship between WM capacity and comprehension in the L2 provides support for the view that L2 WM capacity is directly related to L2 comprehension, with L1* (AL).

2) *In short, the previous studies did not fully illuminate students' corpus use in L2 writing... (AL).*

3) *Demographic characteristics of the study participants are shown in Table 1. There were no significant differences between groups in age, gender...diagnosis. Overall, male participants in this study were significantly older ... than female participants but this demonstrated only a small effect size ... (Nursing).*

4) *Once again, as one can see in Fig. 2, although there were a few differences in extreme cases, overall, the two criteria give the same picture in terms of rank orders* (Nursing).

(e). Apposition

Biber et al. (1999) indicated that linking adverbials of apposition are used to clarify ideas and to add further explanation. Hence, the second unit is considered equivalent or part of a preceding segment. This definition, however, seems to be broad given that exact equivalence is barely used in this corpus; the functions of exemplification and reformulation proposed by Hyland (2007) seem more appropriate in describing the function of apposition here. Exemplification where instances of a previous category are introduced is presented mainly by *for example*, *such as*, and *e.g.*, and is widely employed in both corpora but more often in AL (1-2-3-4). However, unlike Nursing, where exemplification is geared often to clarify ideas, exemplification markers in Applied Linguistics seem to be used in supporting claims rather than mere clarification of meaning. The appositive marker *that is*, on the other hand, has a reformulation function and tends to be used in both corpora for specifying or constraining the previous contention and bringing readers' attention to a particular conclusion (5-6-7-8).

1) *All the physical problems that led to the patients eating less were dealt with, **for example**, constipation, pain, or bad oral hygiene (Nursing).*

2) *Such differences are due to restrictions in the range of retention scores from the more familiar passage, perhaps are result of several factors **such as** fewer words to learn, greater ease... (AL).*

3) *L2 vocabulary development through reading is complex. It takes place through various component processes involved in text processing and comprehension. For example, it involves noticing that particular words are unfamiliar. Then, in the absence of dictionaries or human assistance, it requires inferring meaning (lexical inferencing) (AL).*

4) *A repeated-measures design where each participant reads both conditions would have allowed for a direct comparison of reading times enabling control for individual differences. Individual differences in reading speed are considerable. Jackson and McClelland (1975), for example, show mean reading speeds to vary from 260 words per minute for average readers to 586 words per minute for fast readers (AL).*

5) *Race was a significant moderator of the pain–disability relationship; **that is**, the impact of more pain (greater severity and number of painful body locations) on physical and social limitations was worse for Whites than for Blacks (Nursing).*

6) *From a public health perspective, intervening with these abstinent girls represents a true primary prevention opportunity; **that is**, HIV prevention can take place preemptively, prior to the girls' sexual debut (Nursing).*

7) *The study adopted an incidental acquisition design that **is** we investigated whether the target words and collocations were acquired without learners' deliberate attempt to commit them to memory (AL).*

8) *Evaluation is how good or bad something is, **that is**, whether the entity has peoples' approval or disapproval (AL).*

V. DISCUSSION

The findings of this study reflect not only the different communicative purposes of each discipline but also writers' awareness of their readership needs. Writers of empirical research articles in Applied Linguistics, presuming less homogeneity in their readers' background knowledge, seem to be more concerned with persuading their audience of their field knowledge and the significance of their research. On the other hand, researchers in Nursing assume more shared scientific knowledge and, thus, tend to be more interested in informing their readers about the proposed therapies or treatments drawing their attention to the limitations of their conclusions. Prioritizing informative over involved production, Nursing research articles use fewer linking adverbials almost half of those used in Applied Linguistics research articles. This result was expected and comes in congruence with the characteristics of hard and soft science discussed in second-language literature. Hyland (2005) contended that the use of cohesive devices, including linking adverbials, serves not only textual but more importantly interactional functions. Hence, empirical research articles of Applied Linguistics used more forms of addition, summation, contrast, and apposition than Nursing. Additives were found to be the most frequent function in both disciplines. The results were similar to Peacock's (2010) findings where *also*, *as well*, and *in addition* were predominantly used in both science and non-science disciplines.

However, the frequency of semantic functions is to some extent different from that reported by Biber et al. (1999) and Biber (2006) in which result/inference, opposition, and enumeration were found to be the most frequent categories in academic prose. In this study, the semantic function of contrast was more frequent in both corpora than the result/inference category. Nevertheless, the two corpora differ in their frequency rank of apposition. Applied Linguistics research articles employ apposition more than contrast whereas Nursing articles use more contrast than apposition. This was unexpected given the nature of topics in each discipline. It was thought that Nursing would use more apposition to clarify medical terms and therapies. It seems that in Nursing articles, researchers are concerned with specificity in making conclusions and, hence, employed contrast markers to emphasize what should not be concluded or drawn from the study in question. This assumption is also supported by the use of the reformulation marker *that is* to support the specificity of statements. This is in congruence with Hyland's (2007) findings, where markers of exemplifications were far more commonly used in soft than hard sciences. In Applied Linguistics, however, apposition was not only used to clarify concepts, but was also utilized along with additives to advance researchers' proposed argument. The use of appositives in each field reflects the writers' awareness of the processing needs of their readers given that, unlike Nursing, where scientific knowledge is cumulative and relatively well-established, applied linguists deal with more

controversial theorized issues and, hence, need more examples to facilitate the comprehension of a supposedly less cohesive audience.

