Connecting the Functions of Lexical Bundles and Moves in Published Research Articles: The Case of Developmental and Educational Psychology

Mei Yang, University of Helsinki

Abstract
The Introduction-Methods-Results-Discussion (IMRD) pattern is frequently used in research articles (RAs) in many disciplines. Following the IMRD format enables writers to organize research content more easily, and thoroughly understanding IMRD sections and their functions will facilitate the writing of IMRD-structured RAs (Mack 2018). Studying lexical bundles, especially their functions, can help understand how research writing is organized. Combining top-down move analysis of RAs with bottom-up frequency-based identification of bundle functions can provide evidence for the occurrence of bundle functions in a particular position of an RA. However, previous studies integrating these two approaches tend to focus on RA Introductions, lacking a systematic investigation of the other three sections. To fill this gap, the present study connects bundle functions and moves in all the sections of RAs in the field of developmental and educational psychology. The results reveal that there are differences between RA sections in terms of the functional distribution of lexical bundles, which are related to the respective roles of the four sections in RAs. The results also show that lexical bundles of certain functions stand out in the moves of each RA section. For novice writers, awareness of such salient combinations of bundle functions and specific moves in the IMRD sections may improve the clarity of argumentation and make their writing more persuasive.

Keywords: lexical bundles; academic writing; research articles; move analysis

1. Introduction

The Introduction-Methods-Results-Discussion (IMRD) pattern is frequently used in research articles (RAs) in many disciplines. Following the IMRD format enables writers to organize research content more easily, and thoroughly understanding IMRD sections and their functions will facilitate the writing of IMRD-structured RAs (Mack 2018). In genre analysis, each RA section is seen to consist of certain functional units called

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moves (Swales 2004) that can help the authors better meet the scientific community's expectations (Kanoksilapatham 2005). In previous work, a top-down approach has been used to analyse the move structure of RAs: researchers have distinguished moves on the basis of 'their interpretations of the communicative purpose of the text' (Pho 2013: 30). From a top-down perspective, moves have been identified in different RA sections, such as the *Introduction* (Hirano 2009; del Saz Rubio 2011), *Methods* (Lim 2006; Cotos, Huffman & Link 2017), *Results* (Brett 1994; Lim 2010), and *Discussion* (Holmes 1997; Basturkmen 2012). After the moves have been identified, the linguistic features associated with particular moves have been analysed in different RA sections. These studies have shown that each RA section consists of specific moves, which are associated with specific linguistic resources used to help achieve the communicative purposes in each move.

Lexical bundles are an 'important component of fluent linguistic production' (Hyland 2012: 150) and they are generally identified based on frequency (e.g., Sánchez Hernández 2013; Esfandiari & Barbary 2017; Wright 2019). The benefit of this approach is that it automatically identifies the lexical bundles that are frequently used in a corpus. When combined with top-down move analysis, this bottom-up approach can provide evidence about how a lexical bundle occurs in a particular position in a text. Lexical bundles are 'lexico-grammatical building blocks associated with basic functions' (Cortes 2013: 36), while moves are 'segments of discourse that provide the building blocks of texts' (Biber, Connor & Upton 2007: 9). Adopting this combined approach to analyse the distribution of functions of lexical bundles can show how these two types of building blocks are used to organize a text. However, to my knowledge, previous studies of this kind tend to focus more on one specific RA section, the Introduction (e.g., Cortes 2013), lacking a comprehensive investigation of the other RA sections.

In order to extend the investigation to other RA sections, the present study aims to connect lexical bundles with moves in all four RA sections: Introduction, Methods, Results and Discussion. As lexical bundles are influenced by the discipline (Lu & Deng 2019), the present study concentrates on only one discipline, psychology, which frequently follows the IMRD pattern (Lin & Evans 2012).

This study explores the impact of RA section on the functional distribution of lexical bundles and the connection of bundle functions with moves in each RA section. The information about the functional difference

across sections and the connection between bundle functions and moves may help novice researchers clearly convey the message in each move and write RAs in a more persuasive way.

2. Literature Review

2.1 Lexical bundles

Lexical bundles are 'the sequences of words that most commonly co-occur in a register' (Biber et al. 1999: 989). Lexical bundle studies have usually taken a bottom-up approach (e.g., Baker & Chen 2010; Esfandiari & Barbary 2017; Wright 2019). Frequency is one criterion for lexical bundle identification. Previous studies have set frequency thresholds at 10 (Biber et al. 1999), 20 (Cortes 2004), 25 (Baker & Chen 2010), or 40 times (Biber, Conrad & Cortes 2004) per million words. Another criterion for lexical bundle identification is dispersion. Dispersion refers to the use of lexical bundles by different writers or speakers and the dispersion thresholds are typically set at three to five texts (e.g., Biber & Barbieri 2007) or 10% of texts (e.g., Hyland 2008a) to avoid individual writers' preferences and ensure the typicality across the entire corpus.

The functions of lexical bundles have been investigated in many studies, and the functional frameworks developed by Biber, Conrad and Cortes (2004) and Hyland (2008b) have been widely used. Biber et al's framework is based on a broader corpus of both spoken and written registers, whereas the one developed by Hyland focuses specifically on research writing. Biber, Conrad and Cortes (2004) classified bundle functions into three groups of stance expressions, discourse organizers and referential expressions. Stance expressions 'express attitudes or assessments of certainty that frame some other proposition'; discourse organizers 'reflect relationship between prior and coming discourse'; referential expressions 'make direct reference to physical or abstract entities, or to the textual context itself' (Biber, Conrad & Cortes 2004: 384). Hyland (2008b) classified bundle functions into research-oriented, text-oriented, and participant-oriented ones, based on Halliday's (1994) ideational, textual, and interpersonal functions. In Hyland's classification, the research-oriented bundles 'help writers to structure their activities and experiences of the real world' (Hyland 2008b: 13); the text-oriented bundles are 'concerned with the organization of the text and its meaning as a message or argument' (Hyland 2008b: 13); the participant-oriented bundles are 'focused on the writer or reader of the text' (Hyland 2008b: 14).

Scholars have made minor adjustments to Hyland's categories to accommodate the bundles in their research. For example, Durrant (2017) added intangible framing attributes to research-oriented bundles, excluded topic bundles from research-oriented bundles, and excluded engagement bundles from participant-oriented bundles. In what follows, the present study will discuss how lexical bundles vary across registers and disciplines based on Biber et al's and Hyland's functional frameworks.

Register and discipline have been found to influence the functions of lexical bundles. Biber, Conrad and Cortes (2004) found that classroom teaching used more stance expressions and discourse organizers than in conversation, but more referential expressions than in academic prose. Hyland (2008b) discovered that hard science (i.e., electrical engineering and microbiology) used more research-oriented bundles, and soft science (i.e., business studies and applied linguistics) more text-oriented and participant-oriented bundles. Durrant (2017) found that hard science writing and soft science writing showed a series of differences in focus when these two clusters of writing were analysed from the perspective of bundle functions. In his study, hard science writing was shown to use research-oriented bundles to describe physical location and quantification, text-oriented bundles to indicate cause and effect, and stance bundles to state received opinion, whereas soft science used these three functions to depict abstract constructs and historical moments, indicate relationships or differences, and evaluate topic importance, respectively. Functional analysis of lexical bundles can help understand the roles bundles play in different registers and disciplines. For instance, Biber, Conrad and Cortes (2004) found that textbook writers used stance expressions to introduce a topic (e.g., *it is important to*), discourse organizers to indicate comparison and contrast (e.g., *on the other hand*), and referential expressions to establish logical relationships in a text (e.g., *on the basis of*). Hyland (2008b) reported that hard science used research-oriented bundles to describe research objects, specify equipment, materials or research environment (e.g., *the structure of the, the size of the*), and soft science used text-oriented and participant-oriented bundles to direct readers around the text (e.g., *in terms of the, will be discussed in*) and indicate the writer's stance (e.g., *it is possible that*). Durrant (2017) found that science and technology writing used research-oriented bundles to depict the physical location and quantification (e.g., *at the bottom of, the length of the*), text-oriented bundles to indicate cause and effect (e.g., *this is because the*), and

stance bundles to state received opinion (e.g., *it is thought that*). By contrast, humanities and social sciences writing used these three functions respectively to describe abstract constructs and historical moments (e.g., *the role of the*, *at the time of*), indicate relationships or differences (e.g., *in contrast to the*), and evaluate topic importance (e.g., *the importance of the*). Through the functional analysis of lexical bundles, these studies present a clear picture of how discourse is organized in different registers and disciplines. Previous studies thus reveal that bundle function is a topic that is well worth investigation and that bundle functions vary across registers and disciplines, but it seems that very few studies have explored how RA sections are linked with bundle functions. To contribute to this line of research, this study explores how RA sections influence bundle functions within the genre of published journal articles.

