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Turkish Discourse Bank: Porting a Discourse Annotation Style to a Morphologically Rich Language

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Abstract

This paper describes the current state of the Turkish Discourse Bank, the first publicly available annotated discourse resource for Turkish. It describes the annotation methods and the challenges posed by annotating Turkish, a free word order language with rich morphology. It shows the usefulness of the PDTB style annotation but points out the need to expand this annotation style with the needs of the target language.

Keywords: Turkish, discourse, discourse connectives, discourse annotation

1 Introduction

Annotated corpora have come to play an important role both in theoretical linguistics and machine learning applications in natural language processing. There is a pressing need for such resources in Turkish, a free-word order, agglutinative language with rich morphology. There are existing syntactically enriched treebanks for Turkish (e.g., Oflazer et al., 2003) but the field also needs annotated discourse corpora to appeal to the need of researchers who are working with texts in their entirety rather than individual sentences.[1] Annotated discourse corpora allow opportunities to understand what kind of relationships hold among lexical, morphological and syntactic levels and the textual level. They provide an empirical ground for investigating a range of discourse issues and can reveal structures in discourse via various language technology applications, e.g., summarization, information extraction, sentiment analysis, essay analysis, etc. (cf. Webber et al., 2011).

The Turkish Discourse Bank (TDB) is a ~400,000-word resource of modern written Turkish with various genres, mainly containing annotations of explicit discourse connectives and the discourse segments they relate. It shares the principles of the Penn Discourse Tree Bank (PDTB)

[1] The METU-Sabancı Turkish Treebank described in (Oflazer, 2003; Say et al., 2004) is the widely-known syntactically annotated Treebank of Turkish. Since the annotated sentences of this corpus do not form entire texts, we chose not to create the TDB on it.

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and takes discourse connectives as discourse-level predicates with a binary argument structure (Prasad et al., 2007).

The connective denotes relations between eventualities, fact-like objects and proposition-like objects (Asher, 1993). Following the PDTB, we refer to the arguments of a connective as the first argument (Arg1) and the second argument (Arg2). The second argument is the textual unit which syntactically or morphologically contains the connective, the other argument is conveniently referred to as Arg1. Arg2 is the "internal" unit, Arg1 the "external" unit in Stede & Heintze's (2004) terminology. The complete list of the TDB tagset is given in Table 1 (Zeyrek et al., 2010). The definitions and examples of each category are provided in the rest of the paper while discussing the relevant methodological issues.

Conn	The connective head
Arg1	First argument of the connective
Arg2	Second argument of the connective
Supp1	Supplement to the first argument
Supp2	Supplement to the second argument
Shared	The subject, object or adverbial phrase *shared* by a relation
Shared supp	Supplement for the *shared* material
Mod	Modifier of the connective or the modifier of the relation

Table 1. The annotation scheme of the TDB

Only explicit connectives and their two arguments are annotated in the TDB. We plan to annotate implicit connectives and the sense of connectives at a later stage. We chose to annotate explicit connectives first because the primary aim of the project was to reveal explicit discourse connectives to allow further research in discourse coherence. In creating a bank of discourse based on connectives, we do not claim that discourse connectives are the only means establishing coherence; we merely take them as the basic elements of discourse which make coherence relations salient. The TDB 1.0 has been released in March 2011 along with a browser; it is being freely distributed to researchers upon request (www.medid.ii.metu.edu.tr).

The TDB is built on certain principles shared by all annotated corpora (Marcus et al., 1994; Skut et al., 1997). Firstly, it is descriptive. It has a bottom-up approach, aiming to describe the basic characteristics of discourse by annotating discourse relations between segments. Examining discourse by breaking it up to its constituents is the core of almost all theoretical work on discourse, e.g. Asher & Lascarides (2003), Grosz & Sidner (1986), Mann & Thompson (1988), Moser & Moore (1996), Polanyi & Van Den Berg (1996). Secondly, the TDB is data-driven; i.e. the tagging scheme is meant to allow representations of various discourse phenomena, including, for example, shared and crossing arguments (Aktaş et al., 2010). Thirdly, it is theory-independent. It is not influenced by a particular discourse theory; i.e., there is not a correct way of annotating discourse relations given a specific theory, the only requirement is that similar structures should be annotated in the same way for consistency.

