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# ADVERBIAL COHESION IN ENGLISH-MEDIUM ACADEMIC PROSE: DISCIPLINARY AND LINGUACULTURAL CONSIDERATIONS

The article studies the use of linking adverbials (LAs) in English-medium articles by Polish and Anglophone scholars representing medicine and psychology, attempting to reveal discipline- and culture-specific preferences in the choice, frequency and distribution of linkers. The results show that disciplinary and linguacultural constraints impact on LA use. Variation across disciplines reflects differences in the knowledge base and its rhetorical management, as there are significantly more LAs in psychology than in medicine. Cross-cultural variation determines the choice of specific LA (sub)categories in line with the authors' linguacultural backgrounds, target readers and publication contexts. These findings can raise academic writers' awareness of culture- and discipline-driven aspects of adverbial cohesion in English academic prose.

Keywords: linking adverbials, research articles, disciplinary variation, cross-cultural variation

## 1. Introduction

Linking adverbials (LAs) are instrumental in maintaining discourse cohesion, which stems from their potential to provide meaningful connections between stretches of language of different length without adding much propositional content. They can thus influence the persuasive power of the conveyed message, allowing a writer to "articulate the structure of his argument and influence a reader's interpretation of a text" (Gao 2016: 14). Functionally, many LAs fit into Hyland and Tse's (2004) interactive category of metadiscourse, representing transitions (*also*, *however*), frame markers (*next, in short*) or code glosses

(*namely*, *e.g.*). Some researchers differentiate between lexical (*hence*) and phrasal (*for example*) LAs (Sinclair 2005). Others are more interested in the items' rich semantic potential, but are not unanimous in classifying the variety of meanings expressed by LAs. There are classifications with only four (Halliday and Hasan 1976) or six types of linkers (Appel 2020), but also those with as many as nine (Carter and McCarthy 2006). The taxonomy by Liu (2008) used here divides LAs into four types, but distinguishes as many as thirteen of their subtypes.

Previous research has shown that LAs "are primarily characteristic of the written registers" (Biber 2006: 70) and particularly common in academic prose (Biber et al. 1999; Liu 2008). Some linkers are typically found in academic texts (*however*, *thus*, *therefore*, *for example*), while other ones, in conversation (*so*, *then*, *though*, *anyway*) (Biber et al. 1999: 887). Similar tendencies are observed with respect to the different LA categories, as for instance, in the BNC adversative LAs are less frequent in speaking or fiction than in academic prose (Liu 2008), whereas in short stories falling actions are often signalled with temporal LAs (Wong and Lim 2014). In English academic settings, LAs have been reported to be more frequent in textbooks than in research articles (RAs) (Hyland 1999), more popular in non-science than in science disciplines (Peacock 2010), more common in Conclusions than in Abstracts and Introductions (Hůlková 2017), more willingly used by English L2 speakers than by their English L1 counterparts (Gao 2016). Other studies have shown that certain rhetorical functions of academic texts are recurrently assisted by the use of specific LA types, as for example, gaps in earlier research in management RAs are often indicated by concessive adverbials (Lim 2012), whereas research questions in doctoral dissertations are marked by appositive adverbials (Lim 2014).

A different strand of research compares learners' use of LAs with the English L1 norm (e.g. Tankó 2004; Carrio-Pastor 2013; Leedham and Cai 2013). The findings suggest a sort of paradox, as learners' English writings have been shown to include more (Green et al. 2000), fewer (Altenberg and Tapper 1998) or a similar number of linkers (Granger and Tyson 1996) in comparison with the English L1 texts. Added to that is Wodarczyk's (2013: 85) comparison of the BA theses of Polish students of English with the academic section of the BNC which showed a pattern of overuse in the former texts, but emphasized that "learner language is not genuine students' production", as it bears trances of "tutors involvement in the process of writing" that "could have had some influence on the final result". There is also a growing body of research showing that certain LA production tendencies vary depending on the writers' L1 backgrounds (e.g. Ha 2016; Appel 2020).

Within this growing body of research there can be identified gaps that merit further investigation. First, while patterns of LA use in English-medium

RAs have been analysed across the hard/soft divide (Peacock 2010; Gao 2016; Hůlková 2017) or within individual disciplines (applied linguistics, Lei 2012; engineering, Carrió-Pastor 2013), it seems that a comparison of medicine and psychology has skipped the attention of scholars. Second, the investigated RAs usually come from leading journals published in an international context, leaving in relative neglect the national context of publication. Third, many of the available studies use the LA taxonomies by Quirk et. al. (1985) (Carrió-Pastor 2013) or Biber et al. (1999) (Peacock 2010; Hůlková 2017), and those that employ the taxonomy by Liu (2008) focus on variation in the use of the main LA categories (Lei 2012; Gao 2016), without carefully considering their numerous subcategories. Fourth, while the effect of different linguacultural backgrounds on articulating discourse structure in academic English has been examined in the writings of authors of diverse national origins, the Polish cultural setting appears as underresearched.

Academic discourse has long been recognized as varying "according to disciplinary conventions, cultural expectations and writers' professional status experience" (Gotti 2009: 10), but "few studies comparing Polish and Anglo-American research writing have been carried out" (Hryniuk 2018: 269). An alleged pioneer in this kind of contrastive research is Duszak (1994), who compared Polish and English article introductions from the field of language studies, revealing that the former texts lacked linearity and were characterized by implicitness of style, whereas the latter were direct and assertive. Golebiowski (1997) found that linguistics RAs in Polish, contrary to those in English, had no clear division into sections, whereas psychology RAs had non-conventional subsectioning (1998). Reporting on sociology papers, Golebiowski (2000) concluded that texts by Polish authors were strongly marked by digressions, particularly those provided in text fragments that are additional to the main argument. This partly contrasts with Duszak's (1997a) conclusion that digressiveness in Polish academic texts usually takes the form of elaboration accompanied by metatextual clues rather than is a departure from the main line of argumentation. Additionally, Golebiowski (2007) observed that RAs by Polish authors were increasingly monologic and reader-responsible, due to the scarcity of text-organizing markers. What these analyses seem to overlook is that the influence exerted by the writers' linguacultural background often interplays with the impact of their disciplinary writing conventions (Dahl 2004). Hence, there are few investigations adopting a doubly contrastive approach – cross-disciplinary and cross-cultural – to the preferences of scholars from the Polish-based cultural context.