2.2 Lexical bundles and move analysis of RAs

In genre analysis (Swales 1990), a genre is seen as having shared communicative purposes that shape the schematic structure of its discourse. The communicative purposes are realized through the rhetorical choices that follow certain moves, which are discoursal or rhetorical units performing coherent communicative functions (Swales 2004). As a 'prestigious genre' (Swales 2004: 217), RAs are the main way of contributing to knowledge for scholars. They generally follow the IMRD structure and these IMRD sections are sometimes referred to as 'IMRD part-genres' (Cotos, Huffman & Link 2017: 91). The moves of RAs have been extensively studied over the past three decades (Lin & Evans 2012) and some scholars have associated moves with linguistic features in specific sections of RAs. The Introduction (e.g., Hirano 2009; del Saz Rubio 2011) has been extensively studied since Swales' (1981) proposal of move-based approach to genre analysis, particularly the Create a Research Space (CARS) model. For example, using Swales' CARS model, del Saz Rubio (2011) analysed the move structure of RA introductions in the field of agricultural sciences and identified the metadiscoursal features frequently used to signal those moves. In addition to the Introduction, the other three sections, namely the Methods (e.g., Lim 2006; Cotos, Huffman & Link 2017), Results (e.g., Brett 1994; Lim 2010), and Discussion (e.g., Basturkmen 2012) have also been the focus of attention.

In the above top-down move analyses, the moves and their linguistic characteristics are identified based on the communicative purposes of texts,

which are mainly qualitative interpretations. By contrast, the bottom-up identification of lexical bundles is based on purely quantitative criteria, namely frequency and dispersion thresholds. It has been suggested that connecting the qualitative top-down move analysis with quantitative bottom-up identification of lexical bundles can 'provide evidence for the strong connection that exists between MWEs (multi-word expressions) and rhetorical moves' (Omidian, Shahriari & Siyanova-Chanturia 2018: 3). Based on a one-million word corpus of RA introductions, Cortes (2013) identified a group of lexical bundles, classified the bundles grammatically and functionally, and matched the bundles to the moves and steps characteristic of RA introductions. Inspired by Cortes (2013), Omidian, Shahriari and Siyanova-Chanturia (2018) investigated multi-word expressions in the moves of RA abstracts. However, to my knowledge, such research tends to emphasize RA abstracts and introductions over other in-text sections. This study seeks to contribute to this line of research with a focus on the IMRD sections in one type of RA (i.e., published journal articles). This study first identifies the lexical bundles using a bottom-up approach, and then conducts a top-down move analysis to determine the moves in which the extracted bundles occur based on the communicative purposes of the surrounding context. The bundles and moves are then linked to see which bundles are characteristic of the moves.

2.3 Overview of the present study

The present study is motivated by three points. First, the functional analysis of lexical bundles can present a clear picture of how discourse is organized. Second, connecting top-down move analysis with bottom-up identification of lexical bundles can provide evidence about how lexical bundles are used to organize discourse. Third, to my knowledge, previous studies using this combined approach tend to focus more on abstracts and introductions, rarely including other in-text sections in the research.

Exploring the impact of IMRD sections will inevitably involve the issue of sectional division. The IMRD framework is generally self-explanatory and the section headings given by RA authors can offer important insight for macro-structure analysis (Ruiying & Allison 2003). However, in practice, due to journal conventions or discipline features, not all authors of RAs give explicit IMRD section headings, thus resulting in the issue of subjectivity in sectional division. To reduce the degree of subjectivity, this study focuses on those IMRD-structured RAs, which

means that an RA to be included in the corpus must have independent Introduction, Methods, Results and Discussion sections with explicit headings. The IMRD pattern is not limited to natural sciences, but is frequently employed also in some social science disciplines like psychology (Lin & Evans 2012), which is the reason for selecting this discipline in the present study. Besides, since subdisciplines within a single discipline show variations in writing conventions (Ozturk 2007), this study focuses on the RAs in one subdiscipline to control the variables, facilitate the interpretation of results and make them more meaningful. The subdiscipline is developmental and educational psychology, which is an important yet less fully explored psychology branch in terms of lexical bundle analysis (Esfandiari & Barbary 2017).

This study aims to answer the following two research questions:

1) Is there a significant difference between RA sections in terms of the functional distribution of lexical bundles in developmental and educational psychology?
2) How are the functions of lexical bundles connected to the moves in each RA section in developmental and educational psychology?

3. Corpora and Methods

3.1 Corpora

The corpora in this study consist of the IMRD-structured empirical RAs selected from five journals in the field of *Developmental and Educational Psychology* published by Elsevier. The five journals are *Journal of School Psychology*, *Journal of Experimental Child Psychology*, *Contemporary Educational Psychology*, *Research in Developmental Disabilities* and *Journal of Applied Developmental Psychology*.

The extraction of RAs was based on a stratified random sampling. Specifically, five IMRD-structured texts were selected from each of the five journals each year for a total of 10 years (2010–2019) (i.e., 50 texts for each of the five journals and 250 texts in total). Each RA has independent Introduction, Method, Results and Discussion sections and the headings of the four sections are clearly labelled ‘Introduction’, ‘Method(s)’, ‘Results’ and ‘Discussion’, respectively. The articles were converted into plain text files and conversion errors were manually corrected. In-text author-date citations were retained, and the tables, figures, footnotes, endnotes, appendices and references not relevant to the topic discussed in this study were omitted. Each RA was then divided into four I-M-R-D sections, saved

in four separate text files, and stored in separate folders. Each folder contained 250 text files, and the four folders were the four sub-corpora in the present study.

All the four sub-corpora of Introduction, Methods, Results and Discussion originally had 250 texts, but they were of different sizes (see Table 1). The Results sub-corpus had the smallest size. Lexical bundles 'are strongly sensitive to the number of words in a corpus rather than the number of texts' (Esfandiari & Barbary 2017: 27) and it is potentially problematic to use the same normalized threshold to compare bundles in corpora of different sizes (Bestgen 2018). If the corpora are of different sizes, it may be desirable to reduce the size of the larger corpora by eliminating some documents (Bestgen 2020). Following Bestgen (2020), I reduced the sizes of the three larger corpora of Introduction, Methods and Discussion by randomly eliminating some texts. Every time one text was randomly eliminated, the word count of the remaining texts was calculated, and the elimination was continued until a closely matched word count in the three larger corpora of Introduction, Methods and Discussion was reached with the sub-corpus of Results. Table 1 gives information about the four sub-corpora before and after refinement.

Table 1. Composition of the four sub-corpora

	Before refinement		After refinement	
	No. of texts	Total tokens (words)	No. of texts	Total tokens (words)
Introduction	250	526,376	131	281,056
Methods	250	480,193	146	280,823
Results	250	280,406	250	280,406
Discussion	250	477,169	146	280,405

3.2 Identification of lexical bundles

Four-word lexical bundles were identified for analysis in the present study because they 'are far more common than 5-word strings and offer a clearer range of structures and functions than 3-word bundles' (Hyland 2008b: 8).

Following Biber, Conrad and Cortes (2004) and Wright (2019), I chose a moderately high frequency threshold of 40 times per million words[1].

Quite a few studies (e.g., Cortes 2013; Omidian, Shahriari & Siyanova-Chanturia 2018) have established the requirement of lexical bundles to occur in at least five texts. The dispersion thresholds of five to ten were tested in this study, and a stricter cut-off point of 10+ texts was finally adopted for dispersion because this threshold generated a reasonable set of bundles for comparison between the four sub-corpora. As shown by Cortes (2013), the frequency of individual lexical bundles becomes higher when the corpus is more focused. For example, many expressions that have been found to be frequent in Cortes' (2013) focused corpus of Introductions had never been identified as recurrent expressions in the corpora made up of whole RAs. Therefore, to extract the bundles that are characteristic of each RA section, I identified bundles at the level of the four focused sub-corpora of Introduction, Methods, Results and Discussion.

AntConc was used to determine the frequency and dispersion thresholds[2]. Considering that the overlap cases of 'complete overlap' and 'complete subsumption' (Baker & Chen 2010: 33) will inflate quantitative results, the identified bundles were manually checked via concordance analyses. Complete overlap refers to the case where two four-word bundles are derived from a single five-word combination. During the manual check, one case of complete overlap was observed in the Methods sub-corpus. *At the time of* and *the time of the* both occurred 35 times, coming from the longer expression *at the time of the*. Complete subsumption refers to the case where two bundles form part of a five-word bundle. A total of 10 cases of complete subsumption (two cases in Introduction; four cases in Results; four cases in Discussion) were observed during the manual check. For

[1] Since the four sub-corpora sizes in the current study are not one million, the frequency threshold was then calculated by multiplying the established cut-off frequency by the corpora size divided by one million, and the equivalent number was 11 times.

[2] During the identification, one lexical bundle (i.e., *in the United States*) was excluded from the Introduction sub-corpus as this bundle is 'a four-word bundle because of the number of words in the country's name' (Wright 2019: 5). One bundle (i.e., *cronbach's alpha for*) in the Methods sub-corpus and one bundle (i.e., *children's ability to*) in the Discussion sub-corpus were excluded because they are counted as four-word bundles due to the misidentification of 'cronbach's' and 'children's' as two separate words by *AntConc*.

example, in the Results sub-corpus, *not significantly related to* occurred 20 times, while *was not significantly related* occurred 19 times. Both bundles occurred as a subset of the five-word bundle *was not significantly related to*, which occurred six times. Following Baker and Chen (2010), the frequency of *was not significantly related to* was subtracted from the combined frequency of *not significantly related to* and *was not significantly related*. Apart from the overlapping cases, there is another problem: should the types of bundles (types) or the frequencies of bundles (tokens) be counted? One corpus with a narrow range of bundles can have high token frequencies of them when certain bundles are repeatedly used. Following Baker and Chen (2010), I counted both the types and tokens of bundles (see Table 2).