In our earlier work, we discussed the evolving stages of the corpus (e.g., Demirşahin, et al. 2012b). In the present paper, we provide a more complete picture of the finalized annotation system and present statistical information about the connectives that proved challenging in the annotation process, namely discourse adverbials, subordinators and their polymorphous occurrences. The rest of the paper proceeds as follows: In Section 2, we describe the annotation cycle, methods, and challenges in porting an annotation system to Turkish. We focus on the annotation of discourse adverbials and how we annotate the discourse relations expressed by nominalizations. In Section 3, we explain the method of annotating phrasal expressions and how we decided to use the *shared* tag. We also discuss how we adapted the *modifier* and the *supplementary* tags of the PDTB. Finally, in Section 4 we conclude with a summary of the paper.

2 Porting an annotation system to Turkish discourse

In this section, we describe the annotation cycle, the annotation procedures and how we evaluate the annotation scheme.

2.1 The annotation cycle

The annotation system used in creating the TDB involves the following steps.

- A first draft of annotation guidelines is prepared and an initial set of explicit connectives is determined.
- Three annotators annotate the whole corpus for the given set of connectives by determining their Arg1 and Arg2 spans, their supplementary materials and modifiers. They go through the whole data, skipping non-discourse usage of the connectives.
- The annotated corpus is statistically analyzed.
- The disagreements are determined and discussed interactively in agreement meetings, focusing on the disagreed cases. Two researchers and all three annotators participate in the meetings. With the researchers' feedback, disagreements are resolved and an 'agreed' version is produced. The annotation guidelines are updated.
- In the cases when the agreement meeting results in a modification of the annotation guidelines, all past annotations are reexamined through a process called 'proof' to ensure that they are in line with the latest version of the guidelines. The proofed annotations are the final version, the gold standard of the TDB.
- The next set of connectives is annotated, and the cycle continues.

Similar to English and many other languages, discourse connectives in Turkish can be identified from three major syntactic classes, namely, coordinating conjunctions (*ve* 'and', *ya da* 'or', *ama* 'but'), subordinators (complex subordinators, e.g. *için* 'for', simplex subordinators, i.e. converbs, e.g. *-IncA* 'when,' *–ken* 'while/now that'), and discourse adverbials (*oysa* 'however', *öte yandan* 'on the other hand', *ayrıca* 'in addition/separately').[2]

The initial list of connectives was prepared on the basis of these syntactic classes. We excluded simplex subordinators, which we aim to annotate later. Then the researchers and the annotators discussed how one distinguishes between discourse and non-discourse usages of connectives, and where the arguments of a connective could be found. During a semester-long training period, the annotators were encouraged to form their own ideas about how discourse works. Next, the annotators studied the annotation tool and the guidelines and started annotating the initial set of connectives. The annotation tool was specifically devised for this project. Briefly, it uses the stand-off annotation methodology and produces XML files as annotation data (Aktaş et al., 2010).

Neither the discourse relations nor the characteristics of the discourse segments (e.g. whether they should be full clauses or not) are spelled out in the annotation guidelines. This method was useful because it allowed the annotators to use their native-speaker intuitions in deciding about the syntactic type and the span of a connective's arguments. Regarding the span of a connective's argument, the annotators were only told to follow the "minimality principle", which requires them to mark the shortest text spans that are necessary and sufficient to interpret a discourse relation encoded by the connective (Prasad et al., 2007).

[2] The capital letters are used to capture the cases where a vowel agrees with the vowel harmony rules of the language. The letter I may be resolved as any of the high vowels in the language. The letter A may be resolved as e or a.

2.2 The annotation procedures and inter-annotator agreement

The annotators worked independently, as a group, or in a procedure we named pair annotation, adapted from pair programming (Demirşahin, et al., 2012a). In the group annotation method, one independent annotator produces a set of annotations, and the other two annotators go over this annotation set together, suggesting changes when necessary. Any disagreements are resolved in agreement meetings. On the other hand, the pair annotation procedure involves one annotator working independently and two annotators working together as a pair, producing two sets of independent annotations. The agreement of pair annotations is measured between the independent annotator and the pair of annotators, treating them as a single annotator. Of the total 8483 relations in the TDB 1.0, 3804 (44.84%) were annotated by three independent annotators, 3985 (46.98%) by pair annotation, and only 694 (8.18%) were annotated by group annotation.