This study aims to reveal the effect of disciplinary and linguacultural considerations on LA use in a specialized corpus of medical and psychology English-medium RAs by Polish and Anglophone authors. The choice of medicine and psychology as disciplines under investigation was motivated by the

fact that they are marked by similarities and differences. On the one hand, they both focus on humans and thus may potentially draw on similar rhetorical and language resources, especially that "medicine is today a field encompassing aspects (…) from disciplines within the social sciences, such as psychology" (Fløttum et al. 2006: 20). On the other hand, they each represent a different side of the knowledge spectrum, with medicine found at its hard end and psychology, at its soft end. It is therefore likely that somewhat more rigorous and evidence-based medicine will diverge from somewhat more imprecise and interpretation-based psychology in the choice of devices used to manage textual cohesion. There are also divergences between the Polish and Anglophone academic discourse conventions (Warchał 2015; Duszak 1994, 1997b), which may possibly affect the English-medium RAs of Polish scholars. Developed under German and Slavonic influence, Polish academic practices are characterized by digressions from the main line of argumentation, few advance organizers and a writer-oriented, implicit and less structured style of writing. In turn, Anglophone academic discourse, formed under the influence of Saxonic intellectual tradition, has a preference for linear argumentation, advance text organizers and a reader-oriented, explicit and orderly exposition of ideas.

The contribution of this study lies in its doubly contrastive approach to the analysis of how the writers' disciplinary and linguacultural affiliations affect the choice of LAs in the genre of RAs. To the author's knowledge, it is also the first systematic analysis of the most comprehensive list of "lexical items that can function as LAs in context" (Gao 2016: 17) in English-medium RAs by Polish authors conducted from a cross-disciplinary and cross-cultural perspective. Additionally, it compares the use of thirteen different LA subcategories used in RAs published in an international (high-impact journals) and a national (local journals) context in order to identify possible differences in the choice of linkers which may have an impact on the chances that L2 (Polish) authors stand to publish their research findings in international journals. Aiming to offer new insights into the patterns of adverbial cohesion in academic prose, the following research questions are addressed:

Is there disciplinary variation between medical and ps**ychology RAs in LA use?

Is there cross-cultural variation in LA use in English-medium RAs by Polish and Anglophone authors published, respectively, in a national and international context?

What are the reasons for the observed divergences in the use of LAs?

## 2. Data and method

### 2.1. Analytical framework

This study employs Liu's (2008) taxonomy of LAs which he examined systematically in the BNC across registers. The list is considered as very comprehensive, comprising 110 linkers found in major English grammar books[1], and has been validated through successful use in other studies (e.g. Lei 2012; Gao 2016). Following Liu (2008), LAs are classified into four main categories and thirteen subcategories reflecting a variety of semantic connections between units of discourse:

Additive – 36 items concerned with providing new information: emphatic, appositional/reformulation, similarity/comparative (e.g. *also*, *namely*, *likewise*),
Adversative – 29 items indicating that something is contrary to expectation: proper adversative/concessive, contrastive, correction, dismissal (e.g. *nevertheless*, *conversely*, *instead*, *admittedly*),
Causal/Resultative – 16 items relating to causes and logical inferences: general causal, conditional causal (e.g. *hence*, *otherwise*),
Sequential – 29 items marking sequential and real-time relationships: enumerative/listing, simultaneous, summative, transitional to another topic (e. g. *finally*, *meanwhile*, *in short*, *incidentally*).

The taxonomy followed in this study does not resolve all issues regarding the defining characteristics of the different types of linking devices. Liu (2008: 497) himself concentrates on clarifying terminological ambiguities surrounding the very term 'linking adverbials', but fails to explain what discourse meanings underlie the distinct (sub)categories within the proposed LA classification, claiming that the system "is not meant as a clear-cut guide for determining the meaning of LAs". Therefore, it has to be noted that the comments provided in the above taxonomy to indicate the rhetorical functions performed by the different LA (sub)categories are indicative rather than unambiguously defining in their nature. For instance, the concept of 'contrariness of expectation' provided next to the adversative category cannot serve as an exhaustive definition of a concessive discourse relationship which is listed as a subcategory of adversative LAs. Writing about concession in academic spoken English, Łyda (2007: 72-73) shows that it actually "borders on other categories, […], sometimes even overlapping into them", and is thus seen as, among others, a relation of counterexpectancy, contrast or even condition. Barth-Weingarten and Couper-Kuhlen (2002: 346) explain that the concessive relation is present when a point made by one speaker is acknowledged as valid by another speaker who, however,

[1] For details, see Liu (2008: 494-495).

"goes on to state that a potentially incompatible point also holds", while Liu (2008: 505) makes a passing remark that concessive LAs express incongruity "with what has been stated or expected".

Attempting to resolve such definitional problems, more recent studies dealing with the categorizations of LAs suggest a departure from "traditional semantic-only" systems in favour of taxonomies "based on both semantic and pragmatic approaches", following the assumption that the meaning of different LAs may vary across registers and linguistic environments (Yin 2016: 1). This, however, gives rise to an even greater diversity of distinct meaning categories to which LAs can be assigned. Therefore, given that the present investigation is not intended to offer clear-cut definitions of various LA types, but rather explore disciplinary and linguacultural variation in their use, it pursues its aim following an LA taxonomy that does not elaborate in detail on the semantic meaning of the LA categories it comprises, but is fairly recent and has been successfully verified in previous research.

This study adopts a mixed quantitative-qualitative approach. Quantitative analysis involves the identification of the frequency of occurrence of all LA (sub) categories and the unveiling of statistically significant differences and variation in LA use across the selected disciplines and linguacultural contexts. Qualitative analysis intends to identify the context-specific rhetorical functions of the different LA (sub)categories, compare their distribution across the RAs sections and examine how they contribute to the creation of a fluent flow of academic discourse in the selected disciplines and linguacultural contexts. A mixed method approach has been chosen in this study as it allows to explore the phenomenon under investigation from different perspectives, thus providing "stronger evidence for a conclusion through convergence and corroboration of findings", which leads to a more complete understanding of the matter (Johnson and Onwuegbuzie 2004: 21). What can be deduced from quantitative data about the impact of disciplinary and linguacultural factors on LA use can be then interpreted inductively in the course of a qualitative analysis to explain the mechanisms underlying the observed trends and practices.

## 2.2. Corpus

The analysis was conducted on a specialized corpus comprising 120 English-medium RAs published in medicine (MED) and psychology (PSY) over the years 2018-1019 that were written by Anglophone (ANG) and Polish (POL) scholars. If the nationality of the author(s) could not be determined, then the factor of academic affiliation with, respectively, a Polish- or English-speaking institution (mostly British or American) was considered. Potential differences between the distinct varieties of English were not considered. The corpus was subdivided into

two disciplinary sub-corpora compiled along the same criteria: five journals per discipline and cultural context, six articles per journal, three per year.