Table 2. Number of bundle types and tokens in each RA section

Section	Types	Tokens
Introduction	45	994
Methods	53	1,112
Results	56	1,445
Discussion	66	1,587

3.3 Functional classification of lexical bundles and bundle-move connection

The functional analysis of lexical bundles was based on Hyland's (2008b) classification framework with some minor adjustments to accommodate the bundles extracted in this study. One subcategory *statistical markers* was added to Hyland's research-oriented bundles, and two subcategories *generalization* and *citation* were added to the text-oriented bundles. The functional classification was done by two raters (the author of this paper and a doctoral student in applied linguistics). The two raters first classified the bundle functions independently and the initial agreement rate was 76%. Each case of disagreement was then discussed to reach 100% agreement.

Close reading of the concordances showed that two bundles (i.e., *in the present study* and *in the current study*) were multifunctional. These two bundles occurred in the Introduction, Methods and Discussion sub-corpora. Based on the specific contexts, these bundles were functionally classified on a case-by-case basis. For example, in the Introduction sub-corpus, the bundle *in the current study* occurred 53 times and had two functions (i.e.,

location and structuring signals). Via concordance analyses and the two raters' discussion, 39 of the occurrences were incorporated into the function of structuring signals and 14 of the occurrences into the function of location. The final functional categories and examples are listed in Table 3. The full list of lexical bundles in the IMRD sections is shown in Appendix A.

Table 3. Functional classification framework (adapted from Hyland 2008b)

Function	Subcategory	Example
Research-oriented	Location	*in a quiet room*
	Procedure	*were used to assess*
	Quantification	*each of the three*
	Description	*the center of the*
	Statistical markers	*means and standard deviations*
Text-oriented	Transition signals	*on the other hand*
	Resultative signals	*the results of the*
	Structuring signals	*are presented in table*
	Framing signals	*in the case of*
	Generalization	*little is known about*
	Citation	*is consistent with the*
Participant-oriented	Stance features	*are more likely to*
	Engagement features	*it should be noted*

Following Baker and Chen (2010) and Omidian, Shahriari and Siyanova-Chanturia (2018), I employed a chi-square test[3] to determine whether or not a statistically significant relationship exists between RA sections and bundle functions in developmental and educational psychology. In the current study, the two categorical variables for chi-square tests are RA *section* and *function*. The null hypothesis in the chi-square test is that there is no association between RA section and the distribution of functions of lexical bundles in the data.

After the chi-square test of RA sections and bundle functions was performed, lexical bundles were connected with the moves they appear in. This was done following the systematic coding scheme of the move structures of RAs in Pho (2013) (see Appendix B). As many moves in the articles in the corpora do not use lexical bundles, this study simply identified the moves based on the context of the extracted lexical bundles,

[3] The chi-square tests in this study were performed using R.

instead of tagging the moves for the four sub-corpora in advance (cf. Moreno & Swales' (2018) critique towards bundle-move analyses). The bundle-move connection was analysed by the same two raters (the author of this paper and a doctoral student in applied linguistics). The two raters first connected the bundles with moves independently and the initial agreement rate was 72%. Each case of disagreement was then discussed to reach full agreement. The bundles that appeared in more than one move were analysed on a case-by-case basis. For example, in the Introduction sub-corpus, *the extent to which* occurred 55 times. Based on the surrounding context and the two raters' negotiation, this bundle appeared 45 times in *Move 1: Establishing a territory <EST>*, five times in *Move 2: Establishing a niche <ESN>* and five times in *Move 3: Presenting the present work <PPW>*.

4. Results and Discussion

4.1 Functional analysis

Tables 4 and 5 show that the Introduction section used significantly more text- and participant-oriented bundles, the Methods and Results sections more research-oriented bundles, and the Discussion section more text- and participant-oriented bundles. The subcategorial distribution of functions can give a clearer picture of how the functions are manifested in each section (see Figure 1). The functional differences across the IMRD sections were analysed in detail below.

Table 4. Standardized residuals in a chi-square contingency table for functional distribution (types)[4]

		Research-oriented	Text-oriented	Participant-oriented
Introduction	Observed count	7	33	7
	Expected count	17.677	23.708	5.615
	R	**-2.539**	1.908	0.584
Methods	Observed count	44	11	0
	Expected count	20.686	27.743	6.571

[4] In terms of the types, the standardized residuals (*R*), calculated to interpret the association between RA sections and bundle functions, showed that the cells in bold ($R > 1.96$) made a statistically significant contribution to the rejection of the null hypothesis.

	R	**5.126**	**-3.179**	**-2.563**
Results	Observed count	28	25	3
	Expected count	21.062	28.248	6.690
	R	1.512	-0.611	-1.427
Discussion	Observed count	6	45	17
	Expected count	25.575	34.301	8.124
	R	**-3.871**	1.827	**3.114**

χ^2= 86.097, *df* = 6, $p < 0.001$, Cramer's $V = 0.437$

Table 5. Standardized residuals in a chi-square contingency table for functional distribution (tokens)[5]

		Research-oriented	Text-oriented	Participant-oriented
Introduction	Observed count	158	655	181
	Expected count	362.351	493.518	138.131
	R	**-10.735**	**7.269**	**3.648**
Methods	Observed count	919	193	0
	Expected count	405.367	552.104	154.529
	R	**25.511**	**-15.283**	**-12.431**
Results	Observed count	664	682	99
	Expected count	526.758	717.438	200.804
	R	**5.980**	-1.323	**-7.184**
Discussion	Observed count	132	1021	434
	Expected count	578.523	787.940	220.537
	R	**-18.565**	**8.303**	**14.374**

χ^2= 1929.6, df = 6, $p < 0.001$, Cramer's $V = 0.433$

[5] In terms of the tokens, all the cells except for text-oriented bundles in Results made a statistically significant contribution to the rejection of the null hypothesis. The difference in the cells between the bundle types and tokens can be attributed to the repeated use of certain types of bundles.

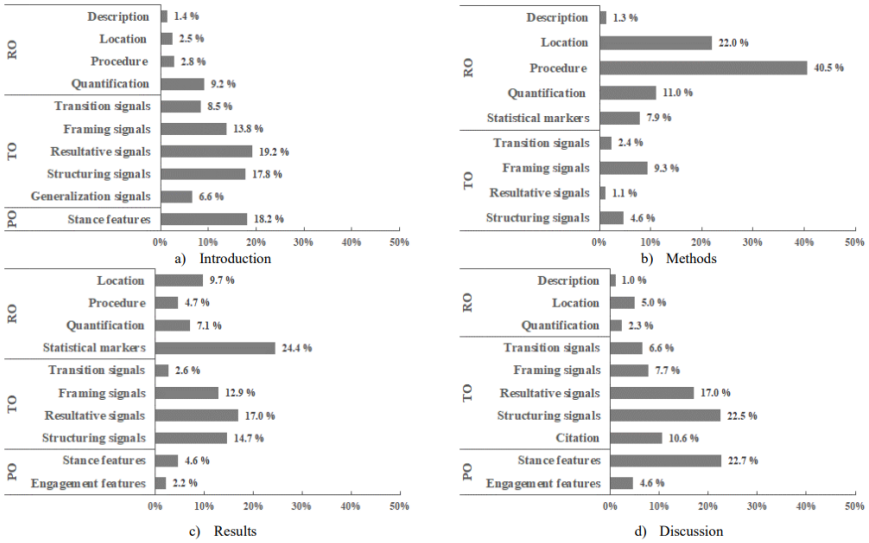

Figure 1. Subcategory functional distribution of bundle tokens in each RA section (Note: RO = research-oriented; TO = text-oriented; PO = participant-oriented)

The functional differences are clearly correlated with the roles the four sections play in RAs. In Introductions, writers refer to previous studies and emphasize possible gaps in the extant literature (del Saz Rubio 2011), which necessitates text-oriented bundles. These include resultative signals (19.2% of all the lexical bundles), which are used to present the findings in previous studies (1).

(1) …empirical ***research has shown that*** students' academic self-concepts... [PSY_CEP_art032019_I]

Generalization signals (6.6%) are employed to show what has not been done in the existing studies (2), and structuring signals (17.8%) are used to highlight the goal of their own studies (3). Such structuring signals also show a close association with previous studies by conveying to the readership in what way their studies are different from the previous ones in the domain.

(2) …but ***little is known about*** the ways in which the needs of children are identified... [PSY_RDD_art012018_I]

(3) The aim ***of the present study*** was to test the… [PSY_JADP_art022019_I]

Stance features are used in the Introduction section to summarize the existing studies (4) and show the value of research (5), in line with the function of the overall communicative purpose of the introduction (Shahriari 2017).

(4) Studies show that young children ***are more likely to*** complete… [PSY_JECP_art012014_I]
(5) ***It is important to*** examine to what extent the predictions of… [PSY_CEP_art012019_I]

In Methods, writers aim to convince the readers of research validity and to enhance the credibility of the findings to be reported in the Results section (Lim 2006). This purpose is clearly reflected in the data as the high incidence of research-oriented bundles (82.7%), especially the bundles depicting the research procedures (40.5%). By clearly delineating how the research is carried out with these bundles, the writers can inform the readers of the authenticity of the research findings in advance (6).

