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The Signaling of Continuative and Contrastive Discourse Relations in English Argumentative Discourse: Corpus-Based and Experimental Perspectives

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This paper examines the linguistic realization of continuative and contrastive discourse relations (DRs) in English argumentative discourse, focusing on both discourse as product and discourse as process. Based on a corpus of 25 argumentative texts with corresponding experimental data stemming from an editing-based task, this study aims to answer the questions of (i) how continuative and contrastive DRs are linguistically realized (i.e., encoded in coherence strands or additionally signaled) in English argumentative discourse, and (ii) how their signaling unfolds during the real-time process of discourse editing. The quantitative analysis of the edited texts shows that contrastive DRs are signaled throughout (e.g., through contrastive discourse connectives), whereas continuative DRs are more frequently encoded only. In addition, the qualitative analysis of the experimental data (i.e., keystroke logging data and corresponding metadata) reveals that while the signaling of contrastive DRs is made manifest right from the start of the editing process across the data, continuative DRs tend to be signaled only at a later stage. This can be explained by the semantic overlap between different types of continuative DRs, which requires that the participants (re-)negotiate the exact nature (and thus the appropriate linguistic signal) of a particular continuative DR more frequently than contrastive DRs, which are clearly interpreted and thus readily signaled as contrastive throughout.

Keywords: continuative discourse relation, contrastive discourse relation, signaling, argumentative discourse, multi-method approach, keystroke logging

1. Introduction

1 Based on the premise that "discourse is a parts-whole configuration in which the whole is more than the sum of its constitutive parts" (Fetzer, 2018a: 400), the analysis of discourse is essentially concerned with the question of how the constitutive parts of discourse, i.e. individual discourse units (henceforth DUs), are combined and connected with each other in order to form a coherent whole. In general terms, DUs are related to each other in terms of discourse relations (henceforth DRs), which can be defined as logical relations holding between two (or more) DUs. With regard to their linguistic realization, DRs may be either encoded in DU-internal coherence strands (see Givón, 1993) only, or they may be additionally signaled through various linguistic devices such as discourse connectives. The analysis of DUs and their connectedness in terms of DRs may be approached from two different perspectives, depending on whether the focus is on discourse as product (i.e., the final product resulting from discourse production) or on discourse as process (i.e., the actual process of discourse production).

2 This paper aims to combine these two perspectives by adopting both corpus-based and experimental methods for an investigation of the linguistic realization of two of the cognitively most salient kinds of DRs, i.e. continuative and contrastive DRs, in English argumentative discourse. Previous research (see, e.g., Asr & Demberg, 2012; Fetzer & Speyer, 2012; Zufferey & Gygax, 2016) has shown that contrastive DRs, which indicate a temporary halt in the discourse flow, are more frequently signaled (e.g., through the contrastive discourse connectives *but* and *however* in English), whereas continuative DRs, which indicate that upcoming DUs are temporally, logically and causally continuous with respect to the preceding discourse, are more often left implicit. Based on a corpus of 25 argumentative texts stemming from an editing-based task in which the participants were asked to edit a source text and turn it into a well-formed argumentative text by adding any linguistic material which they considered necessary[1], the present study aims to answer the following questions: (i) how (and how differently) are continuative and contrastive DRs linguistically realized (i.e., encoded or additionally signaled) in the data, and (ii) how does their signaling unfold during the real-time process of discourse editing? This second question will be addressed through an analysis of experimental data (i.e., keystroke logging data and corresponding metadata) that were recorded during the editing-based task. The ultimate aim of the present study is to show that a multi-method approach adopting both corpus-based and experimental perspectives is indeed required in order to provide a comprehensive analysis of discourse and its constitutive parts.

3 The present paper is structured as follows. Section 2 provides a general overview of discourse and DRs, focusing in particular on the dichotomies of discourse as product vs. discourse as process (Section 2.1), as well as continuative vs. contrastive DRs (Section 2.2). The data and methodology underlying the present study are outlined in Section 3. Section 4 presents the quantitative and qualitative results, which are placed in a wider context in the concluding Section 5.

2. Discourse and discourse relations

4 This section provides the theoretical framework of the present study. It first presents two perspectives that discourse can be approached from (i.e., discourse as product and discourse as process) and discusses the methodological implications of these perspectives (Section 2.1). Section 2.2 provides an overview of two of the cognitively most salient kinds of DRs, i.e. continuative and contrastive DRs.

1. This study, which is part of an ongoing large-scale project on the linguistic realization of DRs in English discourse across discourse genres and production formats, is based on the same data as those used in previous research (see, e.g., Fetzer, 2017, 2018b; Hofmockel et al., 2017; Maier et al., 2016), but differs from previous studies in that it additionally provides an analysis of keystroke logging data elicited in the editing-based task, thus allowing for a triangulation of the experimental data.

2.1. Discourse as product vs. discourse as process

5 The question as to how DUs are combined and connected with each other in order to form a coherent whole may be approached by adopting either a top-down or a bottom-up perspective on discourse. On the one hand, the analysis may start from discourse-as-a-whole and then proceed in a top-down manner to provide an account of how discourse-as-a-whole is composed and internally structured in terms of DUs. In this approach, discourse is conceptualized as a product, i.e. a "delimited and static unit of concatenated discourse units" (Fetzer, 2018a: 396). On the other hand, discourse may be analyzed by starting from an individual DU and then proceeding bottom-up, which provides insights into the unfolding process of discourse production [2].

6 The status of discourse as a dynamic construct that can be approached from two perspectives has different methodological implications. Studies focusing on the product (i.e., discourse-as-a-whole) typically adopt a corpus-based approach, taking into account a large number of electronic texts that are analyzed with regard to how (i.e., by means of which linguistic signals) the individual DUs are connected with each other. Such corpus-based approaches make it possible to identify and quantify both the various relations holding between the different DUs within a text and the linguistic devices used to signal these relations (see also Section 2.2). Moreover, the availability of large numbers of texts enables us to compare the internal structure and composition of final text products across different genres and languages. A wide range of electronic corpora that are annotated for DRs have been compiled and made publicly available in recent years, e.g. the Penn Discourse Treebank (Prasad et al., 2019) or the RST (Rhetorical Structure Theory) Discourse Treebank (Carlson et al., 2002) for English texts, the ANNODIS corpus (Afantenos et al., 2012) for French, or the TED-Multilingual Discourse Bank (Zeyrek et al., 2018) covering texts from six different languages (English, Polish, German, Russian, European Portuguese and Turkish).