To evaluate the reliability of the argument span annotations produced by three independent annotators, or by a pair of annotators and an independent annotator, we measured agreement using Fleiss' Kappa (Fleiss, 1971) described as: [3]

$$\kappa = \frac{P(A) - P(E)}{1 - P(E)}$$

$1 - P(E)$ measures the degree of agreement attainable above chance, and $P(A) - P(E)$ gives the degree of agreement actually attained above chance. Since each connective has two arguments, we calculated agreement over these text spans separately. For Arg1 and Arg2, we formed separate agreement tables similar to the table Fleiss uses (1971:379), where at least two annotators assign the *words* of a text into two categories (*select/exclude*) and we recorded the number of judgments a word receives for each category. We measured agreement over the spans identified by the annotators as the boundaries of the argument spans, which we took as the first and the last words of each argument selected by the annotators (Yalçınkaya, 2010).

To evaluate supplementary material annotations, we used the exact match criterion (Miltsakaki et al., 2004). In this method, agreement for any supplementary material (Supp1 or Supp2) is recorded as 1 when all annotators make identical textual span selections, and 0 otherwise. Agreement is calculated by the number of exact matches found in the total number of annotations annotated by all annotators and given as a percentage (cf. Appendix A).

2.2.1 Discourse adverbials

One of the most challenging issues in the annotation process was that of determining the location and span of the arguments of discourse adverbials. Table 2 provides discourse adverbials in the data and the Kappa measures of their first and second arguments, where applicable. The remaining discourse adverbials, for which Kappa statistics are not measured, are also provided for the sake of completeness (see footnote 5). According to Table 2, except for *aslında*, 'in fact', *örneğin* 'for example', *mesela* 'to exemplify' and *böylece* 'thus', the inter-annotator agreement measures for the first arguments of discourse adverbials are lower than the envisaged 0.80 threshold (Artstein and Poesio, 2008).[4] A preliminary analysis shows that these low agreement measures are largely due to the anaphoric characteristics of these connectives. Similar to anaphors whose antecedents can be ambiguous, the first arguments of discourse adverbials can also be ambiguous since their location is not constrained by adjacency (Forbes-Riley et al., 2006; Webber et al., 2003). The second arguments of discourse adverbials are mostly annotated with high agreement since their location is predictable by adjacency. The connective *öte yandan* 'on the other hand', however, yielded a low inter-annotator measure for its Arg2. Our exploratory

[3] We did not measure the agreement on the discourse connective.

[4] Such low agreement results are not surprising because agreement on the exact boundaries of a text span tend to be low in discourse, as discussed by Artstein & Poesio (2008:580-583).

analyses show that this connective appears in argumentative texts and tends to link text spans which are more than one sentence long. Due to this, the annotators do not agree on the boundaries of Arg2; in particular, the right edge of Arg2 is a source of disagreement. Such disagreements are always resolved in agreement meetings.

			Kappa measures	
Search item (# of annotations)	**Gloss**	**# of annotators**	**Arg1**	**Arg2**
aslında (81)	in fact	2	0.81	0.85
ayrıca (108)	in addition	3	0.66	0.84
böylece (85)	thus	2	0.90	0.99
dahası (9)	furthermore	3	0.71	0.90
gene de (26)*	still	1	-	-
halbuki (17)*	however	1	-	-
mesela (13)	to exemplify	3	0.92	1.00
neticede (1)	eventually	3	-	-
ne ki (14)*	howbeit	1	-	-
ne var ki (32)*	even so	1	-	-
oysa (136)	however	3	0.78	0.91
örneğin (64)	for example	3	0.87	0.92
örnek olarak (2)	to illustrate	3	-	-
sonuçta (10)	finally	3	0.70	0.87
sonuç olarak (5)	as a result	3	0.67	1.00
söz gelimi (6)*	for instance	1	-	-
taraftan (3)	on the other hand	3	-	-
tersine (11)	in contrast	3	0.77	1.00
yalnız (12)*	it is just that	1	-	-
öte yandan (70)	on the other hand	3	0.55	0.66
yine de (65)*	still	1	-	-