(6) …measures ***were used to assess*** group differences over time… [PSY_RDD_art032010_M]

In the Results section, the writers make their new knowledge claims by presenting and explaining numerical data (Brett 1994). The presentation of numerical data accounted for a large proportion of research-oriented bundles (45.9%) in the corpus, especially the statistical markers (24.4%). With these statistical markers, the writers can draw the readers' attention to the quantitative findings (7).

(7) …this result ***was not statistically significant*** after applying the... [PSY_JSP_art052014_R]

The Discussion section of RAs reinforces the principal lines of argument and establishes the importance of research findings (Liu & Buckingham 2018), which requires interaction between the writers and readers. To effectively convey the research value to readers, the writers

need to direct the readers' attention to the organization of the text and convey their own attitudes and evaluations to readers (8).

(8) …findings most directly point ***to the importance of*** specifying… [PSY_CEP_art022019_D]

4.2 Bundle-move connection

To investigate the link between bundles and rhetorical moves, I identified for each occurrence of a bundle the corresponding rhetorical move. Table 6 lists the moves with the highest frequencies of the bundle functions that have been found to be statistically significant[6]. These highly-frequent bundles were then analysed using specific examples.

Table 6. Moves with the highest frequencies of statistically significant functions

Move (Introduction)	**Function**	**Lexical bundle**	**TF#**
Move 1: Establishing a territory <EST>	Text-oriented (resultative signals)	*have been found to(30)*, research has shown that(28), studies have shown that(24), has been shown to(21), have been shown to(20), to be associated with(15), has been found to(14), there is evidence that(12), these findings suggest that(11), the findings suggest that(11)*	186
	Participant-oriented (stance features)	*are more likely to(25), one of the most(19), it is possible that(16), be more likely to(9), more likely to be(9), were more likely to(8), it is important to(5)*	91
Move 3: Presenting the present work <PPW>	Text-oriented (structuring signals)	*in the current study(37), of the present study(29), of this study was(26), of the current study(22), in this study we(21), in the present study(15), purpose of*	172

[6] Due to space limitations, Table 6 only lists the moves with the highest frequencies of the bundle functions that have been found to be statistically significant. The full list of bundle-move connection is shown in Appendix C.

		this study(11), purpose of the study(11)	
Move (Methods)	**Function**	**Lexical bundle**	**TF**
Move 1: Describing the data and data collection procedure <DCP>	Research-oriented (procedure)	*children were asked to(33), to participate in the(28), participants were asked to(27), were randomly assigned to(22), were excluded from the(20), were presented in a(18), participants were instructed to(17), was approved by the(17), they were asked to(13), was used in the(12), randomly assigned to the(12), and were asked to(11), participated in the study(11), were approved by the(11), were included in the(10), used in the present(10), was used as a(9), were used to measure(9), were used in the(9), was used to measure(8), was presented in a(8), used in the current(7), used in this study(5)*	327
Move (Results)	**Function**	**Lexical bundle**	**TF**
Move 2: Reporting specific/individual results <RER>	Research-oriented (statistical markers)	*of the variance in(82), did not differ significantly(29), means and standard deviations(28), was not statistically significant(28), fit to the data(25), significant differences between the(21), not significantly related to(20), was a significant predictor(16), were not significantly different(16), was significantly related to(15), were not statistically significant(14), was not significantly related(13), was significantly correlated with(12), as the dependent variable(3)*	322

Move (Discussion)	**Function**	**Lexical bundle**	**TF**
Move 4: Discussing the findings of the study <DFS>	Text-oriented (resultative signals)	*the results of the*$_{(55)}$, *these findings suggest that*$_{(27)}$, *results of this study*$_{(26)}$, *our findings suggest that*$_{(23)}$, *the results of this*$_{(23)}$, *as a result of*$_{(15)}$, *the findings of the*$_{(15)}$, *the effects of the*$_{(14)}$, *these results suggest that*$_{(14)}$, *our results suggest that*$_{(12)}$, *the results suggest that*$_{(12)}$, *the findings of this*$_{(11)}$, *the results of our*$_{(11)}$, *the findings suggest that*$_{(11)}$	269
	Text-oriented (citation)	*is in line with*$_{(36)}$, *in line with previous*$_{(25)}$, *in line with the*$_{(24)}$, *are in line with*$_{(20)}$, *is consistent with the*$_{(20)}$, *consistent with previous research*$_{(15)}$, *in line with our*$_{(14)}$, *this is consistent with*$_{(14)}$	168
	Participant-oriented (stance features)	*it is possible that*$_{(85)}$, *are more likely to*$_{(33)}$, *were more likely to*$_{(31)}$, *it may be that*$_{(24)}$, *are likely to be*$_{(14)}$, *it is also possible*$_{(13)}$, *in their ability to*$_{(13)}$, *it is important to*$_{(5)}$, *to the importance of*$_{(4)}$, *our understanding of the*$_{(2)}$, *it is also important*$_{(2)}$	226
Move 6: Evaluating the study <EVS>	Participant-oriented (stance features)	*it is important to*$_{(42)}$, *we were able to*$_{(14)}$, *it is also important*$_{(12)}$, *study is the first*$_{(12)}$, *this is the first*$_{(11)}$, *our understanding of the*$_{(9)}$, *to the importance of*$_{(8)}$, *it is possible that*$_{(2)}$	110

* The numbers in brackets indicates raw frequencies.
# TF denotes total frequencies.

In Introductions, the high frequency of text-oriented bundles is due to resultative and structuring signals that are linked with *Move 1: Establishing a territory <EST>*. These bundles often use the wordforms *shown* and *found* (9 and 10).

(9) Previous ***studies have shown that*** children who have... [PSY_JSP_art012014_I]
(10) …students' expectancies ***have been found to*** be better predictors of... [PSY_CEP_art032019_I]

A large number of structuring signals also appear in *Move 3: Presenting the present work <PPW>*, and a majority of these structuring signals share the items *current study, present study* and *this study* (11 and 12).

(11) ***In the current study***, students in a comparison group... [PSY_CEP_art022010_I]
(12) …the main purpose ***of this study was*** *to* directly test... [PSY_JECP_art042018_I]

These findings are consistent with Cortes (2013), who has linked bundles such as *studies have shown that, have been shown to be, it was found that the* with the function of reviewing previous literature, and *of this study was to, the purpose of the present study was to, the aim of this study* with announcing present research purposefully. The core items such as *shown* and *found* give an indication of the discussion about research findings in previous work in *Move 1: Establishing a territory <EST>*. The core items such as *current study, present study* and *this study* provide clues about how *Move 3: Presenting the present work <PPW>* is initiated via illuminating the information about the present work.

Stance bundles are also mainly used in *Move 1: Establishing a territory <EST>*. In this move, most stance features sharing the core items *more likely* are used to summarize the findings of previous studies (13).

(13) Latino college students have also been found to ***be more likely to*** live at home… [PSY_JADP_art042012_I]

In contrast to Introductions, Methods are dominated by research-oriented bundles. These bundles are connected with *Move 1: Describing the*

data and data collection procedure <DCP>, and they frequently contain verbs such as *ask, use, exclude, present,* and *approve* (14).

(14) …***participants were asked to*** list up to 10 people... [PSY_RDD_art032018_M]

These procedural verbs in the past simple tense typically 'refer to procedures carried out in the past' (Lim 2006: 303) and as such form a natural connection with the rhetorical purpose of this move.

The Results section used significantly more research-oriented bundles. Statistical markers are frequently used in *Move 2: Reporting specific/individual results <RER>*. In this move, the results are normally presented with relevant evidence such as statistics (Ruiying & Allison 2003). As can be seen in Table 6, most of the statistical markers are indeed frequently used to report the statistical results, and the lexical item *significant* acts as an important signal for identifying this move (15). The high frequency of statistical markers further underlines the fact that experimental research design is widely used also in psychology and statistical methods are used to make predictions for the relationships that exist for psychological phenomena (Goodwin & Goodwin 2016).

(15) …our experimental groups ***were not significantly different***… [PSY_JECP_art032010_R]

Finally, the Discussion section used significantly more text-oriented and participant-oriented bundles, which are linked to *Move 4: Discussing the findings of the study <DFS>*. Text-oriented bundles include resultative and citation signals used to interpret what information the readers can get from the writer's research results. Most resultative signals have the words *results, findings* and *suggest* (16 and 17).

(16) ***These findings suggest that*** the effect of pre-adoption adversity... [PSY_JADP_art012012_D]
(17) ***Results of this study*** extend what is known about the... [PSY_RDD_art032015_D]

These words were already identified as being characteristic of the Discussions by Le and Harrington (2015), who note that they are used to

obscure the writers' agency and authorial responsibility (Le & Harrington 2015). In this way, the writers can become less involved with the results and invite comment on their findings. The epistemic verb *suggest* is used to express the writers' caution and 'hedged interpretations of their results' (Le & Harrington 2015: 51).

Citation bundles in *Move 4: Discussing the findings of the study <DFS>* share the lexical items *in line with* and *consistent with* (18 and 19), which are used to compare the writer's own research and previous studies. The items *in line with* and *consistent with* 'emphasize the writer's alignment with the cited sources to advance a valued proposition' (Cheng & Unsworth 2016: 47).