7 While corpora are useful for identifying, quantifying and comparing discourse-related phenomena across the final products of discourse, they do not provide any information with regard to how these final products have come into existence during the process of discourse production. In order to find out how a text unfolds, and what cognitive processes on the part of the speaker/writer take place, during the real-time process of discourse production, we have to make use of psycholinguistic experiments that enable us to systematically control and manipulate particular variables as well as to access the cognitive factors involved. While numerous discourse-related studies adopting an experimental approach have investigated the dynamic processes taking place during discourse processing (e.g., by means of reading tasks or eye-tracking experiments; see, e.g., Canestrelli et al., 2013; Crible & Pickering, 2020; Sanders & Noordman, 2000; Zufferey et al., 2018), the

2. Systemic Functional Grammar uses the term *logogenesis* to refer to "the creation of meaning in the course of the unfolding of text" (Halliday & Matthiessen, 2014: 601).

dynamics of discourse production have so far been mainly examined by means of narrative tasks in the case of spoken discourse (e.g., story (re-)telling; see, e.g., Dimroth et al., 2010) and keystroke logging experiments in the case of written discourse (see, e.g., Leijten & Van Waes, 2013; Van Waes et al., 2016). While it has to be borne in mind that "cognitive processes can only be inferred indirectly from process data" (Vandermeulen et al., 2020: 113), the additional use of metadata documenting speakers' or writers' negotiations of a text's well-formedness during the process of discourse production provides valuable insights into their underlying cognitive processes, as will be shown in this study.

8 In order to provide a complete picture of discourse and its constitutive parts, discourse-related studies should adopt both a top-down and a bottom-up perspective, thus taking into account both discourse as product and discourse as process. The gap between these two perspectives may be bridged by adopting a multi-method approach, using both corpus research and experimental methods. The combination of these two methods has attracted some attention in discourse-related research in recent years (see, e.g., Mak et al., 2013; Zufferey & Gygax, 2016) and will also be the methodological basis for the present study (see Section 3).

2.2. Continuative vs. contrastive discourse relations

9 DRs are of key importance for the structuring of discourse and the construal of discourse coherence. There has been a large amount of research on DRs over the past few decades, and their classification varies considerably across theoretical frameworks, ranging from 12 relations identified in the Cognitive approach to Coherence Relations (CCR – Sanders et al., 1992) to a total number of 78 relations (divided into 16 categories) used in the RST Discourse Treebank (Carlson et al., 2002). The present study is based on the classification of DRs proposed by Asher and Lascarides' (2003) Segmented Discourse Representation Theory (SDRT) and contextualized by Fetzer (2018b). Within this framework, a general distinction is made between coordinating DRs (e.g., Continuation, Narration or Contrast), which keep the discourse at the same level, and subordinating DRs (e.g., Result, Comment or Elaboration), which yield a hierarchical structure in the discourse. The different types of DRs can be distinguished according to a number of defining conditions and particularized features (for an overview, see Fetzer, 2018b: 23-24).

10 The focus of the present study is on two of the cognitively most salient kinds of DRs, i.e. continuative and contrastive DRs, which differ in their functions with regard to how they indicate how the flow of discourse is to proceed. Continuative DRs (e.g., Continuation, Narration or Elaboration), on the one hand, do not convey a halt in the discourse flow or a shift in perspective but rather indicate that upcoming DUs are causally congruent with preceding DUs and proceed in a temporally and logically linear manner, thus keeping the sequential organization of discourse in order. Contrastive DRs (e.g., Contrast or Corrective Elaboration), on the other hand, convey a temporary halt in the discourse flow and a local shift

in perspective, which requires a reorganization of the sequential ordering of DUs with respect to chronology and/or logic.

11 From a cognitive perspective, continuative and contrastive DRs have been shown to vary with regard to their production and interpretation. Previous research on the cognitive processes involved in discourse processing has shown that language users by default expect upcoming DUs to be causally congruent as well as temporally and logically continuous with respect to the preceding discourse (see, e.g., Asr & Demberg, 2012; Hoek & Zufferey, 2015; Mak & Sanders, 2013; Murray, 1997; Sanders, 2005; Segal et al., 1991). Based on this finding, continuative DRs can be considered to be expected and default (because discourse is proceeding in a temporally, logically and causally continuous manner), whereas contrastive DRs are considered to be non-expected and non-default (because they indicate a temporary halt in the flow of discourse).

12 In very general terms, DRs can be linguistically realized in two different ways: they may be either left implicit (i.e., without any signaling of the respective relation), or they may be additionally signaled by means of various linguistic devices such as discourse connectives, metadiscursive comments or pragmatic word order, that is, DU-initial adjuncts (see Fetzer, 2018b: 21). If there is no signal, the most likely DR is to be inferred by the reader or hearer from the discourse context (see Taboada, 2009), which is usually achieved through DU-internally encoded coherence strands such as referential (dis)continuity, topic (dis)continuity, temporal and aspectual coherence, lexical coherence, etc. (see Givón, 1993), or through particular syntactic features such as parallel constructions (see, e.g., Crible & Pickering, 2020; Das & Taboada, 2018). By contrast, the presence of signals such as discourse connectives has been shown to play an important role for guiding hearers and readers in their inferencing processes and facilitating discourse interpretation (see, e.g., Canestrelli et al., 2013; Crible, 2018; Das & Taboada, 2018; Degand, 2019; Gast, 2019; Sanders & Noordman, 2000; Zufferey, 2014; Zufferey & Gygax, 2016). The differences between continuative and contrastive DRs in terms of their processing are also reflected in their linguistic realization in that contrastive DRs are more frequently signaled (e.g., through the contrastive discourse connectives *but* and *however* in English) in order to ensure speaker-intended interpretation, whereas continuative DRs are more often encoded in DU-internal coherence strands only, as has been shown in numerous corpus-based and/or experimental studies (see, e.g., Asr & Demberg, 2012; Doherty, 2003; Fetzer & Speyer, 2012; Hoek & Zufferey, 2015; Hofmockel et al., 2017; Zufferey & Gygax, 2016).