Table 2. Kappa measures for the arguments of discourse adverbials in the data[5]

2.2.2 Discourse relations expressed by nominalizations

The second class of discourse connectives mentioned above, i.e., subordinators take nominalizations as complements, i.e. clauses that are "desententialized" to varying degrees (Lehmann, 1988). Except for a few strict cases, nominalizations are not annotated in the PDTB. However in Turkish, nominalized clauses are so common as arguments of not only the subordinators but also the coordinators that we would have missed an important aspect of the language if we left them out.

Complex subordinators are annotated in the TDB 1.0 using the morphological features of their Arg2 as a clue. Complex subordinators have basically two parts; a connective (often a postposition) and nominalizing suffixes which reduce a subordinate clause to varying degrees, causing it to lose its illocutionary force as well as tense and aspect. The nominalized clauses are based on three types of suffixes: (a) clauses based on the factive nominalizer –DIK and the nonfactive nominalizer –AcAk, (b) clauses based on the infinitives –mA or –mAk, (c) clauses formed on the nonfinite nominal marker –Iş (Csató, 1998:230). In the annotation process, the annotators are told to notice these nominalizing suffixes as indicators of nominal clauses that have predicative potential (cf. Appendix B for examples).

We annotate the independent parts of the complex subordinators by selecting the independent part and the Arg2 in its entirety. At a later stage, the suffixes will be separated by postprocessing to analyze the frequency of the nominalization types. This will also enable automatic sense

[5]The stars show that a single set of annotations was created by the group annotation procedure, 2 indicates that the annotations were created via the pair annotation method, the dashes indicate that inter-coder reliability was not calculated.

disambiguation of certain connectives, e.g. *için* 'for/so as to', whose goal- and cause-driven senses can be distinguished via the nominalizing suffixes.

3 Updates in the annotation guidelines

In this section, we present two major updates in the annotation guidelines, namely the decision to annotate phrasal expressions and the introduction of the shared tag to the annotation scheme. We also discuss how we adapted the PDTB's modifier and supplementary tags to Turkish.

3.1 Phrasal expressions

As we explained in Section 2.1, the annotation procedure initially started with a given set of connectives. However, the annotators soon discovered that there are polymorphous occurrences of the independent parts of complex subordinators. For example, the complex subordinator *sonra* 'after', belongs to the same family of connectives with the phrasal expression *sonra* 'after this', and its variants, e.g. *önce .. sonra* 'first .. then'. We therefore decided to allow the annotators to determine all such occurrences of the given set of connectives, rather than restricting them with the given connectives. In this way, we would achieve a wider coverage of the productive means of establishing discourse coherence. Phrasal expressions are marked as a form of alternative lexicalization in the PDTB (Prasad et al., 2010); they are annotated as a form of complex connectives in a German corpus (Stede & Heintze, 2004).

The number of annotated subordinators and phrasal expressions form a sizeable portion of all the annotations in the TDB 1.0. We identified 77 search items. Twenty-eight of these items returned connective types that participate in subordinating relations, and 27 of them in phrasal expressions. Of the total 8483 relations annotated in the corpus, 2284 (26.92%) are signaled by a subordinator, and 482 (5.68%) are signaled by a phrasal expression containing a deictic item. In Appendix A, we provide all annotated complex subordinators (including their polymorphous occurrences) and Kappa values of Arg1 and Arg2 as described in Section 2.2. Appendix A shows that the annotators disagree about the Arg1 of some connectives, e.g., *rağmen* 'despite'. Although the reasons for disagreements may vary, we noticed that the flexible word order of Turkish is an important source of disagreements. We discuss this more in Section 3.2 below.