(18) These findings are ***in line with the*** proposal by... [PSY_JECP_art012012_D]
(19) These results are ***consistent with previous research***... [PSY_JADP_art022016_D]

Discussion sections also employ stance features, which are frequently used both in *Move 4: Discussing the findings of the study <DFS>* and *Move 6: Evaluating the study <EVS>*. The stance features in *Move 4* contain the items *likely to* and *possible that* (20 and 21), which are used to illustrate the writer's stance and account for the research results.

(20) …low-income families who have less financial capital ***are more likely to*** have children with lower math achievement... [PSY_JSP_art052017_D]
(21) ***It is possible that*** the positive changes in teachers' behaviors may have been interpreted by... [PSY_CEP_art052010_D]

The item *likely to* indicates the probability of occurring, and the item *possible that* 'assesses the likelihood or validity of something' (Groom 2005: 259). With these items, the writers are able to argue for the validity of their research data and ensure the legitimation of their own findings (Cheng & Unsworth 2016).

The stance features in *Move 6: Evaluating the study <EVS>* contain the words like *able*, *first*, and *important* (22–24) to state that 'the study is valued over others' (Loi, Lim & Wharton 2016: 9).

(22) ***We were able to*** show that preschoolers are already sensitive... [PSY_JECP_art042015_D]
(23) …the present ***study is the first*** to show that social cognitions... [PSY_JADP_art042019_D.]
(24) …results point ***to the importance of*** considering... [PSY_CEP_art052017_D]

5. Conclusion

The present study has explored two issues about lexical bundles in RAs in a particular discipline. One is the impact of RA section on the functional distribution of lexical bundles, and the other is the connection of bundle functions with the moves in each RA section.

As with Cortes (2013) and Omidian, Shahriari and Siyanova-Chanturia (2018), this study also found a strong connection between lexical bundles and rhetorical moves. However, the findings in this study are not confined to one RA section, but cover all the IMRD sections. In the Introduction section, resultative signals tend to cluster in *Move 1: Establishing a territory <EST>*, structuring signals in *Move 3: Presenting the present work <PPW>* and stance features in *Move 1: Establishing a territory <EST>*. In Methods, procedure bundles stand out in *Move 1: Describing the data and data collection procedure <DCP>*. In Results, statistical markers stand out in *Move 2: Reporting specific/individual results <RER>*. In the Discussion section, resultative and citation bundles tend to cluster in *Move 4: Discussing the findings of the study <DFS>*, whereas stance features are mainly associated with *Move 4: Discussing the findings of the study <DFS>* and *Move 6: Evaluating the study <EVS>*. With its focus on bundle functions in the moves of all research article IMRD sections, this study contributes to the methodology of combining move analysis with bundle analysis. However, more revealing results concerning the linguistic features characterizing RA rhetorical moves might be obtained if RAs were manually annotated at the step level, because a given text fragment can be articulated in more specific terms at the step level (e.g., 'indicating a gap') than at the move level (e.g., 'establishing a niche') (Moreno & Swales 2018). Future studies should take this caveat into account.

Linking frequent word sequences to the rhetorical moves in RAs can assist novice writers in expanding their lexico-grammatical repertoire (Khany & Malmir 2020). For the novice researchers who attempt to publish journal articles, the awareness of the connections between rhetorical moves

and their typical realisations visible in lexical bundles may help in improving the clarity of argumentation and making their writing more persuasive. What should be noted, though, is that this study primarily concentrates on one discipline, the lexical bundles in which may not be fully used in other disciplines (see e.g., Ren 2021; Yin & Li 2021). Therefore, it is recommended that other disciplines be examined in future studies.

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Appendices

Appendix A. Full list of lexical bundles in the IMRD sections in developmental and educational psychology

Section	Lexical bundle	Raw Freq.	Range	Function
Introduction	*the extent to which*	55	32	quantification
	are more likely to	43	36	stance features
	on the other hand	42	30	transition signals
	in the current study	39	21	structuring signals
	in the context of	34	20	framing signals
	it is important to	42	24	stance features
	have been found to	30	26	resultative signals
	in a sample of	29	16	framing signals
	of the present study	29	23	structuring signals
	as a function of	28	18	framing signals
	in the development of	28	18	procedure
	research has shown that	28	23	resultative signals
	of this study was	26	21	structuring signals
	studies have shown that	24	21	resultative signals

	of the current study	22	19	structuring signals
	the degree to which	22	12	quantification
	has been shown to	21	16	resultative signals
	in this study we	21	16	structuring signals
	have been shown to	20	16	resultative signals
	in terms of the	20	12	framing signals
	one of the most	25	19	stance features
	to be associated with	20	17	resultative signals
	be more likely to	21	16	stance features
	in the present study	18	11	structuring signals
	it is possible that	19	12	stance features
	little is known about	17	13	generalization
	more likely to be	17	14	stance features
	on the one hand	16	12	transition signals
	were more likely to	14	13	stance features
	a wide range of	14	10	quantification
	has been found to	14	10	resultative signals
	with higher levels of	14	10	framing signals
	the quality of the	14	10	description
	in the current study	14	12	location
	few studies have examined	13	10	generalization
	as well as the	13	12	transition signals
	as well as their	13	11	transition signals
	research has focused on	13	13	generalization
	a few studies have	12	11	generalization
	in the form of	12	10	framing signals
	there is evidence that	12	11	resultative signals
	purpose of this study	11	10	structuring signals
	these findings suggest that	11	11	resultative signals
	in the present study	11	10	location
	purpose of the study	11	10	location
	the findings suggest that	11	10	resultative signals
	studies have focused on	11	10	generalization

Methods	*at the end of*	57	36	location
	*on a N-point scale**	56	32	statistical markers
	in the present study	45	19	location
	in the current study	42	24	location
	the total number of	39	27	quantification
	at the time of	35	26	quantification
	the extent to which	35	26	quantification
	children were asked to	33	20	procedure
	for each of the	32	25	framing signals
	to participate in the	28	23	procedure
	as well as the	27	22	transition signals
	participants were asked to	27	16	procedure
	were included in the	26	20	procedure
	at the beginning of	25	20	location
	on the basis of	24	18	framing signals
	were randomly assigned to	22	16	procedure
	each of the three	20	15	quantification
	were excluded from the	20	18	procedure
	were used to assess	19	15	framing signals
	who participated in the	19	15	framing signals
	was assessed using the	18	14	procedure
	were presented in a	18	17	procedure
	participants were instructed to	17	11	procedure
	used in this study	17	14	procedure
	was approved by the	17	17	procedure
	was used in the	17	17	procedure
	a mean age of	16	15	statistical markers
	the degree to which	16	13	quantification
	the mean age of	16	13	statistical markers
	the start of the	16	13	location
	of the current study	15	14	structuring signals
	used in the present	15	12	procedure
	was used to assess	15	15	procedure
	with higher scores indicating	15	10	framing signals
	of the school year	14	12	location

	the center of the	14	10	description
	was assessed with the	14	11	procedure
	in the context of	13	13	framing signals
	of the sample was	13	13	structuring signals
	they were asked to	13	12	procedure
	was used as a	13	12	procedure
	have been shown to	12	11	resultative signals
	randomly assigned to the	12	11	procedure
	the majority of the	12	12	quantification
	were used to measure	12	11	procedure
	in the current study	12	10	structuring signals
	and were asked to	11	11	procedure
	in a quiet room	11	11	location
	participated in the study	11	10	procedure
	in the present study	11	10	structuring signals
	was presented in a	11	10	procedure
	were used in the	11	10	procedure
	was used to measure	11	10	procedure
	were approved by the	11	10	procedure
	used in the current	11	10	procedure
Results	*are presented in table*	86	69	structuring signals
	of the variance in	82	39	statistical markers
	as a function of	61	28	framing signals
	were more likely to	52	31	stance features
	as shown in table	47	28	structuring signals
	a main effect of	45	24	resultative signals
	the results of the	41	36	resultative signals
	at the end of	38	13	location
	at the beginning of	37	20	location
	for each of the	34	26	framing signals
	as can be seen	32	20	engagement features
	constrained to be equal	32	15	procedure
	fit to the data	32	21	statistical markers

	are shown in table	31	25	structuring signals
	a significant main effect	30	20	resultative signals
	did not differ significantly	29	19	statistical markers
	means and standard deviations	28	26	statistical markers
	was not statistically significant	28	16	statistical markers
	as the dependent variable	27	17	statistical markers
	with higher levels of	27	16	framing signals
	with the exception of	27	21	framing signals
	in the case of	24	15	framing signals
	the total number of	24	17	quantification
	included in the model	23	16	procedure
	the extent to which	23	16	quantification
	as well as the	22	20	transition signals
	each of the three	22	19	quantification
	in the control group	22	10	location
	significant differences between the	21	10	statistical markers
	not significantly related to	20	13	statistical markers
	the difference between the	20	15	quantification
	was not related to	20	10	resultative signals
	was positively related to	20	15	resultative signals
	are reported in table	19	15	structuring signals
	the effect of the	19	13	resultative signals
	at each time point	17	12	location
	as reported in table	17	11	structuring signals
	the main effects of	16	13	resultative signals
	was a significant predictor	16	10	statistical markers
	were not significantly different	16	12	statistical markers
	differences were found	15	13	resultative signals