3. Data and methodology

13 The present study is based on a corpus of 25 argumentative texts stemming from an editing-based task in which the participants (all of whom were adult native speakers of English) were provided with the following source text and asked to turn it into a well-formed argumentative text (by typing it on the keyboard of a target computer).

The solitary monoglots

1. the British seem set on isolation from the world
2. London was a dowdy place of tea-houses and stale rock cakes
3. it's much more exciting
4. I can hear people speaking in all the languages of the world
5. was that Pashto or Hindi
6. I can differentiate Polish from Lithuanian
7. I delight in hearing them mingled with snatches of French, German, Spanish, Italian, Japanese
8. London has become the capital of linguistic diversity
9. one important group seems to be leaving itself out
10. students
11. foreign language learning at Britain's schools has been in decline
12. the number of universities offering degrees in modern languages has plummeted
13. an inquiry is under way
14. the number of teenagers taking traditional modern foreign languages at A-level fell to its lowest level since the mid-90s
15. it's a paradox

14 This source text, which was based on a newspaper commentary from *The Guardian* (Bellos, 2013), had been stripped of almost all syntactically optional linguistic material (e.g., discourse connectives, temporal/spatial adjuncts, etc.) while still retaining the original sequential organization and default configuration of events (see Fetzer, 2017: 279; Hofmockel et al., 2017: 139). The participants were asked to edit the text by adding or deleting any linguistic material which they considered necessary while maintaining the order of the given DUs. The editing-based task was carried out through two production formats, i.e. by individual participants (monads) and by pairs of participants (dyads), yielding a total of 14 monadically edited and 11 co-edited texts.

15 In order to examine at which stage in the process of discourse editing the participants decided to add linguistic material to the unfolding text to signal continuative and contrastive DRs, the present study added keystroke logging data (using the keystroke logging software *PyKeylogger* [version 1.2.1]) for four of the monadically edited texts and for all of the co-edited texts. In writing research, keystroke logging has become a popular and widely used method to observe and study writing processes as they unfold in real time (for an overview, see Lindgren & Sullivan, 2019; Sullivan & Lindgren, 2006). Keyloggers monitor, record and

time-stamp every keystroke pressed on the computer keyboard, including any revisions, deletions, corrections and cursor movements made by writers during the production process. The resulting data do not only provide detailed insights into the dynamics of discourse production and editing, but also enable researchers to gain a better understanding of the complex cognitive processes involved in writing (see Leijten & Van Waes, 2013; Van Waes et al., 2016). In the present study, the keystroke logging data stemming from the 11 co-edited texts were supplemented by metadata, that is, audio recordings which document the dyads' negotiations of what kind of linguistic material they considered necessary to be added to the DUs of the source text in order to jointly construct an argumentative text that is well-formed in their judgment. According to Fetzer (2017: 279), "[t]he requirement to collaborate makes it necessary for the participants to externalize their expectations for well-formed discourse, and to re-negotiate and adapt them accordingly". The triangulation of keystroke logging data and the corresponding audio recordings is thus expected to provide more conclusive insights into the participants' cognitive processes involved during the moment-by-moment process of discourse editing.

16 In sum, the multi-method approach adopted in the present study is expected to yield insightful information (i) about the linguistic realization of continuative and contrastive DRs in English argumentative discourse (= corpus-based approach; focus on discourse as product), and (ii) about the participants' real-time process of discourse editing (= experimental approach; focus on discourse as process). Section 4 provides a comprehensive analysis of the data described above.

4. Results

17 Since a quantitative and qualitative analysis of all continuative and contrastive DRs identified in the 25 (co-)edited texts would go beyond the scope of this paper, the following analysis is based on three pairs of (adjacent) DUs from the source text (see Section 3) that are reproduced here for convenience:

[1] DU 2: London was a dowdy place of tea-houses and stale rock cakes
DU 3: it's much more exciting

[2] DU 8: London has become the capital of linguistic diversity
DU 9: one important group seems to be leaving itself out

[3] DU 11: foreign language learning at Britain's schools has been in decline
DU 12: the number of universities offering degrees in modern languages has plummeted

18 The relations between DU 2 and DU 3 in [1] and between DU 8 and DU 9 in [2] can be interpreted quite clearly as contrastive. In terms of Fetzer's (2018b) classification of DRs, the relation between DU 2 and DU 3 can be categorized

as Contrast, which is defined as expressing semantic dissimilarity between the propositions p_2 (i.e., DU 3 in this case) and p_1 (i.e., DU 2) (see Fetzer, 2018b: 23). This contrastive relation is already encoded within the "bare" DUs 2 and 3 through the particularized features of temporal discontinuity between past tense (*was*) in DU 2 and present tense (*'s*) in DU 3, gradable antonymy between *dowdy* and *stale* in DU 2 and *exciting* in DU 3, and co-referentiality between *London* in DU 2 and *it* in DU 3. The relation between DU 8 and DU 9 is interpreted as Corrective Elaboration, which is defined as semantic dissimilarity with the main eventualities of p_2 (i.e., DU 9 in this case) being a mereological part of the main eventualities of p_1 (i.e., DU 8) (see Fetzer, 2018b: 23-24). This relation is encoded through mereological topic specification between *London* in DU 8 and *one important group* in DU 9, as well as through temporal and aspectual discontinuity between *has become* in DU 8 and *seems to be leaving itself out* in DU 9 (see also Fetzer, 2017; Maier et al., 2016).