Table 1 provides details of the corpus. The included texts were cleaned by removing abstracts, notes, appendices, examples, longer quotations, bibliographies, tables, figures, and subsequently converted to plain-text format. To neutralize the impact of uneven word count across the two disciplines and linguacultural backgrounds as well as to ensure comparability with data reported in other studies, raw frequencies were normalized to frequencies per 10,000 words. The former are reported in the Appendix and the latter, in Tables 2 to 6.

Table 1. Corpus composition

| Sub-corpora | ANG | | POL | | Total | |
|---|---|---|---|---|---|---|
| | RAs | Words | RAs | Words | RAs | Words |
| MED | 30 | 90,679 | 30 | 78,142 | 60 | 168,821 |
| PSY | 30 | 192,183 | 30 | 137,676 | 60 | 329,859 |
| Total | 60 | 282,862 | 60 | 215,818 | 120 | 498,680 |

The RAs by Anglophone authors were taken from high-impact international journals, i.e. for the MED: *Cancer Treatment and Research Communications, International Journal of Surgery Open, Journal of Orthopaedics, The Lancet Haematology*, and *Infection, Disease & Health*; for the PSY: *Acta Psychologica, Additive Behaviors Report, Child Abuse & Neglect, Journal of Applied Developmental Psychology*, *Psychology of Sport and Exercise*. The RAs by Polish scholars were extracted from national journals indexed by SCOPUS and/or Index Copernicus for the MED: *Acta Angiologica, Advances in Clinical and Experimental Medicine, Nowotwory. Journal of Oncology, Cardiology Journal*, *Medical Research Journal*; as well as ERIH Plus for the PSY: *Adavances in Cognitive Psychology, Creativity. Theories – Research – Applications, Polish Psychological Bulletin, Polskie Forum Pscyhologiczne*, *Roczniki Psychologiczne. Annals of Psychology*.

The collected articles generally followed the IMRD framework (Swales 2004) and the distinct sections were marked by explicit headings. It has to be noted, however, that the rhetorical moves typical of the Conclusion (i.e. summarizing the study, evaluating the study, deductions from the research) were often identified in the Discussion. This was usually observed in the medical RAs, where the former section often crosses over to the latter one (Nwogu 1997). Therefore, to ensure the comparability of results across the sub-corpora, if the Conclusion constituted a separate section, it was coded as part of the Discussion.

The corpus was scanned with *WordSmith Tools* 6.0 (Scott 2012) for the occurrences of 110 LAs (see the Appendix), as distinguished by Liu (2008). To decide whether the extracted LA items indeed functioned as linking adverbials, they were processed manually together with the co-text. Special attention was devoted to those items that, in previous studies (Liu 2008; Peacock 2010; Gao 2016), were found to not always function as LAs (e.g. *further studies*, *too smart*, *instead of*). The cross-disciplinary and cross-cultural differences in LA use were tested for statistical significance with the log-likelihood test, which is useful for frequency comparisons between corpora of different sizes, without bias against low-frequency words (Rayson et al. 2004). The significance threshold was set at the standard value of $p<0.05$. The calculations were performed on the raw numbers reported in the Appendix, using the *UCREL Significance Test System* (Hardie ©1993-2014). As suggested by Rayson (n.d.), "the higher the G2 value, the more significant is the difference between two frequency scores".

## 3. Results and discussion

82 different LAs with a total of 5241 tokens were identified in the whole corpus. Regarding the cross-disciplinary analysis, Table 2 shows that LAs are significantly more prominent in psychology RAs than in medical RAs ($G^2$=174.79, $p$<0.0001[2]), with the former scoring higher rates of LAs in all four semantic categories. The PSY sub-corpus is also marked by a wider variety of LAs: 82 in total (of the 110 items investigated) than the MED sub-corpus: 62 in total. These findings reflect the trend observed by Peacock (2010) and Gao (2016: 14) that "soft non-science disciplines have higher use of LAs than hard science disciplines". This high incidence of LAs in psychology articles could be attributed to the more discursive nature of the soft fields that focus on qualitative features of the object of study, thus incorporating a wealth of ideas that need to be skilfully combined together to counteract the vagueness of research variables and the diversity of outcomes. It is worth noting, however, that adversative LAs, which convey "the most complex of all semantic relations that may hold between parts of a discourse", show no statistically significant difference ($G^2$=3.05, $p$=0.0807), thus possibly reflecting their importance to both disciplines (Kortmann 1991: 161).

What both sub-corpora have in common is the same order of LA categories in terms of their frequency rates, with the additive type being the most frequent, followed by adversative, causal/resultative and sequential linkers. This finding concurs with those of Lei (2012) and Gao (2016) who concluded that additive relations are popular in academic writing, possibly because they allow "to

[2] Very low p-values are represented as <0.0001.

introduce explanatory information regarding the topic of discussion" (Gao 2016: 19). Additive LAs are particularly frequent in the PSY, which is in consonance with the need to provide an elaborate theoretical and methodological framework that the readers can accept as the basis for asserting an argument.

Cross-cultural variation is statistically significant in the MED ($G^2$=13.18, $p$=0.0002), where Anglophone authors employ fewer LAs, and in the PSY ($G^2$=16.73, $p$<0.0001), where they employ more LAs. The preferences for LA use of Anglophone scholars concur with the disciplinary trends reported above, testifying to a greater awareness among these authors of how the patterns of knowledge production in different fields translate into their writing practices. Only the causal/resultative category shows no significant variation in either of the two cultural sub-corpora, though in both disciplines it is more numerous in the ANG texts.

Table 2. Frequency of use of LA categories in the sub-corpora

| Linking adverbials | Medicine | ANG | POL | Psychol-ogy | ANG | POL |
|---|---|---|---|---|---|---|
| Additive | 35.5 | 28.1 | 44.2 | 57.4 | 60.3 | 53.4 |
| Adversative | 21.6 | 19.0 | 24.6 | 24.2 | 25.9 | 21.7 |
| Causal/resultative | 12.7 | 13.7 | 11.5 | 20.9 | 21.2 | 20.4 |
| Sequential | 8.7 | 10.4 | 6.7 | 15.9 | 17.5 | 13.72 |
| Total | 78.7 | 71.4 | 87.2 | 118.5 | 125.1 | 109.3 |

The distribution of LAs across the rhetorical sections of RAs (Figures 1 and 2) reveals that LAs peak in Discussions, where they serve to link the study's findings with a plausible explanation of their significance and implications. LAs are also frequently used in Introductions, where authors strive to clarify their argument, carefully outlining their own line of reasoning for readers, but the rate of LAs is lower in the Methods and Results sections, where research practices are described rather than critically analysed.