3.2 Word order variability of Turkish and the addition of the *shared* tag

Turkish is predominantly a SOV language with a large degree of word order flexibility. Scrambled elements cause difficulties for the annotators because they may disagree whether the scrambled elements belong to Arg1 or Arg2. To overcome this problem, we introduced the *shared* tag (subject, object, adverbial phrase), which is essentially a syntactic tag simply helping to mark the shared elements in a discourse relation no matter where they are in the sentence. In this way, the discourse relation itself is determined with more ease and confidence. Table 3 provides the frequency of the subordinators with the shared tag.

		Shared Tag		**No Shared Tag**		**Total**	
Search item	**Gloss**	**Count**	**Percent**	**Count**	**Percent**	**Count**	**Percent**
için	for/so as to	155	14.07	947	85.93	1102	100.00
sonra	after	77	10.80	636	89.20	713	100.00
kadar	as well as/until	37	23.27	122	76.73	159	100.00
gibi	as	35	15.35	193	84.65	228	100.00
amacıyla	with the aim of	23	35.94	41	64.06	64	100.00
zaman	when	15	9.43	144	90.57	159	100.00
karşın	regardless of	11	15.49	60	84.51	71	100.00
önce	prior to	11	8.21	123	91.79	134	100.00
halde	in spite of	10	16.39	51	83.61	61	100.00

rağmen	despite	7	9.09	70	90.91	77	100.00
birlikte	together/though	6	18.18	27	81.82	33	100.00
ardından	after	5	7.04	66	92.96	71	100.00
Total		392	13.64	2840	86,35	2872	100.00

Table 3. The frequency of shared elements in the subordinators and the related phrasal expressions

Example (1) shows the sentence-medial usage of *rağmen* 'despite', where Arg1 is shown in italics, and Arg2 is rendered in bold letters. The subject, which is not in its canonical sentence-initial position in this case, is shown between curly brackets and annotated as the shared material.

(1) **Sınırlı olmasına <u>rağmen</u>** {bu devrimci kongreler}, *sarayın değil, halkın demokratik ihtilalinin eseriydiler.*
<u>Despite</u> the fact that they were limited, {these revolutionist congresses} *were not a result of the empire but the people's democratic rebellion*.

3.3 Modifiers

The tag *modifier* is primarily used to show the modifier of a connective as in the PDTB (example (2), underlined together with the connective), where the connective is taken as the head, and the adverb as the modifier. Different from the PDTB, we also use this tag to specify adverbs modifying the discourse relation as a whole. We refer to such tokens as *modifier of a relation* as in (3) although they are all marked as *mod*.

(2) *Geri dönüp kanepeye uzanıyorum.* <u>Az</u> **<u>sonra</u> ezgi başlıyor.**
I go back and lie on the couch. <u>A little</u> **<u>later</u>, the melody starts.**

(3) (Belki de) **ona karşı çok iyi ol-duğ-um <u>için</u>** *bıraktı beni.*
(Perhaps) *he left me* **<u>because</u> I treated** [treat-DIK-AGR] **him too well**.

In the TDB 1.0, a total of 540 relations are tagged with modifiers. The most heavily modified connective is *sonra* 'after/later', where 220 of 713 instances are modified: 138 of these modifiers indicate duration, and 78 are focus particles. The focus particle *dA* is the most frequent modifier with 262 instances. The temporal modifier *daha* 'much/more' is the second most frequent modifier with 83 instances.

Eleven classes of modifiers are annotated in the TDB 1.0. Adverbs such as *şimdiye kadar* 'until now', *neyse ki* 'luckily', *ne yazık ki* 'unfortunately', etc. are not tagged as modifiers. Here, we are in agreement with the PDTB, where such clausal adverbs are selected together with the argument in which they appear. Table 4 shows the modifiers and their frequencies in the TDB 1.0.