19 In contrast to Examples [1] and [2], the relation between DU 11 and DU 12 in [3] is categorized as continuative. This interpretation can be accounted for by the presence of DU-internal coherence strands such as topic continuity (i.e., *foreign language learning* in DU 11 and *modern languages* in DU 12), temporal and aspectual coherence (i.e., *has been in decline* in DU 11 and *has plummeted* in DU 12) as well as lexical coherence (with both *schools* in DU 11 and *universities* in DU 12 belonging to the semantic field of education). Which particular type of continuative DR (e.g., Continuation, Explanation, Result, etc.) can be said to hold between DUs 11 and 12 is subject to negotiation, as will be illustrated further below.

20 The following analysis of the three pairs of DUs introduced above is divided into two parts: Section 4.1 provides an overview of the quantitative results, focusing in particular on the question as to how frequently the continuative and contrastive DRs holding between the respective DUs are signaled (e.g., by means of discourse connectives) in the 25 (co-)edited texts underlying the present study. Section 4.2 examines the keystroke logging and audio data recorded for four monadically edited and eleven co-edited texts in more detail, focusing on the question as to how the signaling of continuative and contrastive DRs unfolds during the real-time process of discourse editing.

4.1. Quantitative analysis

21 This section focuses on the analysis of discourse as product, thus aiming to provide an answer to the question as to how (and how differently) contrastive DRs (Section 4.1.1) and continuative DRs (Section 4.1.2) are linguistically realized in the (co-)edited argumentative texts underlying the present study.

4.1.1. Contrastive discourse relations

22 Any DR which establishes a contrast between two DUs (either through Contrast or Corrective Elaboration) was signaled by means of contrastive discourse connectives, metadiscursive comments and/or pragmatic word order across all 25 (co-)edited texts (see also Fetzer, 2017, 2018b; Maier et al., 2016). This finding does not only seem to

hold true for the argumentative genre of commentary, but also for other discourse genres in English (e.g., personal narratives), as has been shown in further studies on contrastive DRs (see, e.g., Doherty, 2003; Fetzer & Speyer, 2012; Hofmockel et al., 2017; Speyer & Fetzer, 2018).

23 As far as the pairs of DUs examined in the present study are concerned, the contrastive relations holding between DUs 2 and 3 (Contrast) and between DUs 8 and 9 (Corrective Elaboration) were made explicit by means of additional linguistic material in all 14 monadically and 11 co-edited texts. In the case of DUs 2 and 3, a total of 19 out of 25 (co-)edited texts (i.e., 76%) made use of pragmatic word order, i.e. temporal adjuncts placed at the beginning of each DU, in order to signal the contrastive relation between these two DUs. While (temporal) adjuncts generally show a strong tendency to be placed in DU-final position in English, they may be placed in non-default DU-initial position[3] to express contrastive focus between the corresponding DUs (see Doherty, 2003; Hasselgård, 2010). This is illustrated in Examples [4] and [5] below[4], both taken from the co-edited texts:

[4] #D06/2[5] [***In the past***,] London was [seen as] a dowdy place [full] of tea-houses and stale rock cakes.
#D06/3 [***Nowadays***] it's much more exciting.

[5] #D09/2 [***In the post-war era***] London was [*very much*] a dowdy place of tea-houses and stale rock cakes.
#D09/3 [***Nowadays***] it {'s} [is a] much more exciting [and vibrant place attracting visitors and people wishing to make a life here from all across the globe].

24 The use of temporal adjuncts in the left peripheries of both DU 2 and DU 3 in Examples [4] and [5] leads to a parallel structure which makes explicit the contrast between the past time reference expressed in DU 2 (specified through the adjuncts *in the past* in [4] and *in the post-war era* in [5]) and the present time reference expressed in DU 3 (specified through the adjunct *nowadays* in both [4] and [5]). While both dyads in [4] and [5] seemed to consider it sufficient to signal Contrast by means of temporal contextual information (in the form of temporal adjuncts) in the left peripheries of both DU 2 and DU 3, more than half of the (co-)edited texts (i.e., 14/25 = 56%) contained – in addition to a temporal adjunct – a contrastive discourse connective in the left periphery of DU 3 (i.e., either *however* [32%] or *but* [24%]). This is shown in Examples [6] and [7] below:

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3. In Systemic Functional Grammar, adjuncts placed in clause-initial position (i.e., before the subject of the clause) are classified as *marked topical Theme* (see Halliday & Matthiessen, 2014: 98).

4. Within all examples provided in Sections 4.1.1 and 4.1.2, *italic* typeface indicates adverbial status, **boldface** indicates DU-initially/DU-finally positioned linguistic material, single square brackets ("[ ]") indicate added lexical material, and curly brackets ("{ }") indicate deleted material.

5. Reference to edited texts is made following the format *X/Y* with *X* indicating the production format (M = monadically edited text; D = dyadically edited text) and the participant (group), and *Y* indicating the DU as enumerated in the source text (see Section 3).

[6] #M23/2 London was [*always*] a dowdy place [full] of tea-houses and stale rock cakes [and distinctly different from cities on the continent].
#M23/3 [***However***, ***in recent years***] it {'s} [has become] much more exciting.

[7] #D02/2 [***In the past***] London was a dowdy place of tea-houses and stale rock cakes,
#D02/3 [**but *now***] it's much more exciting.

25 While each of the Examples presented so far ([4]-[7]) contains a pair of temporal adjuncts which make the temporal contrast between DU 2 and DU 3 explicit, both the monad in [6] and the dyad in [7] seemed to consider it necessary to multiply signal the contrastive relation between DU 2 and DU 3 by using a contrastive discourse connective (i.e., *however* in [6] and *but* in [7]) in addition to the DU-initial temporal contextual information. The participants' cognitive processes underlying the editing process of DUs 2 and 3 will be discussed in more detail in Section 4.2.1. In sum, the DR of Contrast between DU 2 and DU 3 was signaled in all monadically edited and co-edited texts underlying the present study, though in two different ways, i.e. either through pairs of (DU-initial) temporal adjuncts only (as in [4] and [5]) or through temporal adjuncts plus additional contrastive discourse connectives (as in [6] and [7])[6].