In line with the interpretative and reiterative character of the soft sciences, LAs are more prominent in all rhetorical sections of psychology RAs than in medical RAs. Regarding cross-cultural variation, Anglophone medical authors make a greater effort to guide readers through the text only in the Methods section, where they rely mainly on additive and sequential LAs logically organising the study design to ease the reader's understanding of its rationale and enable them to replicate it and verify the results. Methods sections in the PSY-ANG show a similar tendency, which perhaps reflects an overall deep concern of Anglophone authors for the transparency and linearity of the adopted

methodological approach, but also for the cogency of logical argumentation in soft sciences discourse.

Another interesting result is the preponderance of adversative LAs in the Introductions of the MED-ANG texts, which diverges from the tendency observed in the other RA sections across the corpus, namely, for additive items to be the most numerous. Adversative LAs are one of the main linguistic features of Move 2 in the schematic structure of information in the Introduction section of the medical RA which is concerned with reviewing related research (Nwogu 1997: 127). Also, "today's medical writers tend to provide more background information" in Introductions to enhance their credibility as knowledgeable scholars in the field (Li and Ge 2009: 97). This often involves contrasting aspects of previous knowledge, dismissing minor research problems and introducing alternative ones, all of which is aided by the use of adversative LAs.

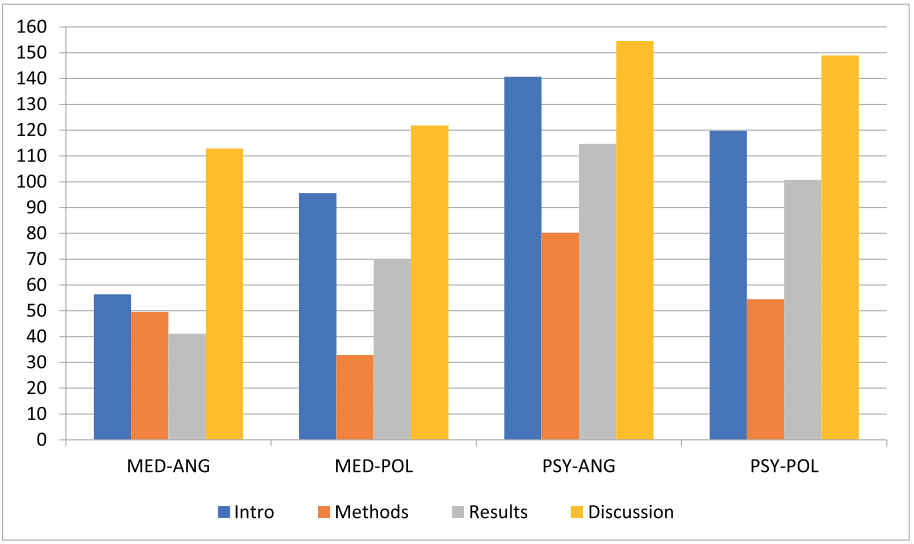


Fig. 1. Distribution of LAs across the rhetorical sections of RAs (per 10,000 words)

The following sections will present the results of the doubly contrastive analysis of all the LA (sub)categories included in the analytical framework. The distribution of the different subcategories of the four main types of LAs will be summarized in Tables 3 to 6.

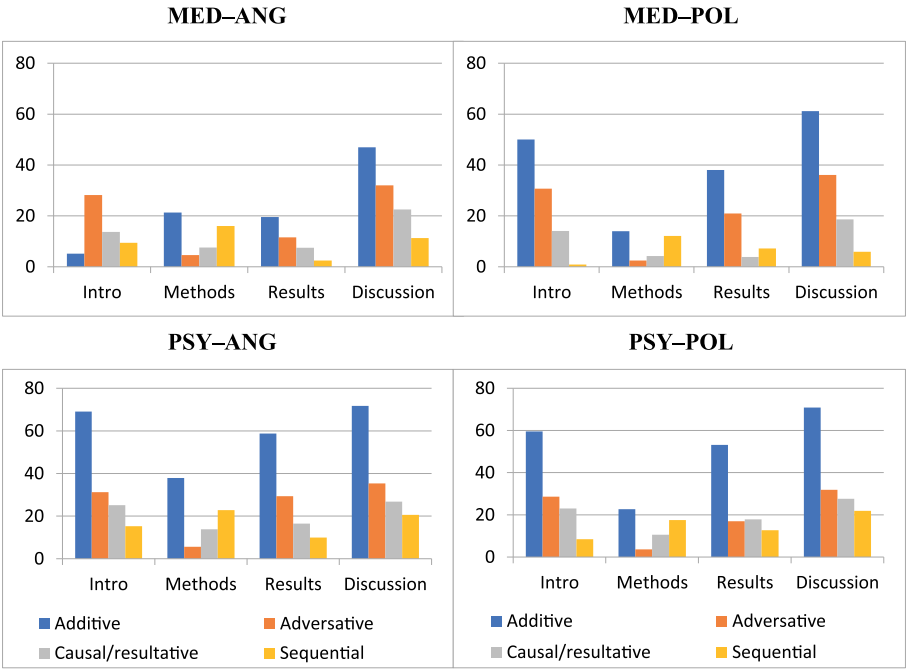


Figure 2. Distribution of the four categories of LAs across the sections (per 10,000 words)

### 3.1. Additive LAs

Additive LAs signal that one idea is being added to another and are the most frequent category. Their rate is significantly higher in the PSY than in the MED (57.4 vs 35.5; $G^2$=112.56, $p$<0.0001). In fact, soft disciplines are concerned with particulars and qualities, which need to be comprehensively elucidated to have the desired impact, whereas hard disciplines are concerned with universals and quantities, which are more concrete and self-explanatory in their nature. From a cross-cultural perspective, additives are significantly more numerous in the ANG component of the PSY (60.3 vs 53.4; $G^2$=6.65, $p$=0.0098) and in the POL component of the MED (44.2 vs 28.1; $G^2$=30.59, $p$<0.0001). The greater prominence of additives in the Polish medical RAs may result from the tendency of their authors to make digressions aimed at providing additional theories or perspectives. Given the local context of publication, Polish medical writers may find it necessary to firmly embed their research in a larger theoretical framework, thus emphasizing its universal applicability.

Table 3. Additive LAs across the sub-corpora

| Additive | Medicine | ANG | POL | Psychology | ANG | POL |
|---|---|---|---|---|---|---|
| emphatic | 30.56 | 24.04 | 38.13 | 37.83 | 37.36 | 38.49 |
| apposition/reformulation | 3.37 | 2.86 | 3.96 | 18.12 | 20.81 | 14.38 |
| similarity/comparative | 1.65 | 1.21 | 2.17 | 1.51 | 2.18 | 0.58 |

### *3.1.1. Emphatic*

Emphatic LAs are the most common subcategory of additives, possibly because they strengthen the argument by highlighting new information that will make the presented idea more logically valid. This seems to be particularly important in the PSY, where the rate of emphatic additives is significantly higher than in the MED ($G^2$=17.03, $p$<0.0001). Attempting to counterbalance the often vague nature of the phenomena investigated by the discipline, psychology authors find it necessary to expand what has been already accounted for with additional ideas (1) or even use two emphatic LAs in one sentence when introducing interpretations for the obtained results (2).