	between			
	on the other hand	15	13	transition signals
	over the course of	15	10	location
	was positively associated with	15	13	resultative signals
	more likely to be	15	10	stance features
	was significantly related to	15	11	statistical markers
	for boys and girls	14	10	framing signals
	the magnitude of the	14	11	quantification
	was found to be	14	11	resultative signals
	were not statistically significant	14	14	statistical markers
	was not significantly related	13	11	statistical markers
	were included in the	13	10	procedure
	variables are presented in	12	11	structuring signals
	were significantly correlated with	12	10	statistical markers
	the end of the	11	10	location
	were found to be	11	10	resultative signals
Discussion	*it is possible that*	106	66	stance features
	in the current study	96	34	structuring signals
	of the current study	58	35	structuring signals
	the results of the	55	33	resultative signals
	of the present study	54	28	structuring signals
	it is important to	50	40	stance features
	in the present study	49	27	structuring signals
	research is needed to	43	32	engagement features
	in the current study	37	20	location
	is in line with	36	24	citation
	the extent to which	36	25	quantification
	on the other hand	35	29	transition signals
	are more likely to	33	23	stance features
	were more likely to	31	22	stance features
	in the context of	29	23	framing signals

	as well as the	27	26	transition signals
	these findings suggest that	27	23	resultative signals
	results of this study	26	21	resultative signals
	in line with previous	25	18	citation
	in line with the	24	19	citation
	it may be that	24	19	stance features
	our findings suggest that	23	20	resultative signals
	the results of this	23	17	resultative signals
	in the case of	21	13	framing signals
	are in line with	20	16	citation
	is consistent with the	20	18	citation
	it should be noted	19	17	engagement features
	used in this study	19	14	structuring signals
	of this study was	18	16	structuring signals
	on the basis of	18	11	framing signals
	as well as a	17	15	transition signals
	as a function of	16	12	framing signals
	it is also possible	16	14	stance features
	the nature of the	16	12	description
	in the present study	16	10	location
	as a result of	15	14	resultative signals
	in this study were	15	14	structuring signals
	consistent with previous research	15	11	citation
	the findings of the	15	10	resultative signals
	are likely to be	14	13	stance features
	at the beginning of	14	10	location
	from the current study	14	10	structuring signals
	in addition to the	14	11	transition signals
	in line with our	14	10	citation
	it is also important	14	11	stance features
	the effects of the	14	12	resultative signals
	these results suggest that	14	11	resultative signals
	this is consistent with	14	11	citation

	we were able to	14	12	stance features
	with regard to the	14	12	framing signals
	at the end of	13	11	location
	in the presence of	13	11	framing signals
	in their ability to	13	10	stance features
	as well as in	12	10	transition signals
	limitation of this study	12	11	structuring signals
	our results suggest that	12	11	resultative signals
	study is the first	12	11	stance features
	the results suggest that	12	10	resultative signals
	to the importance of	12	11	stance features
	future research is needed	11	10	engagement features
	in terms of the	11	11	framing signals
	our understanding of the	11	10	stance features
	the findings of this	11	11	resultative signals
	the results of our	11	10	resultative signals
	this is the first	11	11	stance features
	from the present study	11	10	structuring signals
	the findings suggest that	11	10	resultative signals
	in this study was	11	10	structuring signals

**N* refers to unspecified numbers, such as *on a 5-point scale*.

Appendix B. Move structures of RAs (Pho, 2013)

Introduction	Move 1: Establishing a territory <EST> Move 2: Establishing a niche <ESN> Move 3: Presenting the present work <PPW>
Methods	Move 1: Describing the data and data collection procedure <DCP> Move 2: Describing the data analysis procedure <DAP>
Results	Move 1: Preparing for the presentation of the Results section <PPR> Move 2: Reporting specific/individual results <RER> Move 3: Commenting on specific results <COR>

	Move 4: Summarizing results <SUR>
Discussion	Move 1: Preparing for the presentation of the Discussion section <PPD> Move 2: Summarizing the study <STS> Move 3: Highlighting overall research outcome <ORO> Move 4: Discussing the findings of the study <DFS> Move 5: Drawing conclusions of the study/Stating research conclusions <CNC> Move 6: Evaluating the study <EVS> Move 7: Deductions from the research <DER>

Appendix C. Bundle-move connection in IMRD sections

Move (Introduction)	**Function**	**Lexical bundle**	**TF#**
Move 1: Establishing a territory <EST>	Text-oriented (resultative signals)	*have been found to*$_{(30)*}$, *research has shown that*$_{(28)}$, *studies have shown that*$_{(24)}$, *has been shown to*$_{(21)}$, *have been shown to*$_{(20)}$, *to be associated with*$_{(15)}$, *has been found to*$_{(14)}$, *there is evidence that*$_{(12)}$, *these findings suggest that*$_{(11)}$, *the findings suggest that*$_{(11)}$	186
	Text-oriented (framing signals)	*in the context of*$_{(25)}$, *in a sample of*$_{(25)}$, *in terms of the*$_{(12)}$, *with higher levels of*$_{(10)}$, *in the form of*$_{(8)}$, *as a function of*$_{(1)}$	81
	Text-oriented (transition signals)	*on the other hand*$_{(35)}$, *on the one hand*$_{(13)}$, *as well as their*$_{(9)}$, *as well as the*$_{(8)}$	65
	Text-oriented (generalization signals)	*research has focused on*$_{(13)}$, *a few studies have*$_{(12)}$, *studies have focused on*$_{(11)}$	36
	Text-oriented (structuring signals)	*in the present study*$_{(2)}$, *in the current study*$_{(1)}$	3
	Research-oriented (quantification)	*the extent to which*$_{(45)}$, *the degree to which*$_{(15)}$, *a wide range of*$_{(10)}$	70

	Research-oriented (location)	*in the current study*$_{(14)}$, *in the present study*$_{(11)}$	25
	Research-oriented (procedure)	*in the development of*$_{(16)}$	16
	Research-oriented (description)	*the quality of the*$_{(11)}$	11
	Participant-oriented (stance features)	*are more likely to*$_{(25)}$, *one of the most*$_{(19)}$, *it is possible that*$_{(16)}$, *be more likely to*$_{(9)}$, *more likely to be*$_{(9)}$, *were more likely to*$_{(8)}$, *it is important to*$_{(5)}$	91
Move 2: Establishing a niche <ESN>	Text-oriented (resultative signals)	*to be associated with*$_{(2)}$	2
	Text-oriented (framing signals)	*in the context of*$_{(5)}$, *in terms of the*$_{(4)}$, *in a sample of*$_{(2)}$, *as a function of*$_{(2)}$, *with higher levels of*$_{(2)}$, *in the form of*$_{(2)}$	17
	Text-oriented (transition signals)	*on the other hand*$_{(4)}$, *as well as the*$_{(3)}$, *as well as their*$_{(2)}$, *on the one hand*$_{(1)}$	10
	Text-oriented (generalization signals)	*little is known about*$_{(17)}$, *few studies have examined*$_{(13)}$	30
	Text-oriented (structuring signals)	*in the current study*$_{(1)}$, *in the present study*$_{(1)}$	2
	Research-oriented (quantification)	*the extent to which*$_{(5)}$, *the degree to which*$_{(4)}$, *a wide range of*$_{(2)}$	11
	Research-oriented (procedure)	*in the development of*$_{(6)}$	6
	Research-oriented (description)	*the quality of the*$_{(1)}$	1
	Participant-oriented	*it is important to*$_{(5)}$, *are more likely to*$_{(3)}$, *be more*	17

	(stance features)	*likely to*$_{(3)}$, *it is possible that*$_{(2)}$, *one of the most*$_{(2)}$, *more likely to be*$_{(1)}$, *were more likely to*$_{(1)}$	
Move 3: Presenting the present work <PPW>	Text-oriented (Resultative signals)	*to be associated with*$_{(3)}$	3
	Text-oriented (framing signals)	*as a function of*$_{(25)}$, *in the context of*$_{(4)}$, *in terms of the*$_{(4)}$, *with higher levels of*$_{(2)}$, *in the form of*$_{(2)}$, *in a sample of*$_{(2)}$	39
	Text-oriented (transition signals)	*on the other hand*$_{(3)}$, *on the one hand*$_{(2)}$, *as well as the*$_{(2)}$, *as well as their*$_{(2)}$	9
	Text-oriented (structuring signals)	*in the current study*$_{(37)}$, *of the present study*$_{(29)}$, *of this study was*$_{(26)}$, *of the current study*$_{(22)}$, *in this study we*$_{(21)}$, *in the present study*$_{(15)}$, *purpose of this study*$_{(11)}$, *purpose of the study*$_{(11)}$	172
	Research-oriented (quantification)	*the extent to which*$_{(5)}$, *the degree to which*$_{(3)}$, *a wide range of*$_{(2)}$	10
	Research-oriented (procedure)	*in the development of*$_{(6)}$	6
	Research-oriented (description)	*the quality of the*$_{(2)}$	2
	Participant-oriented (stance features)	*it is important to*$_{(32)}$, *are more likely to*$_{(15)}$, *be more likely to*$_{(9)}$, *more likely to be*$_{(7)}$, *were more likely to*$_{(5)}$, *one of the most*$_{(4)}$, *it is possible that*$_{(1)}$	73
Moves (Methods)	**Function**	**Lexical bundle**	**TF**
Move 1: Describing the data and data collection	Research-oriented (procedure)	*children were asked to*$_{(33)}$, *to participate in the*$_{(28)}$, *participants were asked*	327

procedure <DCP>		*to(27), were randomly assigned to(22), were excluded from the(20), were presented in a(18), participants were instructed to(17), was approved by the(17), they were asked to(13), was used in the(12), randomly assigned to the(12), and were asked to(11), participated in the study(11), were approved by the(11), were included in the(10), used in the present(10), was used as a(9), were used to measure(9), were used in the(9), was used to measure(8), was presented in a(8), used in the current(7), used in this study(5)*	
	Research-oriented (quantification)	*the total number of(35), the extent to which(30), the degree to which(10), each of the three(8), the majority of the(8)*	91
	Research-oriented (location)	*at the end of(50), in the current study(36), in the present study(35), at the time of(32), at the beginning of(19), the start of the(14), in a quiet room(11), of the school year(10)*	207
	Research-oriented (statistical markers)	*a mean age of(13), the mean age of(13)*	26
	Research-oriented (description)	*the center of the(14)*	14
	Text-oriented (resultative)	*have been shown to(3)*	3