Modifier Class	**Example**	**Gloss**	**Count**	**Percent**
Focus	dA	focus particle (FP)	265	49.07
Temporal	*üç gün* sonra	*three days* later	170	31.48
Intensifier	*tam* aksine	*just* to the contrary	26	4.81
Counterfactuality	*sanki* … gibi	as though	25	4.63
Epistemic	*belki de* bunun için	*perhaps FP* because of this	17	3.15
Interrogative	bu yüzden *mi*	*is this* the reason	14	2.59
Quantifier	*bütün* bunlara rağmen	despite *all* these	9	1.67
Condition	*ancak* bundan sonra	*only* after this	5	0.93
Negation	için *değil*	*not* because of this	5	0.93
Qualifier	*çarpıcı* örnek olarak	as a *striking* example	3	0.56
Pragmatic	*peki* o zaman	well, *ok* then.	1	0.19
Total			540	100.00

Table 4. The frequency of the modifier tags in the TDB

3.4 The supplementary material

We identified two types of material that supplement the arguments: (a) the material that makes the semantic contribution of the argument more specific, which is how the PDTB uses this tag, and (b) the antecedent of a deictic item in one of the arguments. Example (4) shows the latter function of the *supp* tag, where the deictic item is underlined and the supplementary text shown between straight lines "|".

(4) |Ante mutlaka yalnız görüşmeleri gerektiğini| anlatmaya çalıştı. *Sonunda padişah buna razı oldu* **ve huzurunda bulunan herkesi dışarı çıkardı.**
Ante tried to explain |that they had to meet privately|. *Eventually, the sultan agreed with this* **and asked everyone out**.

We used the *shared supp* tag for indicating the antecedent of a deictic element in the shared material (example (5)). In the example, the shared material (the subject in this case) is rendered between curly brackets; its referent is put between double straight lines.

(5) Simitis, "||Türkiye'ye müzakere tarihi verildiği ortamda Kıbrıs sorunu çözülmüş olacaktır herhalde ||. {Bu ikisi} *birbirine bağlı değil* **ama beraber gitmeleri gereken iki süreç**" dedi.
Simitis said, "||When Turkey is given a date for the discussions, the Cyprus problem will probably have been solved||. {These two} *are not linked with each other* **but they are two processes that must go together.**"

The TDB 1.0 has 869 supplementary annotations for Arg1 (10.24%) and 337 supplementary annotations for Arg2 (3.97%).

In future research, the use of the *supplementary* tag for the antecedents of discourse deictic items as in (4) and (5) will enable us to compare the role of deictic items in the discourse relation with the discourse relation itself.

4. Summary

In this paper we described the Turkish Discourse Bank, where discourse connectives are annotated with their two arguments in the style of the PDTB. We focused on the challenges posed by the morphological richness of Turkish as well as its varying word order. We described those aspects of the annotation scheme that are different from the original language English, focusing on the fact that searching for discourse relations between clauses may not capture all the means for presenting information in Turkish.

One departure from the PDTB is annotating phrasal expressions, which revealed additional discourse relations based on connectives. Future research will elucidate whether the senses of complex subordinators and the associated phrasal expressions differ systematically. In addition to this, when we reach a larger coverage in the TDB (e.g., by annotating implicit connectives), we will be able to compare the connective-based discourse relations with the non-connective-based ones, obtaining data for cross-linguistic comparison.

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Appendix A

This appendix provides Fleiss' Kappa measures for Arg1 and Arg2 of the search items that retrieved subordinators, the related phrasal expressions and their variants (where applicable). The appendix also shows the exact match measures for the text spans that supplement Arg1 and Arg2, where relevant (see Section 2.2). The connective *sonra* 'after' was annotated in 4 consecutive stages and agreement was measured for each stage.