Serving also a persuasive function, contrastive adverbials in Applied Linguistics tend also to be used in highlighting limitations of previous research and, thereby justifying a given path of exploration. Alternatively, contrastive adverbials are used to support the methodology or findings by justifying unexpected results. The variations in the use of contrast/concessive forms in Applied Linguistics and Nursing research articles are an exemplary model of how writers in different disciplines mitigate their argument to gain support for their claims or counterclaims.

Results and summation were found to be the least used functions in both disciplines. Nevertheless, the use of summation in nursing research articles is limited to one form (i.e., *overall*) which is used to indicate generalizability rather than summing or rephrasing propositions. On the other hand, research articles in Applied Linguistics use a wide range of summatives serving apparently as signposts to draw readers' attention to the important points the author wishes to emphasize. This, as mentioned earlier, seems to be influenced by reader-writer mutual expectations. Researchers in Nursing articles seem to trust their readers' ability to infer the importance of their work focusing instead on elaborating their propositions and highlighting possible limitations. Writers in Applied Linguistics presuppose that their readers may not be able to make such a connection and, therefore, utilize more summatives to ensure their readers' understanding and consequently their appreciation of the writer's field knowledge and the overall value of the research.

In sum, the disciplinary variations in the frequency and function of linking adverbials in empirical research articles in Nursing and Applied Linguistics indicate that linking adverbials perform more than a textual function and are, thus, utilized differently in different disciplines. They seem to reflect how writers in different disciplines are involved with their readers. In Applied Linguistics, where researchers assume less agreement from their readers, linking adverbials are employed to persuade the seemingly less cohesive readership. In Nursing, however, where researchers build upon a seemingly well-established shared scientific knowledge, linking adverbials serves to introduce more elaborative and cautious propositions.

While contributing to the existing literature on disciplinary variation in the use of LAs, the findings of this study merit further research on how linking adverbials interact with other rhetorical devices, such as hedges, boosters, and stance markers, to project writers' arguments not only in Nursing and Applied Linguistics but across various disciplines. This study was limited to empirical research articles and no distinction was made between quantitative and qualitative research. Future research may examine the use of linking adverbials across both types of research and theoretical research papers. Another limitation is that no statistical tests of significance were employed. Future studies are encouraged to confirm the reported variations via appropriate statistical tests.

VI. CONCLUSION

Crafting coherent, well-organized research articles that adhere to disciplinary conventions is what most ESL teachers and learners aspire to achieve, especially at the university level. Unfortunately, the traditional way of presenting cohesive devices, particularly linking adverbials, does not account for the differences in use across disciplines. This study shows that some linking adverbials are not used at all in both disciplines, while others might be used in one field but not the other. The placement of linking adverbials receives little if any attention in ESP courses. Nevertheless, this study revealed that Nursing and AL research articles show variations in their placement preferences of some linking adverbials. Overall, the variation in the frequency and function of linking adverbials displayed in this paper reflects not only the different communicative purposes of different fields but also the writers' awareness of the needs and expectations of their readers. ESP course designers are therefore invited to utilize the findings of corpus-based studies that incorporate both quantitative and qualitative analysis in their materials design. Such a step would probably help to narrow the gap between what is taught and what is actually practiced in disciplinary academic writing. It is hoped that the results of this study will advance the knowledge of the discursial role of linking adverbials by displaying the logic and the stylistic preferences of their use in different academic communities.

APPENDIX

Addition	Summation	Apposition	Result/Inferences	Contrast/concessive	Transitions
Additionally	All in all	e.g.	Accordingly	After all	By the by
Also	all in all	For example	As a result	Alternatively	incidentally
And	altogether	For instance	Consequently	Anyhow	meanwhile
as well	In conclusion	In other	For this reason	Anyway	Now
besides	in conclusion	words	hence	At any rate	
by the same token	In short	namely	In consequence	Beside	
Finally	In sum	Such as	so	But	
First	overall	That is/i.e	Then	By comparison	
First of all	To conclude	Which is to	thereby	conversely	
Firstly, secondly....	to conclude	say	Therefore	However,	
For one thing...for another	To sum up		Thus	In any case	
further/furthermore	To summarize			In contrast/ by contrast	
In addition				In spite of that	
In the first/second place				Instead	
In the same way				Nevertheless/nonetheless	
lastly				notwithstanding	
likewise				On the contrary	
moreover				On the other hand	
Next				otherwise	
Second				Still	
Similarly				Though	
Third				Yet	
To begin with					
What is more					

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