*Collectively, findings pertaining to the physiological correlates of flow in exercise are equivocal. Furthermore, due to the variance in the physiological and flow measures employed, it is difficult to draw firm conclusions at present.* (PSY-ANG)

*Low neuroticism and lack of protective parental attitudes may be factors which determine the decision-making measure of forgiveness. Moreover, the results observed also indicate that strains and conflicts in relationship with God may reduce tendency to forgive.* (PSY-POL)

From a cross-cultural perspective, emphatic LAs show higher frequencies in the POL sub-corpora, which may be related to the defensive position adopted by Polish authors (3), who try "to shun the responsibility for misreadings of their formulations, to anticipate criticisms" by emphatically introducing new considerations in an argument (Duszak 1994: 307). The difference is significant in the MED ($G^2$=27.13, $p$<0.0001) and insignificant in the PSY ($G^2$=0.27, $p$=0.6019).

*[…] due to concerns regarding long-term clinical safety all patients after BVS implantation should be closely monitored. Additionally, data from ongoing trials should be made available in the public domain at regular intervals.* (MED-POL)

### *3.1.2. Apposition/reformulation*

Apposition/reformulation LAs are significantly more frequent in the PSY ($G^2$=230.31, $p$<0.0001), where their rate is significantly higher in the Anglophone rather than Polish RAs ($G^2$=18.74, $p$<0.0001), whereas in the MED, they show no significant cross-cultural variation ($G^2$=1.50, $p$=0.2210). This subcategory of LAs restates more explicitly what has been already stated (4) or provides examples that develop more general ideas (5), both of which correlate with the reiterative character of the knowledge base in the soft discipline of psychology. The lower number of apposition/reformulation LAs in the PSY-POL sub-corpus may stem from the reader-responsible nature of Polish academic discourse, which makes it the reader's duty to exert every effort to understand the writer's message (Warchał, 2015: 20-21). This seems to be partly generated by the low occurrence of the adverbial *i.e.* (POL: 4.86 vs ANG: 11.13), which introduces a more comprehensible version of what has been already stated (6).

*Nordin and Cumming (2005) interviewed 250 elite and non-elite dancers, asking them how they imaged. By "how" they meant the complexity of the imagery they used, and layering, that is, creating a basic image of a skill and then adding qualitative (contextual) elements.* (PSY-ANG)
*Memories change with time and are like constructions which are influenced by current attitudes, beliefs, and available information. For example, the present mood affects the memory of the past.* (PSY-POL)
*Additionally, the mechanism from power to action, i.e. active orientation towards action, has an increasing effect on broadly understood sexual expansiveness.* (PSY-POL)

### *3.1.3. Similarity/comparative*

Similarity/comparative LAs are the least frequent subcategory of additives and show no significant cross-disciplinary variation ($G^2$=0.14, $p$=0.7042). From a cross-cultural perspective, they are significantly more numerous in the PSY-ANG articles ($G^2$=15.39, $p$<0.0001), whose authors may be more prone to providing analogous examples for supporting purposes (7). The MED shows no cross-cultural variation ($G^2$=2.34, $p$=0.1258).

*Lee et al. (2016) found no significant relationship between flow intensity and age in a single exergame session. Similarly, Marston et al. (2016) observed no significant difference in flow intensity between different age groups in exergaming.* (PSY-POL)

### 3.2. Adversative LAs

Adversative LAs are the only category that shows no significant cross-disciplinary variation ($G^2$=3.05, $p$=0.0807), but it is significantly more numerous in the Anglophone component of the PSY ($G^2$=6.03, $p$=0.0140) and in the Polish component of the MED ($G^2$=6.08, $p$=0.0136). Adversative relations signal contrasts, differences and reservations about what has been expressed in the preceding discourse (Biber et al. 1999: 878), therefore they seem more suitable for the intrinsically rhetorical and argumentative nature of knowledge in the soft sciences. Yet, they are also "often etymologically related to expressions dealing with quantity" and are closely linked with "purely procedural meanings" (Winterstein 2016: 1, 5). Their more frequent use in Polish medical RAs can be tentatively explained by a propensity for a detailed description of the adopted research methodology, which, as Duszak (1994) suggests, is believed to help avoid potential criticism from readers.

Table 4. Adversative LAs across the sub-corpora

| Adversative | Medicine | ANG | POL | Psychology | ANG | POL |
|---|---|---|---|---|---|---|
| proper adversative/ concessive | 15.04 | 12.9 | 17.53 | 16.91 | 17.95 | 15.47 |
| contrastive | 3.25 | 2.97 | 3.58 | 3.36 | 3.59 | 3.05 |
| correction | 0.53 | 0.55 | 0.51 | 1.27 | 1.45 | 1.01 |
| dismissal | 2.84 | 2.64 | 3.07 | 2.63 | 2.96 | 2.17 |

#### *3.2.1. Proper adversative/concessive*

Proper adversative/concessive LAs express reservation about the preceding unit of discourse. This can be seen in (8), where the sentence starting with *nevertheless* denies the implicit assumption that 'if family studies have a long tradition in psychology, then it is not worth continuing to explore this topic' evoked in the previous sentence.

*Family studies have a long tradition in psychology. Nevertheless, it is worth continuing to explore this topic, because the world around us is changing and so is the family*. (PSY-POL)

Such items are the most frequent subcategory of adversatives and also the only one to show significant cross-cultural variation, but solely in the MED sub-corpus, where their frequency is higher in the Polish RAs ($G^2$=5.95, $p$=0.0147). The difference is not significant within the PSY sub-corpus ($G^2$=2.94, $p$=0.0864),

where the items are only slightly more numerous than in the MED ($G^2$=2.43; p=0.1191). The greater prominence of concessive LAs in the Polish medical RAs may suggest a tendency to develop scientific argumentation by drawing on "the experience of colliding with a barrier and overcoming its resistance" (Danylchenko 2020: 36), which may result from a more urgent need to surmount various obstacles involved in the research process (9). This may be also linked with high intellectualisation of academic discourse in Poland, which Duszak (1994: 307) attributes to the propensity of scholars for "preparing the tools", that is, for explaining explicitly and elaborately the conceptual-terminological apparatus of research and defining precisely the key terms.