26 By analogy with the DR of Contrast between DU 2 and DU 3, the DR of Corrective Elaboration between DU 8 and DU 9 is not only encoded in coherence strands but also signaled throughout both the monadically edited and the co-edited data. In this case, the contrast between DUs 8 and 9 was made explicit in all 25 (co-)edited texts by means of various contrastive discourse connectives, i.e. *however* (in 60% of all texts), *yet* (16%), *but* (12%), *(even) though* (8%) and *nevertheless* (4%), as is exemplified in [8] to [10] below:

[8] #M21/8 [***As a result of such a rich mix of peoples***,] London has become the capital of linguistic diversity.
#M21/9 [***Nevertheless***,] one [all] important group seems to be leaving itself out:

[9] #D04/8 London has become the capital of linguistic diversity.
#D04/9 [**And *yet***,] [there is] one important group [that] seems to be leaving itself out [of this phenomenon]:

[10] #D05/8 London has become the capital of linguistic diversity.
#D05/9 [***However***,] one important group seems to {be leaving} [have left] itself out [of this cultural shift]:

6. It is important to note that no difference between the two production formats (i.e., monads vs. dyads) was observed with regard to the ways in which the contrastive relation between DUs 2 and 3 was signaled, i.e. both monads and dyads made use of temporal adjuncts only as well as temporal adjuncts plus additional contrastive discourse connectives.

27 The discourse connectives used to signal the contrastive relation holding between DU 8 and DU 9 are added to the left periphery of DU 9 in Examples [8] to [10] as well as in almost all other cases from the corpus (except for one case in which right-peripheral *though* is used). Example [9] provides an interesting case in that it contains a combination of the additive connective *and* as well as the contrastive connective *yet*. This example (as well as some of the other examples presented in this section) will be examined in more detail with regard to the participants' moment-by-moment process of discourse editing in Section 4.2.1.

4.1.2. Continuative discourse relations

28 Previous research based on the same experimental data as the present study (see Fetzer, 2018b; Maier et al., 2016) has shown that the continuative DRs of Continuation, Explanation and Elaboration are signaled to varying degrees across the entire data set and across the two production formats (i.e., monads and dyads), ranging from 40.6% to 78.5% (see Fetzer, 2018b: 29). As for DUs 11 and 12 in particular (see Example [3] above), whose relation has been classified as continuative on the basis of the DU-internal coherence strands of topic continuity, temporal/aspectual coherence and lexical coherence, the quantitative analysis shows that the relation between these two DUs was signaled by means of additional linguistic material in 18 out of 25 (co-)edited texts (i.e., in 72% of all texts in the corpus). The two types of signals that were used to make the continuative relation between DU 11 and DU 12 explicit are discourse connectives (which occur in 14 out of the 18 (co-)edited texts that made use of a signal in this context [= 77.8%]) and temporal adjuncts (which occur in 4 out of the 18 (co-)edited texts [= 22.2%]). Examples from the corpus are provided in [11] to [13]:

[11] #D08/11 Foreign language learning at {Britain's} [British] schools has been in decline

#D08/12 [**and**] the number of universities offering degrees in modern languages has plummeted.

[12] #M20/11 Foreign {language} [students] learning at Britain's schools has been in decline [***in recent years***].

#M20/12 [**It could be in part because**] the number of universities offering degrees in modern languages has plummeted [, but the reasons are still mostly unknown].

[13] #D03/11 [***For decades***,] foreign language learning at {Britain's} [British] schools has been in decline.

#D03/12 [***Over the last few years***] the number of universities offering degrees in modern languages has plummeted.

29 While the signaling of the continuative relation between DUs 11 and 12 by means of (DU-initial) temporal adjuncts (as in [13]) was relatively rare, the corpus data show a wide range of discourse connectives used to link the two DUs. These

include the connectives *and* (as shown in [11]), *also*, *as well*, *as*, *because* (as shown in [12]) and *as a result*. While the additive connectives *and*, *also* and *as well* can be said to signal the continuative DR of Continuation, the connectives *because* and *as a result* indicate the DRs of Explanation and Result, respectively. This variation in the use of discourse connectives can be explained by an underspecification of the DR holding between DUs 11 and 12. On the basis of the source text, the particular type of continuative DR between these two DUs is not readily interpretable and thus subject to negotiation among the participants. Indeed, there is considerable overlap between the different types of continuative DRs with regard to their defining conditions and particularized features such as topic and referential continuity, temporal coherence, etc. (see Fetzer, 2018b: 23-24). This overlap might be a possible reason for the relatively high frequency of signals used within this particular DU pair (i.e., 72%). To be more precise, since the particular type of continuative relation holding between the "bare" DUs 11 and 12 is underspecified and thus not readily interpretable, most participants may have considered it necessary to use additional linguistic material in order to disambiguate the specific type of continuative DR (e.g., Continuation or Explanation) in context. This might also explain the higher frequency of signals in the co-edited data (i.e., 90.9% as opposed to 57.1% in the monadically edited texts), where two participants are required to (re-)negotiate (and agree on) what type of continuative DR holds between DU 11 and DU 12, and thus how (not) to signal this particular relation. More detailed insights into the participants' cognitive processes involved in their choice of signals during the process of discourse editing will be provided in the next section.

4.2. Qualitative analysis

30 The aim of the following qualitative analysis is to answer the second research question underlying the present study, i.e. how the signaling of contrastive DRs (Section 4.2.1) and continuative DRs (Section 4.2.2) unfolds during the real-time process of discourse editing. To this end, the keystroke logging and audio data elicited during the editing-based task will be examined in more detail.

4.2.1. Contrastive discourse relations

31 While the DRs of Contrast (between DUs 2 and 3) and Corrective Elaboration (between DUs 8 and 9) have been shown to be signaled (by means of discourse connectives and/or DU-initial temporal adjuncts) throughout the (co-)edited data underlying the present study (see Section 4.1.1), the question still remains open as to when (i.e., at which stage in the editing process) the participants added linguistic material in order to make the contrastive relation between the DUs under investigation explicit.