	Text-oriented (framing signals)	*who participated in the*$_{(15)}$, *for each of the*$_{(12)}$, *on the basis of*$_{(9)}$, *in the context of*$_{(6)}$, *with higher scores indicating*$_{(5)}$	47
	Text-oriented (transition signals)	*as well as the*$_{(21)}$	21
	Text-oriented (structuring signals)	*of the current study*$_{(9)}$, *of the sample was*$_{(7)}$, *in the current study*$_{(7)}$, *in the present study*$_{(6)}$	29
Move 2: Describing the data analysis procedure <DAP>	Research-oriented (procedure)	*were used to assess*$_{(19)}$, *was assessed using the*$_{(18)}$, *were included in the*$_{(16)}$, *was used to assess*$_{(15)}$, *was assessed with the*$_{(14)}$, *used in this study*$_{(12)}$, *was used in the*$_{(5)}$, *used in the present*$_{(5)}$, *used in the current*$_{(4)}$, *was used as a*$_{(4)}$, *were used to measure*$_{(3)}$, *was presented in a*$_{(3)}$, *was used to measure*$_{(3)}$, *were used in the*$_{(2)}$	123
	Research-oriented (quantification)	*each of the three*$_{(12)}$, *the degree to which*$_{(6)}$, *the extent to which*$_{(5)}$, *the majority of the*$_{(4)}$, *the total number of*$_{(4)}$	31
	Research-oriented (location)	*in the present study*$_{(10)}$, *at the end of*$_{(7)}$, *in the current study*$_{(6)}$, *at the beginning of*$_{(6)}$, *of the school year*$_{(4)}$, *at the time of*$_{(3)}$, *the start of the*$_{(2)}$	38
	Research-oriented (statistical markers)	*on a N-point scale*$_{(56)}$, *a mean age of*$_{(3)}$, *the mean age of*$_{(3)}$	62
	Text-oriented (resultative signals)	*have been shown to*$_{(9)}$	9

	Text-oriented (framing signals)	*for each of the*$_{(20)}$, *on the basis of*$_{(15)}$, *with higher scores indicating*$_{(10)}$, *in the context of*$_{(7)}$, *who participated in the*$_{(4)}$	56
	Text-oriented (transition signals)	*as well as the*$_{(6)}$	6
	Text-oriented (structuring signals)	*of the current study*$_{(6)}$, *of the sample was*$_{(6)}$, *in the current study*$_{(5)}$, *in the present study*$_{(5)}$	22
Moves (Results)	**Function**	**Lexical bundle**	**TF**
Move 1: Preparing for the presentation of the Results section <PPR>	Research-oriented (quantification)	*the total number of*$_{(17)}$, *the extent to which*$_{(14)}$, *each of the three*$_{(2)}$, *the magnitude of the*$_{(2)}$	35
	Research-oriented (location)	*at the end of*$_{(10)}$, *at the beginning of*$_{(9)}$, *in the control group*$_{(5)}$, *at each time point*$_{(2)}$, *over the course of*$_{(2)}$, *the end of the*$_{(2)}$	30
	Research-oriented (procedure)	*constrained to be equal*$_{(32)}$, *included in the model*$_{(15)}$, *were included in the*$_{(10)}$	57
	Research-oriented (statistical markers)	*as the dependent variable*$_{(24)}$, *fit to the data*$_{(2)}$	26
	Text-oriented (resultative signals)	*a main effect of*$_{(10)}$, *the effect of the*$_{(10)}$, *the results of the*$_{(9)}$, *a significant main effect*$_{(8)}$, *the main effects of*$_{(6)}$	43
	Text-oriented (framing signals)	*as a function of*$_{(11)}$, *for each of the*$_{(2)}$, *with the exception of*$_{(2)}$, *in the case of*$_{(2)}$	17
	Text-oriented (transition signals)	*on the other hand*$_{(3)}$, *as well as the*$_{(1)}$	4
	Participant-oriented	*were more likely to*$_{(15)}$, *more likely to be*$_{(2)}$	17

	(stance features)		
	Participant-oriented (engagement features)	*as can be seen*$_{(1)}$	1
Move 2: Reporting specific/individual results <RER>	Research-oriented (statistical markers)	*of the variance in*$_{(82)}$, *did not differ significantly*$_{(29)}$, *means and standard deviations*$_{(28)}$, *was not statistically significant*$_{(28)}$, *fit to the data*$_{(25)}$, *significant differences between the*$_{(21)}$, *not significantly related to*$_{(20)}$, *was a significant predictor*$_{(16)}$, *were not significantly different*$_{(16)}$, *was significantly related to*$_{(15)}$, *were not statistically significant*$_{(14)}$, *was not significantly related*$_{(13)}$, *was significantly correlated with*$_{(12)}$, *as the dependent variable*$_{(3)}$	322
	Research-oriented (quantification)	*the difference between the*$_{(20)}$, *each of the three*$_{(18)}$, *the magnitude of the*$_{(12)}$, *the total number of*$_{(7)}$, *the extent to which*$_{(3)}$	60
	Research-oriented (location)	*in the control group*$_{(17)}$, *over the course of*$_{(13)}$, *at each time point*$_{(12)}$, *at the end of*$_{(11)}$, *at the beginning of*$_{(8)}$, *the end of the*$_{(2)}$	63
	Research-oriented (procedure)	*included in the model*$_{(4)}$, *were included in the*$_{(3)}$	7
	Text-oriented (resultative signals)	*the results of the*$_{(25)}$, *was not related to*$_{(20)}$, *was positively related to*$_{(20)}$, *a significant main effect*$_{(19)}$, *a main effect of*$_{(17)}$, *differences were*	172

		found between(15), was positively associated with(15), was found to be(14), were found to be(11), the main effects of(9), the effect of the(7)	
	Text-oriented (framing signals)	*as a function of(50), for each of the(30), with higher levels of(27), with the exception of(22), in the case of(19), for boys and girls(14)*	162
	Text-oriented (transition signals)	*as well as the(17), on the other hand(10)*	27
	Text-oriented (structuring signals)	*are presented in table(86), as shown in table(47), are shown in table(31), are reported in table(19), as reported in table(17), variables are presented in(12)*	212
	Participant-oriented (stance features)	*were more likely to(16), more likely to be(8)*	24
	Participant-oriented (engagement features)	*as can be seen(29)*	29
Move 3: Commenting on specific results <COR>	Research-oriented (quantification)	*the extent to which(2), each of the three(2)*	4
	Research-oriented (location)	*at the beginning of(17), at the end of(15), the end of the(5), at each time point(2)*	39
	Research-oriented (procedure)	*included in the model(4)*	4
	Research-oriented (statistical markers)	*fit to the data(3)*	3

	Text-oriented (resultative signals)	*a main effect of*$_{(13)}$, *the results of the*$_{(4)}$, *a significant main effect*$_{(2)}$, *the effect of the*$_{(1)}$, *the main effects of*$_{(1)}$	21
	Text-oriented (framing signals)	*for each of the*$_{(2)}$, *with the exception of*$_{(2)}$, *in the case of*$_{(2)}$	6
	Text-oriented (transition signals)	*as well as the*$_{(1)}$, *on the other hand*$_{(1)}$	2
	Participant-oriented (stance features)	*were more likely to*$_{(13)}$, *more likely to be*$_{(5)}$	18
	Participant-oriented (engagement features)	*as can be seen*$_{(2)}$	2
Move 4: Summarizing results <SUR>	Research-oriented (quantification)	*the extent to which*$_{(4)}$	4
	Research-oriented (location)	*at the beginning of*$_{(3)}$, *at the end of*$_{(2)}$, *the end of the*$_{(2)}$, *at each time point*$_{(1)}$	8
	Research-oriented (statistical markers)	*fit to the data*$_{(2)}$	2
	Text-oriented (resultative signals)	*a main effect of*$_{(5)}$, *the results of the*$_{(3)}$, *a significant main effect*$_{(1)}$, *the effect of the*$_{(1)}$	10
	Text-oriented (framing signals)	*with the exception of*$_{(1)}$, *in the case of*$_{(1)}$	2
	Text-oriented (transition signals)	*as well as the*$_{(3)}$, *on the other hand*$_{(1)}$	4
	Participant-oriented (stance features)	*were more likely to*$_{(8)}$	8