Search item (# of annotations)	Gloss			# of Annotators	Kappa measures		Exact Match Agreement					
	Subordinator	Phrasal expression	Variants		Arg1	Arg2	Supp1			Supp2		
							No of Exact Matches	Total No of Ann.	% Agr	No of Exact Matches	Total No of Ann.	% Agr
aksine (13) *[6]	contrary to	contrary to this	-	1	-	-	-	-	-	-	-	-
amacıyla (64)	with the aim of	-	-	3	0.69	0.93	0	0	-	0	0	-
ardından (71)	after	after this	first … then	2	1.00	0.99	7	7	100	2	2	100
beri (4)	since (temporal)	-	-	2	-	-	1	1	100	0	0	-
birlikte (33)*	together/ though	nevertheless	-	1	-	-	-	-	-	-	-	-
bu yana (10)	-	since this time (temporal)	-	2	1.00	1.00	1	1	100	0	0	-
dolayı (21)	owing to	-	-	3	0.98	1.00	0	0	-	0	1	0
dolayısıyla (66)	in consequence of	-	consequently	3	0.78	0.97	2	2	100	1	4	25
ek olarak (1)	-	in addition to this	-	3	NA	NA	0	0	-	0	0	-
gibi (228)	as	-	-	2	0.94	0.95	28	29	96.55	9	9	100
halde (61)	in spite of	inspite of this/that	-	2	0.87	0.93	0	0	-	0	0	-
için (1102)	for, so as to	for this/that	for … for	3	0.81	0.92	3	7	42.86	9	18	50
içindir (4)	because of	because of this/that	it is because of this/that	2	-	-	0	0	-	0	0	-
kadar (159)	as well as, until	-	-	2	0.84	0.99	2	3	66.67	5	5	100
karşılık (28)	although	nonetheless	-	1	-	-	-	-	-	-	-	-
karşın (71)	regardless of	regardless of this/that	irregardless	3	0.86	0.84	0	0	-	0	0	-
nedenle (117)	-	for this/that reason	-	2	0.94	0.99	13	15	86.67	2	2	100
nedenlerle (4)	-	for these reasons	for the reasons above	2	-	-	0	0	-	0	0	-
nedeniyle (42)	for the reason that	-	-	2	0.96	0.97	2	2	100	4	4	100
neticesinde (1)	-	as a result of this	-	3	NA	NA	0	0	-	0	0	-
önce (134)	prior to	prior to this	first	2	1.00	1.00	4	5	80.00	1	1	100
			first … then/now	2	0.84	0.88	4	4	100	1	1	100
ötürü (11)	due to	due to this/that	due to this/that reason	2	1.00	0.94	0	0		1	1	100
rağmen (77)	despite	despite this/these	-	3	0.73	0.78	0	0	-	0	0	-
sayede (5)	-	thanks to this/that	-	2	1.00	1.00	2	2	100	0	0	-
sayesinde (3)*	thanks to	-	-	1	-	-	-	-	-	-	-	-
sonra (713)	after	after this	first.. then,	3	0.85	0.91	5	10	50	7	8	87.50
			now.. then,	2	0.91	0.96	18	18	100	13	13	100
			at the beginning.. then,	2	0.89	0.94	8	9	88.89	5	5	100
			at the beginning..after this	2	0.89	0.98	0	0	-	0	0	-
sonucunda (12)	as a result of	-	-	3	0.78	0.78	0	0	-	0	0	-
yüzünden (5)	since (causal)	-	-	2	1.00	1.00	1	1	100	1	1	100
zaman (159)	when	at that time	whenever … then	2	0.97	0.98	19	21	90.48	10	11	90.91

[6] The stars indicate that the annotations were created by the group annotation procedure; the dashes show that inter-coder reliability was not calculated.

Appendix B

This appendix provides examples that are used to guide the annotators in annotating subordinators and their nominalized arguments by using the nominalizing suffixes that have predicative potential as clues. The normal order of the arguments of a subordinator is Arg2-Arg1. The suffixes are shown in small caps, both the connective and the corresponding suffixes are underlined. [7]

An example for nominalized clauses based on the factive –DIK[8]:

(a) **Üzül-DÜĞ-Ü kadar** *şaşırmıştı da.*

She/He was surprised **as much as she/he was saddened** [sad-PASS-DIK].

An example for nominalized clauses based on the infinitive –MAK:

(b) **Gör-ün-me-mek için** *hemen duvara yaslandı.*

In order not to be seen *[see-PASS-NEG-mAk] he immediately leaned against the wall.*

An example for nominalized clauses based on –Iş:

(c) **İhaleli sisteme geç-iş-in ardından** *bu ihalelere katılmayan 10 kadar firma takibe alındı.*

After the shift [shift-Iş-GEN] **to the bidding system**, *legal action was taken against circa 10 firms that did not undertake bidding processes.*

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[7] In the examples, the following abbreviations are used: DAT: dative suffix, INST: instrumental suffix, GEN: genitive suffix, PASS: the passive morphemes.

[8] The capital letter K may be resolved as k or ğ, the letter which refers to the lengthening of the previous vowel.

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