32 The analysis of the keystroke logging data collected for four monadically edited and eleven co-edited texts reveals that DU 2 and DU 3 were signaled by means of temporal adjuncts (with or without additional contrastive connectives, as shown in Examples [4] to [7]) right at the start of the typing process of the relevant DUs

throughout the data, irrespective of the production format. In other words, both monads and dyads immediately (i.e., even before they start typing in their edited texts on the computer keyboard) identified the relation between the "bare" DUs 2 and 3 as contrastive (on the basis of the DU-internally encoded coherence strands). Given the non-default nature of contrastive DRs in terms of discourse processing (see Section 2.2), the participants may have considered it necessary to add (DU-initial) temporal adjuncts and/or contrastive discourse connectives right from the start in order to immediately guide the readers' attention and to ensure that they understand and interpret the contrastive relation correctly (that is, as intended by the participants). As has been shown in Section 4.1.1, some of the participants considered it sufficient to signal the contrast between DUs 2 and 3 by means of pairs of (DU-initial) temporal adjuncts only (see [4] and [5]), while others considered it necessary to multiply signal the relation between these two DUs by making use of both temporal contextual information and a contrastive discourse connective (see [6] and [7]). Examples [14] and [15] below provide the keystroke logging data corresponding to the (final products of the) co-edited texts provided in [5] and [7] above [7].

[14] #D09/2–3

⍓**In the** ⌫⌫⌫⌫**the post-war era** ⍓London was very much a dowdy place of tea-houses and stale rock cakes. ⍓**Nowadays** it is a much more exciting and vibrant place attracting visitors and peope⌫le wishing to make a life here from all across the globe.

[15] #D02/2–3

⍓**In th e**⌫⌫**e past**, ⍓London was a dowdy place of tea-houses and stale rock cakes, u⌫**but now** it⍓'s much more exciting.

33 Examples [14] and [15] represent two straightforward cases in which the unfolding text that was typed on the computer keyboard in real time corresponds exactly to the final products of the texts provided in [5] and [7], respectively. In other words, any editing of the "bare" DUs 2 and 3 (including the addition of temporal adjuncts and/or contrastive discourse connectives) took place right at the start of the editing process of these two DUs. This editing behavior for DU 2 and DU 3 was also observed for all other participants (both monads and dyads) whose typing process was recorded by means of keystroke logs. With regard to the participants' cognitive processes underlying the editing process of DUs 2 and 3, the data in [14] and [15] suggest that the participants immediately interpreted the relation between these two DUs as contrastive, and thus considered it necessary to signal this contrastive relation by readily inserting two initially placed adjuncts

7. In the keystroke logging data provided in the present study, the symbol ⍓ indicates shift, the symbol ⌫ indicates backspace, and the symbols ←, ↑, ↓ and → indicate arrow key movement. For the sake of clarity, the signals discussed in the present study are highlighted in **boldface** type.

(as in [14]) plus an additional connective *but* (as in [15]). What is interesting about dyad #D09 is the fact that while the two participants eventually chose to use two DU-initial adjuncts (i.e., *in the post-war era* and *nowadays*) in order to express contrastive focus between DU 2 and DU 3, one of the participants (#D09/B) originally suggested adding yet another contrastive signal (i.e., the discourse connective *however*) in the left periphery of DU 3 in order to multiply signal the contrastive relation between the two DUs. Participant #D09/A, however, considered the signaling of the DR of Contrast by means of the temporal adjunct *nowadays* in the left periphery of DU 3 to be sufficient. This negotiation between the two participants in dyad #D09 is illustrated by the corresponding metadata, the transcript of which is provided in [16] [8]:

[16] #D09/A: Erm, **nowadays** it is a much more exciting place

#D09/B: You could, you could I'll tell that sentence, I see, **however nowadays** and keep it as a one

#D09/A: [overlap-] **in the post-war era** [-overlap]

#D09/B: [overlap-] Could you say [-overlap] that would make sense grammatically to keep that statement number three and the first

#D09/A: and the [overlap-] first one? [-overlap]

#D09/B: [overlap-] the first paragraph [-overlap]

#D09/A: Well, the paragraph but maybe not the second sentence in the first [unclear] anyway. Stale rock cakes maybe wouldn't put in there **'however'** just **'nowadays'** maybe?

#D09/B: yeah [noise]

34 As shown in Section 4.1.1, all participants in the experiment (i.e., both monads and dyads) chose to (multiply) signal the contrastive relation between DU 2 and DU 3. This can be accounted for in terms of the participants' knowledge of discourse grammar, which guides them in constructing well-formed discourse, specifying how they are to index the contrastive relation between DU 2 and DU 3 in order to achieve their communicative goals. However, Example [16] illustrates that the participants varied to some extent in their ideas of how much, and what kind of, additional linguistic material was necessary in order to make the contrast between DUs 2 and 3 sufficiently explicit (see also Examples [4] to [7] in Section 4.1.1).

35 As far as the editing process of the DR of Corrective Elaboration between DU 8 and DU 9 is concerned, the keystroke logging data provide a similar picture as described above in that the contrastive discourse connectives used to signal the contrastive relation between these two DUs were readily inserted during the

8. In the transcripts, the periphery-positioned linguistic material negotiated in the dyads is highlighted in **boldface** type.

typing process throughout the data. This finding suggests that both monads and dyads immediately interpreted the relation between the "bare" DUs 8 and 9 as contrastive (on the basis of the DU-internal coherence strands), and therefore considered it necessary to signal this relation by means of a contrastive discourse connective (e.g., *however*, *nevertheless*, etc.) right at the start of the editing process of these two DUs. The only revisions that were made to the edited productions of DU 8 and DU 9 at a later stage (i.e., after a first version of the text had already been typed on the computer keyboard) concern shifts in the choice of contrastive connective. Examples [17] and [18] below provide the keystroke logging data corresponding to the (final products of the) (co-)edited texts provided in [8] and [9] above:

[17] #M21/8–9

⍓**As a result of such publich** ⌫⌫⌫⌫⌫⌫⌫⌫⌫⌫⌫⌫⌫⌫⌫**such a rich mix of peoples**, ⍓London has become the capital of linguistic diversity ⌫. ⍓**Nevertheless**, one all important group seems to be lean⌫ving itself out⍓:

[18] #D04/8–9

⍓London has become the capital of linguistic diversitz⌫y. #**howe**⌫⌫⌫⌫ ⍓**HO**⌫**owever**, there is ⌫⌫⌫sems⌫⌫ems o⌫to be one impotatnt ⌫⌫⌫nt ⌫⌫⌫⌫⌫rtant group leaving ⌫⌫⌫⌫⌫⌫←←←←←←←is →→→→→→→→→→ →→→←←←←←←←⌫⌫⌫⌫⌫⌫→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→←that seems to be→→→→→itself out of this

[...]