Moves (Discussion)	**Function**	**Lexical bundle**	**TF**
Move 1: Preparing for the presentation of the Discussion section <PPD>	Text-oriented (framing signals)	*in the context of*$_{(3)}$, *in the case of*$_{(2)}$, *with regard to the*$_{(2)}$, *in terms of the*$_{(2)}$, *from the present study*$_{(2)}$, *on the basis of*$_{(1)}$	12
	Text-oriented (transition signals)	*on the other hand*$_{(5)}$, *in addition to the*$_{(2)}$, *as well as in*$_{(2)}$, *as well as the*$_{(1)}$	10
	Text-oriented (structuring signals)	*in the present study*$_{(3)}$, *from the current study*$_{(3)}$, *in the current study*$_{(2)}$, *in this study was*$_{(2)}$, *used in this study*$_{(1)}$, *of this study was*$_{(1)}$	12
	Research-oriented (quantification)	*the extent to which*$_{(1)}$	1
	Research-oriented (location)	*in the current study*$_{(20)}$, *in the present study*$_{(8)}$, *at the beginning of*$_{(8)}$, *at the end of*$_{(5)}$	41
Move 2: Summarizing the study <STS>	Text-oriented (framing signals)	*in the context of*$_{(2)}$, *in the case of*$_{(2)}$, *on the basis of*$_{(2)}$, *in terms of the*$_{(1)}$	7
	Text-oriented (transition signals)	*on the other hand*$_{(3)}$, *as well as the*$_{(3)}$, *in addition to the*$_{(2)}$, *as well as a*$_{(1)}$	9
	Text-oriented (structuring signals)	*in the current study*$_{(19)}$, *of the current study*$_{(20)}$, *of the present study*$_{(36)}$, *in the present study*$_{(13)}$, *of this study was*$_{(12)}$, *in this study were*$_{(12)}$, *from the current study*$_{(8)}$, *from the present study*$_{(7)}$, *in this study was*$_{(7)}$, *used in this study*$_{(2)}$	136
	Research-oriented (quantification)	*the extent to which*$_{(6)}$	6
	Research-oriented	*in the current study*$_{(5)}$, *in the present study*$_{(2)}$, *at the*	9

	(location)	*beginning of*$_{(1)}$, *at the end of*$_{(1)}$	
	Participant-oriented (stance features)	*it is possible that*$_{(3)}$, *it is important to*$_{(2)}$	5
Move 3: *Highlighting overall research outcome <ORO>*	Text-oriented (framing signals)	*in the context of*$_{(2)}$, *in the case of*$_{(1)}$, *on the basis of*$_{(1)}$	4
	Text-oriented (transition signals)	*on the other hand*$_{(4)}$, *as well as a*$_{(2)}$, *in addition to the*$_{(1)}$, *as well as the*$_{(1)}$	8
	Text-oriented (structuring signals)	*in the present study*$_{(3)}$, *in the current study*$_{(22)}$, *of this study was*$_{(2)}$, *used in this study*$_{(1)}$	28
	Research-oriented (quantification)	*the extent to which*$_{(3)}$	3
	Research-oriented (location)	*in the current study*$_{(2)}$, *in the present study*$_{(1)}$, *at the beginning of*$_{(1)}$, *at the end of*$_{(1)}$	5
	Participant-oriented (stance features)	*it is possible that*$_{(2)}$, *it is important to*$_{(1)}$	3
Move 4: Discussing the findings of the study <DFS>	Text-oriented (resultative signals)	*the results of the*$_{(55)}$, *these findings suggest that*$_{(27)}$, *results of this study*$_{(26)}$, *our findings suggest that*$_{(23)}$, *the results of this*$_{(23)}$, *as a result of*$_{(15)}$, *the findings of the*$_{(15)}$, *the effects of the*$_{(14)}$, *these results suggest that*$_{(14)}$, *our results suggest that*$_{(12)}$, *the results suggest that*$_{(12)}$, *the findings of this*$_{(11)}$, *the results of our*$_{(11)}$, *the findings suggest that*$_{(11)}$	269

	Text-oriented (citation)	*is in line with*$_{(36)}$, *in line with previous*$_{(25)}$, *in line with the*$_{(24)}$, *are in line with*$_{(20)}$, *is consistent with the*$_{(20)}$, *consistent with previous research*$_{(15)}$, *in line with our*$_{(14)}$, *this is consistent with*$_{(14)}$	168
	Text-oriented (framing signals)	*in the case of*$_{(16)}$, *as a function of*$_{(16)}$, *in the context of*$_{(15)}$, *on the basis of*$_{(13)}$, *in the presence of*$_{(13)}$, *with regard to the*$_{(12)}$, *as well as in*$_{(8)}$, *in terms of the*$_{(8)}$	101
	Text-oriented (transition signals)	*as well as the*$_{(15)}$, *in addition to the*$_{(9)}$, *as well as a*$_{(8)}$, *on the other hand*$_{(3)}$	35
	Text-oriented (structuring signals)	*in the current study*$_{(36)}$, *of the present study*$_{(16)}$, *in the present study*$_{(16)}$, *of the current study*$_{(35)}$, *used in this study*$_{(3)}$, *of this study was*$_{(3)}$, *in this study were*$_{(3)}$, *from the current study*$_{(2)}$, *from the present study*$_{(1)}$	115
	Research-oriented (quantification)	*the extent to which*$_{(19)}$	19
	Research-oriented (location)	*in the current study*$_{(2)}$, *in the present study*$_{(2)}$, *at the end of*$_{(2)}$, *at the beginning of*$_{(1)}$	7
	Research-oriented (description)	*the nature of the*$_{(16)}$	16
	Participant-oriented (stance features)	*it is possible that*$_{(85)}$, *are more likely to*$_{(33)}$, *were more likely to*$_{(31)}$, *it may be that*$_{(24)}$, *are likely to be*$_{(14)}$, *it is also possible*$_{(13)}$, *in their ability to*$_{(13)}$, *it is important to*$_{(5)}$, *to the importance of*$_{(4)}$, *our*	226

		understanding of the$_{(2)}$, *it is also important*$_{(2)}$	
	Participant-oriented (engagement features)	*it should be noted*$_{(2)}$	2
Move 5: Drawing conclusions of the study/Stating research conclusions <CNC>	Text-oriented (framing signals)	*in the context of*$_{(1)}$, *on the basis of*$_{(1)}$	2
	Text-oriented (transition signals)	*on the other hand*$_{(4)}$, *as well as the*$_{(3)}$	7
	Text-oriented (structuring signals)	*in the current study*$_{(13)}$, *in the present study*$_{(12)}$, *from the current study*$_{(1)}$, *from the present study*$_{(1)}$	27
	Research-oriented (quantification)	*the extent to which*$_{(2)}$	2
	Research-oriented (location)	*in the current study*$_{(3)}$, *in the present study*$_{(1)}$, *at the beginning of*$_{(1)}$, *at the end of*$_{(2)}$	7
	Participant-oriented (stance features)	*it is possible that*$_{(12)}$, *it is also possible*$_{(3)}$	15
Move 6: Evaluating the study <EVS>	Text-oriented (framing signals)	*in the context of*$_{(3)}$	3
	Text-oriented (transition signals)	*on the other hand*$_{(13)}$, *as well as the*$_{(2)}$, *as well as in*$_{(2)}$, *as well as a*$_{(1)}$	18
	Text-oriented (structuring signals)	*used in this study*$_{(12)}$, *limitation of this study*$_{(12)}$, *in the current study*$_{(3)}$, *of the current study*$_{(3)}$, *of the present study*$_{(2)}$, *in this study was*$_{(2)}$, *in the present study*$_{(1)}$	35

	Research-oriented (quantification)	*the extent to which*$_{(1)}$	1
	Research-oriented (location)	*in the current study*$_{(3),}$ *in the present study*$_{(1),}$ *at the beginning of*$_{(1),}$ *at the end of*$_{(1)}$	6
	Participant-oriented (stance features)	*it is important to*$_{(42),}$ *we were able to*$_{(14),}$ *it is also important*$_{(12),}$ *study is the first*$_{(12),}$ *this is the first*$_{(11),}$ *our understanding of the*$_{(9),}$ *to the importance of*$_{(8),}$ *it is possible that*$_{(2)}$	110
	Participant-oriented (engagement features)	*it should be noted*$_{(16)}$	16
Move 7: Deductions from the research <DER>	Text-oriented (framing signals)	*in the context of*$_{(3)}$	3
	Text-oriented (transition signals)	*as well as a*$_{(5),}$ *on the other hand*$_{(3),}$ *as well as the*$_{(2)}$	10
	Text-oriented (structuring signals)	*in the current study*$_{(1),}$ *in the present study*$_{(1)}$	2
	Research-oriented (quantification)	*the extent to which*$_{(4)}$	4
	Research-oriented (location)	*in the current study*$_{(2),}$ *in the present study*$_{(1),}$ *at the beginning of*$_{(1),}$ *at the end of*$_{(1)}$	5
	Participant-oriented (stance features)	*it is possible that*$_{(2)}$	2
	Participant-oriented (engagement features)	*research is needed to*$_{(43),}$ *future research is needed*$_{(11),}$ *it should be noted*$_{(1)}$	55

* The numbers in brackets indicates raw frequencies.
# TF denotes total frequencies.

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