*Based on our data, univariate analysis confirmed the significant relationship between treatment with GP IIb/IIIa inhibitors before and during PCI and the rate of periprocedural deaths, no-reflows and all complication counts in the overall group of patients undergoing PCI (p < 0.001 in all comparisons). However, multivariable analysis did not confirm such a relationship*. (MED-POL)

### *3.2.2. Contrastive*

Contrastive LAs establish links between contradictory ideas, attempting to explain difficult or seemingly unlikely combinations of factors involved in the discussed phenomena (10). They are relatively rare in the corpus and show no significant cross-disciplinary ($G^2$=0.04, $p$=0.8441) or cross-cultural variation (MED: $G^2$=0.47, $p$=0.4925; PSY: $G^2$=0.70, $p$=0.4024).

*People reported exercising for 49 min per day, on average. In contrast, people reported intending to exercise for nearly an hour the next day*. (PSY-ANG)

### *3.2.3. Correction*

Correction LAs are barely represented in the corpus, yet their rate is significantly higher in the PSY than in the MED ($G^2$=6.68, $p$=0.0097). From a cross-cultural perspective, they are more prominent in the Anglophone sub-corpora, but the difference is insignificant either in medicine ($G^2$=0.01, $p$=0.9116) or in psychology ($G^2$=1.25, $p$=0.2635). The greater prominence of correction LAs in psychology may stem from their rhetorical potential to amend the main line of argumentation by negating one idea in favour of another that is more clear and valid (11). In the soft disciplines, "what counts as adequate explanation is less assured, interpretative variation increases", which justifies reliance on alternative views (Hyland 2006: 37). This may also explain why correction LAs are more readily chosen by Anglophone authors, one of whose

main concerns is to ensure clarity as well as "rational argument supported by evidence" (Bennett 2009: 52).

*WM is not simply about storing static information and executing processes on the information system. Rather, WM is a coordinative system that provides access to information by binding elements or chunks of elements (Cowan, 2010) to positions within a relational schematic (Oberauer, 2009).* (PSY-ANG)

#### *3.2.4. Dismissal*

Dismissal LAs show no significant cross-disciplinary ($G^2$=0.17, $p$=0.6772) or cross-cultural variation (MED: $G^2$=0.27, $p$=0.6064; PSY: $G^2$=1.92, $p$=0.1656). Their main function is to indicate that some idea is not affected by the particular detail mentioned, which allows the author to mention a necessary but undesirable factor while simultaneously downplaying its role, and highlight another claim that they consider important (12).

*Despite the existing limitations, the results of our study show that this regimen is safe in patients with newly diagnosed myeloma.* (MED-ANG)

### 3.3. Causal/resultative LAs

Causal/resultative LAs establish cause-and-effect relations between units of discourse. They show significant cross-disciplinary variation, as they are more prominent in psychology than in medicine (20.9 vs 12.7; $G^2$=43.67, $p$<0.0001). It may be that the fuzzy nature of psychological knowledge induces "the presence of multiple explanations for a phenomenon", at the core of which often lies the specification of causes that have led to a particular event (Rosman et al. 2017: 168). Cross-cultural variation is insignificant either in the PSY ($G^2$=0.21, $p$=0.6437) or in the MED ($G^2$=1.70, $p$=0.1920). Both groups of scholars seem to be aware that causal/resultative relations reflect the actual connections between phenomena occurring in objective reality and are generally fundamental to the discursive representation of knowledge.

Table 5. Causal/resultative LAs across the sub-corpora

| Causal/resultative | Medicine | ANG | POL | Psychology | ANG | POL |
|---|---|---|---|---|---|---|
| general causal | 11.72 | 12.13 | 11.26 | 19.94 | 20.03 | 19.82 |
| conditional causal | 1.00 | 1.65 | 0.25 | 0.97 | 1.19 | 0.65 |

### *3.3.1. General causal*

General causal LAs are significantly more frequent in the PSY sub-corpus ($G^2$=46.80, $p$<0.0001), where they help writers to explicitly state the expected conclusion (13) or establish a logical link between evidence and the writer's claim (14). Their lower incidence in medicine may be associated with the esteem it holds for "an objectivist ideal of science", which allows facts to speak for themselves, thereby exempting the author from suggesting to readers what they are supposed to deduce from the data (Fløttum et al. 2006: 261). Cross-cultural variation is not statistically significant in either the PSY ($G^2$=0.02, $p$=0.8972) or the MED ($G^2$=0.27, $p$=0.6029).

*Any product of human activity can be creative. Therefore, we can speak of a creative essay, idea, solution or a creative dish.* (PSY-POL)

*Healthcare professionals talk about patients in their presence yet without their participation, speaking about "them", that is in the third person. This phenomenon is common in hospitals in Poland. Consequently, patients are not considered partners.* (PSY-POL)

### *3.3.2. Conditional causal*

Conditional causal LAs indicate that whenever one phenomenon occurs, then the other also occurs (15). They are infrequent in the corpus and show no cross-disciplinary variation ($G^2$=0.02, $p$=0.9012), but their frequencies are higher in the Anglophone sub-corpora. The difference is significant in the MED ($G^2$=9.41, $p$=0.0021) and insignificant in the PSY ($G^2$=2.55, $p$=0.1100).

*If a finer time scale was used in the model instead, then it would be more appropriate to use a smoother which allows for greater variations in the smoothed values.* (MED-ANG)

## 3.4. Sequential LAs[3]

Sequential LAs signal that units of discourse follow logically in a sequence. Their rate is significantly higher in the PSY than in the MED (15.9 vs 8.7; $G^2$=46.11, $p$<0.0001). Knowledge in psychology is structured quite loosely, concepts often lack clear definitions and many theories are marked by inconsistency (Rosman et al. 2017), therefore, if readers are to realise where distinct ideas end and begin, they need to be signposted from one piece of information to another. From a cross-cultural perspective, sequential LAs show significantly higher frequencies in the ENG sub-corpora (MED: 10.4 vs 6.7;

[3] Transitional sequentials, which introduce information that is only loosely related to the main discussion, are absent from the corpus and are thus not discussed.

$G^2$=6.65, $p$=0.0099, PSY: 17.5 vs 13.72; $G^2$=7.59, $p$=0.0058), which may be due to the fact that in the Anglophone tradition "it is the writer who is primarily responsible for making clear, comprehensible statements and for organisation of ideas in a way which is easy to follow" (Warchał 2015: 21).