⌫⌫⌫⌫⌫⌫⌫⌫⍓**And yet**↓↓↑→→→→→→→→→

36 Example [17] shows that the contrastive discourse connective *nevertheless* was added right after DU 8 and before DU 9 had been typed on the computer keyboard (without any further revisions at a later stage in the editing process). The participant in monad #M21 can thus be said to ensure that the semantic relationship holding between the two DUs was made sufficiently explicit and, thus, understood and interpreted as intended. The participants in dyad #D04 (see Example [18]) also considered it necessary to signal the contrastive relation between DU 8 and DU 9 right at the beginning of the editing process. What is striking in this example, however, is the fact that the dyad originally furnished the left periphery of DU 9 with the contrastive discourse connective *however*, but then – i.e., towards the end of the editing process – decided to replace *however* with the combination of the additive connective *and* and the contrastive connective *yet*, as is shown in the final product of the co-edited text provided in [9]. This shift in the choice of discourse connective suggests that the participants in dyad #D04 considered it necessary to intensify the contrastive relation between DU 8 and DU 9, hence their use of the combination of *and* and *yet* instead of *however* (see Quirk et al., 1985: 642). This is corroborated by the following transcript documenting the dyad's negotiations with regard to their choice of connective.

[19] #D04/B: [laughed] okay wait London has become the capital of linguistic diversity okay I think we can just continue with that

#D04/A: Okay

#D04/B: Alright **however** no not **however** why [unclear]

#D04/A: I would say **however** though 'cause like one seems to be leaving itself out

#D04/B: So [unclear]

#D04/A: okay but okay London has become the capital of linguistic diversity if we wanna say one group then we should talk about another gr- like other groups like other ages you know that seem to be well [unclear] in

#D04/B: so like this is people themselves

#D04/A: yeah like you know just to con- have a contrast it's not it's like going very sudden like you know [overlap-] one group [-overlap]

[...]

#D04/B: [...] London has become the capital of linguistic diversity

#D04/A: **and yet** [overlap-] can we [-overlap] start a sentence with

#D04/B: [overlap-] yeah [-overlap] that's good yeah

#D04/A: we can right

#D04/B: **and yet**

#D04/A: Oh my God

#D04/B: It's not great but it's not a **but** so it's fine

37 At the beginning of the editing process of DU 8 and DU 9, the two participants in dyad #D04 negotiate whether or not to add the discourse connective *however* in order to make the contrastive relation between these two DUs explicit. While participant #D04/B first suggests adding *however* but immediately withdraws this suggestion, participant #D04/A insists on using this connective. Towards the end of the editing process (i.e., when the two participants read their co-edited text once again before submitting their final version), however, it is participant #D04/A who suggests replacing *however* with *and yet*, which is eventually agreed upon by both participants. Interestingly, participant #D04/B does not seem to be entirely convinced by the choice of *and yet*, but considers this to be a better choice than a simple *but*. This example illustrates that the participants were not only aware of the contrastive relation holding between DU 8 and DU 9, but also knew how to make this relation sufficiently explicit and intensify it by means of a more determinate, unambiguously concessive discourse connective. This knowledge and common understanding among the participants provide further evidence for a discourse grammar of English, which serves as a blueprint that specifies how DUs can be concatenated in order to constitute discourse-as-a-whole (with varying degrees of variation), and thus guides participants in producing and interpreting discourse.

4.2.2. Continuative discourse relations

38 As has been shown in Section 4.1.2, the continuative relation holding between DUs 11 and 12 is signaled (by means of discourse connectives or temporal adjuncts) in the majority of the (co-)edited texts underlying the present study. As far as the signaling during the participants' moment-by-moment process of discourse editing is concerned, the keystroke logging data recorded during the experiment reveal that the relation between DU 11 and DU 12 was not readily signaled as continuative in the data but tended to be made manifest only at a later stage in the editing process, generally after some more extensive (re-)negotiation between the participants with regard to the particular kind of DR holding between DUs 11 and 12. This is illustrated in Example [20] below, which presents the keystroke logging data corresponding to the (final product of the) co-edited text provided in [11] above:

[20] #D08/11–12

⍓Forei⌫ign language learning at ⍓British schools has bee ⌫n in decline. ⍓**For example**, the number of universities offering degrees in modern languages has plummeted↑←←←←←←⌫⌫⌫⌫⌫⌫⌫⌫⌫⌫⌫⌫ ⍓T↓→→→→→→→→⍓Aa⌫s⌫⌫, as a result of ths⌫is an inquirz⌫y is under way ↑←←←←←← **and** t→→→→↓

39 Even though the final product of the text edited by dyad #D08 shows the use of the discourse connective *and* in the left periphery of DU 12 (see Example [11]), the keystroke logging data in [20] reveal that this connective was only added at a later stage in the dyad's editing process. In fact, the dyad had originally inserted the adverbial *for example* in order to link DU 11 with DU 12, which was eventually replaced by *and*. This revision in the course of the editing process illustrates the participants' uncertainty with regard to what type of continuative DR actually holds between DU 11 and DU 12, and thus how to signal this particular relation. While the adverbial *for example* is typically used to make explicit the DR of Elaboration [9], the participants of dyad #D08 did not seem to consider Elaboration to be the appropriate DR in the further course of their editing process, which is why they eventually decided to replace *for example* by the additive (and highly multifunctional) connective *and*.

40 Another example which illustrates the participants' uncertainty as to how to signal the relation between DU 11 and DU 12 is provided by dyad #D21. Examples [21] and [22] show the final product of the text edited by this dyad and the corresponding keystroke data, respectively.

[21] #D21/11 Foreign language learning at Britain's schools has been in decline

#D21/12 [**and**] the number of universities offering degrees in modern languages has plummeted.

9. Other frameworks which make use of a more fine-grained categorization of elaborative DRs would classify DRs signaled by *for example* as Instantiation (Prasad et al., 2019), Example (Carlson et al., 2002) or Exemplification (Hobbs, 1985; Kehler, 2002).

[22] #D21/11–12

⍓Foreign language learning t⌫at ⍓Britain ⍓'s⌫⌫⍓'s schools has been in decline **and** the number of universities offering degrees in modern languages has plummeted.

41 At first sight, the keystroke logging data in [22] suggest that the discourse connective *and* was readily inserted by the participants of dyad #D21, i.e. right at the beginning of their editing process. However, the metadata additionally recorded during the experiment (see [23] below) reveal that the editing process of DUs 11 and 12 was accompanied by some extensive negotiation between the participants of dyad #D21 concerning the particular type of DR holding between these two DUs:

[23] #D21/B: foreign language learning at Britain's school has been in decline **and** the number of universities offering degrees in modern languages has [overlap-] plummeted [-overlap]

#D21/A: [overlap-] yeah [-overlap] or **as** or **because** the- **because of** [unclear]

#D21/B: I don't know if it's **because of** I [overlap-] don't think [-overlap]

#D21/A: [overlap-] [unclear] [-overlap]

#D21/B: that the reason why universities are not offering that many degrees in languages is because they're not being taught at school I think it's sort of just I don't think it's [overlap-] gone very [-overlap]

#D21/A: [overlap-] foreign [unclear] at [-overlap] Britain's schools has been declined has been in decline the number of universities offering lang- okay so the degrees have plummeted **because** nobody is speaking it in British schools is that right

#D21/B: but wha- I mean that's the question I don't know

#D21/A: [overlap-] What do you think [-overlap]

#D21/B: I mean [overlap-] I think- I think **and** rather than **because** [-overlap] [noise] so but I mean it could be [unclear]

42 While participant #D21/B suggests using the additive connective *and* already in the very first turn of Example [23], participant #D21/A proposes to connect DU 11 with DU 12 by means of a causal connective (e.g., *as* or *because*), thus signaling the DR of Explanation (as in Example [12] in Section 4.1.2). According to this participant, the proposition expressed in DU 11 provides the reason for the proposition expressed in DU 12. Participant #D21/B, however, expresses their concerns as to whether there is indeed a causal relationship between DU 11 and DU 12, which is why the dyad eventually agrees on using the connective *and*, thus (most likely) signaling the DR of Continuation.

43 The two cases discussed in this section (#D08 and #D21) have shown that the type of continuative DR holding between DU 11 and DU 12 is not readily interpretable on the basis of the source text. This is due to the fact that there is considerable overlap between the different types of continuative DRs (e.g., Continuation, Elaboration, Explanation, etc.) in terms of their defining conditions and particularized features, which requires that the participants extensively (re-)negotiate the exact nature of

the relation between DUs 11 and 12. In order to disambiguate the specific type of continuative DR in context, most participants decided to use additional linguistic material to connect DU 11 with DU 12, though the wide range of discourse connectives added to the text (see Section 4.1.2) reflects the various ways of how the relation between these two DUs was interpreted by the participants (e.g., as Continuation, Explanation or Result).

5. Conclusion

44 This paper has aimed to investigate the linguistic realization of continuative and contrastive DRs in English argumentative discourse from both a top-down and a bottom-up perspective, adopting a multi-method approach. The results of the quantitative analysis of the 25 argumentative texts underlying the present study corroborate the findings of previous research (e.g., Asr & Demberg, 2012; Doherty, 2003; Fetzer & Speyer, 2012; Hoek & Zufferey, 2015; Hofmockel et al., 2017; Zufferey & Gygax, 2016). While the contrastive DRs of Contrast and Corrective Elaboration were shown to be signaled throughout the data (e.g., by means of discourse connectives and/or temporal adjuncts), the continuative DR holding between DUs 11 and 12 from the underlying source text was made explicit less frequently (i.e., in 72% of all texts from the corpus). This still relatively high number of signaled realizations of the continuative relation between DU 11 and DU 12 has been accounted for by the fact that the particular type of DR holding between these two DUs is underspecified and therefore not readily interpretable on the basis of the source text, which is assumed to have led most participants to use additional linguistic material in order to disambiguate the specific type of continuative DR (e.g., Continuation or Explanation) in context.

45 The qualitative analysis of the keystroke logging data and metadata recorded for four monadically edited and eleven co-edited texts has revealed that the signaling of the contrastive DRs of Contrast and Corrective Elaboration is made manifest right from the start of the editing process throughout the data, whereas continuative DRs tend to be made manifest only at a later stage in the editing process, generally after some more lengthy (re-)negotiation among the participants. This difference between continuative and contrastive DRs with regard to the real-time process of discourse editing can be explained by the semantic overlap between different types of continuative DRs, which requires that the participants (re-)negotiate the exact nature (and thus the appropriate linguistic signal) of a particular continuative DR more frequently than contrastive DRs, which are clearly interpreted and thus readily signaled as contrastive throughout.

46 By adopting a multi-method approach, the present study has ultimately aimed to show that the analysis of discourse does indeed need to take into account both discourse as product and discourse as process in order to provide a complete picture of discourse and its constitutive parts. The triangulation of keystroke logging data and corresponding metadata has been shown to be particularly valuable in this respect. While this goal has been achieved for the present study on continuative

and contrastive DRs in English argumentative discourse, further research adopting both corpus-based and experimental methods is called for in order to investigate the signaling of other types of DRs across other discourse genres as well as other languages, and thus to contribute to an even more comprehensive picture of how discourse (both as product and as process) works in social interaction.

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