Table 6. Sequential LAs across the sub-corpora

| Sequential | Medicine | ANG | POL | Psychology | ANG | POL |
|---|---|---|---|---|---|---|
| enumerative/listing | 7.16 | 8.93 | 5.11 | 14.52 | 16.33 | 11.98 |
| simultaneous | 0.23 | 0.22 | 0.25 | 0.39 | 0.31 | 0.50 |
| summative | 1.36 | 1.32 | 1.40 | 1.06 | 0.93 | 1.23 |

### *3.4.1. Enumerative/listing*

Enumerative/listing LAs are the most numerous subcategory of sequentials, possibly because they arrange pieces of information in an order intended by the writer, helping to structure the discourse. They thus seem equally important in both disciplines, but are significantly more numerous in the PSY than in the MED ($G^2$=54.75, $p$<0.0001), which may be due to text-internal variation in their use across the two disciplines. In the PSY, enumerative/listing LAs occur most frequently in Discussions (32.9%), where they often introduce series of interpretations of the results (16). In the MED, they are mostly used in Methods (34.7%) to indicate a sequential relationship between consecutive procedural steps (17). The LAs are also more prominent in the ANG sub-corpora (MED: $G^2$=8.73, $p$=0.0031; PSY: $G^2$=10.67, $p$=0.0010).

*The data are consistent with the correlations between power in professional relations and a sense power in sexual relations. Firstly, a sense of power is, to a certain extent, dependent on the actual power […]. Secondly, a stronger sense of power […] may reinforce all consequences of having power. Thirdly, the sense of power in various relations is interrelated to a certain degree.* (PSY-POL)

*Blood was drawn with venipuncture and was then clotted (30') and centrifuged (15', 720 × g).* (MED-POL)

### *3.4.2. Simultaneous*

Simultaneous LAs are barely represented and show no significant cross-cultural ($G^2$=0.86, $p$=0.3535) or cross-disciplinary variation (MED: $G^2$=0.02, $p$=0.8817; PSY: $G^2$=0.77, $p$=0.3800). They indicate that different phenomena coincide with one another in some way (18).

*An inspired activity takes place when the teacher, […], creates an opportunity for the children to undertake various actions, at the same time encouraging them to participate in them.* (PSY-POL)

### *3.4.3. Summative*

Summative LAs are infrequent in the corpus and show no significant cross-disciplinary ($G^2$=0.85, $p$=0.3564) or cross-cultural variation (MED: $G^2$=0.02, $p$=0.8823; PSY: $G^2$=0.66, $p$=0.4151). They are used to conclude the previous discourse (19) or to reiterate the main ideas (20), which is possibly why they most often occur in Discussions.

*In conclusion, there is a changing trend in the management of dis-placed clavicle fractures.* (MED-ANG)

*Self-regulatory biases include the above-mentioned tendency to overestimate the probability of one's future success (Weinstein, 1980). In short, these are biases that help individuals to undertake social and cognitive activity and pursue their goals […]* (PSY-POL)

## 4. Conclusion

The analysis shows that disciplinary and linguacultural constraints impact on LA use in English-medium RAs. Linkers are significantly more frequent in psychology than in medicine, which is in line with previous research on the non-science/science difference in this regard (e.g. Peacock 2010; Hůlková 2017). Yet, both disciplines show a preference for additives and do not differ much in their use of adversatives. Cross-cultural variation has no effect only on causal/resultative LAs, a finding that corroborates Gao's (2016: 23) observation that "LA use in English academic writing is affected by writers' cultural or linguistic backgrounds". Generally, the observed differences reflect a greater awareness of Anglophone authors of the diverse epistemologies, methods and conventions behind the disciplines considered in the study. This finds its reflection in the number of citable documents by Anglophone scholars, published in the years 1996-2021 and included in the Scopus database, where publication rates in psychology are the highest for such countries as the USA and the UK, similarly as in medicine, which is dominated by papers originating in the USA and those from the UK are ranked 3rd (SCImago 2022). It thus seems that Anglophone writers understand that the heterogeneous international readership they address may need more precise guidance regarding the less absolute nature of psychology knowledge. Still, they do not invest much effort into creating complex networks of adverbial cohesion in the medical RAs, realizing that "the way medical

researchers conduct their work and report their findings" provided "a disciplinary mould that transcends national culture" (Dahl 2004: 1822). Polish authors, who target local, more homogeneous intellectual communities, seem to be closer to national academic culture, which presumes that more focus should be given to the content than to the organization of the argument. This is in accordance with earlier findings on Polish researchers' style of writing (e.g. Golebiowski 2007; Donesch-Jeżo 2011; Duszak and Kowalski 2015). However, the greater frequency of LAs in their medical RAs, as compared to the Anglophone RAs, suggests that they have made stylistic and rhetorical accommodations to satisfy the norms of academic English-medium discourse but failed to acknowledge the demands of disciplinary writing.

Despite some limitations, particularly, isolated instances of inaccuracies relating to the correct identification of LAs, these findings provide important implications for users of English for Academic Purposes. Aspiring to publish their research in high-impact international journals, Polish authors should become competent in fuelling their texts with a constellation of LAs selected in line with diverse cultural, disciplinary and publication contexts. Thus, the presented results can inform the design of teaching materials aimed at increasing experienced and novice L2 writers' awareness of the interaction between culture- and discipline-driven rhetorical choices in the English-medium RA.

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## Appendix. Linking adverbials across the sub-corpora (raw numbers)

| Linking Adverbials | MED-ENG | MED-POL | PSY-ENG | PSY-POL |
|---|---|---|---|---|
| **Additive** | **255** | **346** | **1160** | **736** |
| ***Emphatic*** | ***218*** | ***298*** | ***718*** | ***530*** |
| above all | ——— | 1 | ——— | 4 |
| additionally | 27 | 22 | 32 | 27 |
| again | 3 | 1 | 30 | 14 |
| also | 137 | 170 | 407 | 361 |
| as I/they/you say | ——— | ——— | ——— | ——— |
| as well | 1 | 11 | 7 | 13 |
| as a matter of fact | ——— | ——— | ——— | 1 |
| besides | ——— | 5 | ——— | 7 |
| in addition (to) | 18 | 10 | 75 | 24 |
| further | 16 | 7 | 92 | 13 |
| furthermore | 10 | 28 | 37 | 20 |
| moreover | 6 | 40 | 31 | 39 |
| not to mention | ——— | ——— | ——— | 1 |
| of course | ——— | ——— | 2 | 2 |
| to crown it all | ——— | ——— | ——— | ——— |
| to cap it all | ——— | ——— | ——— | ——— |
| too | ——— | 1 | 5 | 2 |
| what's (is) more | ——— | 2 | ——— | 2 |
| ***Apposition/Reformulation*** | ***26*** | ***31*** | ***400*** | ***198*** |
| i.e. | 10 | 20 | 214 | 67 |
| that is | 1 | ——— | 36 | 49 |
| that is to say | ——— | ——— | ——— | ——— |
| in other words | ——— | ——— | 6 | 12 |
| for example | 10 | 6 | 112 | 44 |
| for instance | 1 | 4 | 25 | 19 |
| for one thing | ——— | ——— | ——— | ——— |

| Linking Adverbials | MED-ENG | MED-POL | PSY-ENG | PSY-POL |
|---|---|---|---|---|
| namely | 4 | 1 | 7 | 7 |
| to put it another way | ——— | ——— | ——— | ——— |
| to put it bluntly/mildly | ——— | ——— | ——— | ——— |
| what I'm saying is | ——— | ——— | ——— | ——— |
| what I mean is | ——— | ——— | ——— | ——— |
| which is to say | ——— | ——— | ——— | ——— |
| ***Similarity Comparative*** | ***11*** | ***17*** | ***42*** | ***8*** |
| alternatively | 2 | ——— | 3 | ——— |
| by the same token | ——— | ——— | ——— | ——— |
| correspondingly | ——— | ——— | ——— | 1 |
| likewise | ——— | 5 | 10 | 1 |
| similarly | 9 | 12 | 29 | 6 |
| **Adversative** | **173** | **193** | **499** | **299** |
| ***Proper adversative/Concessive*** | ***117*** | ***137*** | ***345*** | ***213*** |
| at the same time | 1 | 2 | 2 | 26 |
| however | 97 | 115 | 251 | 163 |
| nevertheless | 4 | 11 | 10 | 5 |
| nonetheless | 2 | 5 | 8 | ——— |
| of course | ——— | ——— | 2 | 1 |
| then again | ——— | ——— | ——— | ——— |
| though | 5 | 4 | 61 | 5 |
| yet | 8 | ——— | 11 | 13 |
| ***Contrastive*** | ***27*** | ***28*** | ***69*** | ***42*** |
| actually | 4 | ——— | ——— | 2 |
| as a matter of fact | ——— | ——— | ——— | 1 |
| conversely | 1 | 1 | 4 | 2 |
| in/by comparison | 5 | ——— | 2 | ——— |
| in/by contrast | 9 | 5 | 43 | 11 |
| in fact | 3 | 2 | 6 | 9 |
| in reality | ——— | ——— | ——— | 1 |

| Linking Adverbials | MED-ENG | MED-POL | PSY-ENG | PSY-POL |
|---|---|---|---|---|
| on the other hand | 5 | 20 | 14 | 16 |
| ***Correction*** | ***5*** | ***4*** | ***28*** | ***14*** |
| instead | 2 | 1 | 11 | 3 |
| on the contrary | ——— | 3 | 2 | ——— |
| rather | 3 | ——— | 15 | 11 |
| ***Dismissal*** | ***24*** | ***24*** | ***57*** | ***30*** |
| admittedly | ——— | ——— | ——— | ——— |
| after all | ——— | ——— | ——— | ——— |
| all the same | ——— | ——— | ——— | ——— |
| anyhow | ——— | ——— | ——— | ——— |
| anyway | ——— | ——— | 1 | ——— |
| at any rate | ——— | ——— | ——— | ——— |
| despite X/this/that | 21 | 22 | 49 | 20 |
| in any case | ——— | ——— | ——— | 1 |
| in spite of this/that/X | 3 | ——— | 3 | ——— |
| still | ——— | 2 | 4 | 9 |
| **Causal/Resultative** | **125** | **90** | **408** | **282** |
| ***General causal*** | ***110*** | ***88*** | ***385*** | ***273*** |
| accordingly | 1 | 6 | 6 | 3 |
| as a consequence (of) | ——— | ——— | 1 | 9 |
| as a result (of) | 3 | 3 | 25 | 19 |
| because of it/this/that/X | 15 | 8 | 40 | 33 |
| consequently | 4 | 6 | 9 | ——— |
| in consequence | ——— | ——— | ——— | 2 |
| hence | 1 | 5 | 15 | 14 |
| naturally | ——— | ——— | ——— | 3 |
| so | 19 | 9 | 37 | 24 |
| therefore | 38 | 19 | 94 | 90 |
| thus | 29 | 32 | 158 | 76 |
| ***Conditional causal*** | ***15*** | ***2*** | ***23*** | ***9*** |
| all things considered | ——— | ——— | ——— | 3 |

| Linking Adverbials | MED-ENG | MED-POL | PSY-ENG | PSY-POL |
|---|---|---|---|---|
| in such a case/cases | 1 | 1 | ——— | 9 |
| in that case | ——— | ——— | 1 | 19 |
| otherwise | 4 | ——— | 2 | 33 |
| then | 10 | 1 | 20 | ——— |
| **Sequential** | **95** | **53** | **338** | **189** |
| ***Enumerative/listing*** | ***81*** | ***40*** | ***314*** | ***165*** |
| afterwards | ——— | 4 | ——— | ——— |
| eventually | ——— | ——— | 1 | 2 |
| first(ly) | 24 | 5 | 58 | 49 |
| first and foremost | ——— | ——— | 1 | ——— |
| first of all | ——— | 1 | ——— | 7 |
| in the first place | ——— | ——— | ——— | ——— |
| to begin with | ——— | ——— | ——— | ——— |
| second(ly) | 4 | 2 | 36 | 22 |
| third(ly) | 2 | ——— | 18 | 6 |
| fourth(ly) | ——— | ——— | 6 | 1 |
| finally | 11 | 3 | 65 | 34 |
| last(ly) | ——— | ——— | 13 | 2 |
| last of all | ——— | ——— | ——— | ——— |
| next | ——— | 5 | 8 | 10 |
| then | 40 | 20 | 108 | 32 |
| ***Simultaneous*** | ***2*** | ***2*** | ***6*** | ***7*** |
| at the same time | 1 | 2 | 3 | 6 |
| in the meantime | ——— | ——— | ——— | ——— |
| meanwhile | 1 | ——— | 3 | 1 |
| ***Summative*** | ***12*** | ***11*** | ***18*** | ***17*** |
| all in all | ——— | ——— | ——— | ——— |
| in a word | ——— | ——— | ——— | ——— |
| in conclusion | 8 | 7 | 6 | 3 |
| in short | ——— | ——— | 1 | 1 |
| in sum(mary) | 2 | 2 | 10 | 7 |

| Linking Adverbials | MED-ENG | MED-POL | PSY-ENG | PSY-POL |
|---|---|---|---|---|
| to conclude | 2 | 2 | ——— | ——— |
| to sum up | ——— | ——— | 1 | 6 |
| to summarize | ——— | ——— | ——— | ——— |
| ***Transitional to another topic*** | ***0*** | ***0*** | ***0*** | ***0*** |
| by the by | ——— | ——— | ——— | ——— |
| by the way | ——— | ——— | ——— | ——— |
| incidentally | ——— | ——— | ——— | ——— |