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Grammatical Subject in Results and Discussion Section of Research Articles: Disciplinary Variations

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Abstract

Frequencies and discourse functions of grammatical subject types were investigated in a corpus of forty results and discussion sections selected from four disciplines (Applied Linguistics, Psychology, Chemistry, and Environmental Engineering). The results and discussion sections were selected from research articles that were published in 2008-2012 issues of prestigious high journals of the four disciplines. The results and discussion sections were analyzed for realizations and discourse functions of grammatical subject types adopting the taxonomy suggested by Ebrahimi (2014). The results suggested that the selections, frequencies and discourse functions of grammatical subject types were highly imposed by the macro functions of the results and discussion sections and the conventional rules of writing in the disciplines. One immediate implication for the outcome of this study is that writers and instructors need to keep in mind that they must be fully aware (and follow suit) of how the implementation of grammatical subjects are imposed and restricted by disciplinary conventions.

Keywords: research article, results and discussion, discourse function, grammatical subject, disciplinary study, genre

In discourse communities, there exist groups of members with shared goals and purposes who use different methods of communication, toward the achieving of those shared goals (Borg 2003, Swales, 1990). An example of a discourse community is that of an academic community within which there are disciplinary communities. A disciplinary

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community as a specific discourse community can be defined and classified in a number of ways (see Bailey, 1977; Becher, 1989, 1994; Becher & Trowler, 2001; Biglan, 1973; Kolb, 1981; Kuhn, 1970). According to Kuhn (1970), a disciplinary community consists of a group of practitioners with shared literature, judgments, communicative networks, and professional goals. On the other hand, Becher (1989) classified disciplinary communities into hard and soft sciences. Hard science includes natural and mathematical disciplines, and soft science covers social sciences and humanities. These two sciences also classified further to include pure (reflective and theoretical based) and applied (active and practical based) disciplines.

This would mean the success of the speaker or writer within that discipline is likely to depend on how he/she can frame the arguments in a way that his/her disciplinary members would find convincing and would pursue further action that could be mutually beneficial to parties concerned. As such, disciplinary studies could assist us greatly in understanding and practicing English for Academic Purposes (EAP) (Hyland, 2009) as different disciplines have different discourses, different expectations of argument and different forms of verification.

In association with the discourse community is the notion of the genre that can be viewed as a method of communication. The research article is an important genre of study in an academic context. The research article can be further subdivided into three sub-genres: a) theoretical, b) review or state-of-art, and c) experimental (Swales, 2004). An experimental research article is a genre in which the developmental stages of a scientific experiment are documented. It usually has a fixed format of sections and subsections of introduction, review of literature, methodology, results, discussion, and conclusion (IMRD) (Swales, 2004). The results section deals with presentations of main results of the research and discussion section attempts to present a discussion of major findings culled from the obtained data (Jalilifar, 2009).

In writing sections of a research article (IMRD), the writer resorts to the use of macrostructures as well as conventional microstructures, of which the grammatical subject is one such feature. The grammatical subject refers to the point of departure in a clause which is captured by a noun group. In cases where other grammatical elements precede a noun clause, the grammatical subject is extended to include the first noun group. Thus, this study was carried out to meet this need by forwarding these questions:

1. How are the types of grammatical subject manifested in the results and discussion section of research articles across four disciplines (Applied Linguistics, Psychology, Chemistry, and Environmental Engineering)?
2. How are the types of grammatical subject manifested in the results and discussion section of research articles across the hard and soft sciences?
3. What are the discourse functions served by the grammatical subjects used in results and discussion section of research articles across four disciplines (Applied Linguistics, Psychology, Chemistry, and Environmental Engineering)?

Literature Review

Many studies have investigated the frequencies and functions of the grammatical subject in different genres of academic writing (e.g., Ebrahimi and Chan, 2015, 2018; Ebrahimi, Chan, & Ain, 2014; Gosden, 1993; Lores, 2004). Lores (2004) studied the structure of theme across and within the rhetorical structure of research article abstracts. She analyzed 36 research article abstracts selected from four indexed journals in linguistics. She relied on Gosden's (1992) and Davies' (1988) frameworks to study the realizations of theme. Concerning theme types including grammatical subject and context frames, her discussion centered on IMRD and CARS macro structures. Following IMRD macro structure, it was found that in the introduction and methodology moves, the grammatical subject is mostly situated in the thematic spot, but in the

discussion move, context frames and grammatical subject together engaged the thematic spot.

The discourse function of the grammatical subject was investigated by Gosden (1993). He established a sample of 36 research articles selected from the three disciplines of Physics, Chemistry, and Biological Sciences. To analyze the data, Gosden (1993) used Davies (1988) categorization of discourse functions of grammatical subject.

The result indicated that two-thirds of sentence-initial elements were classified as grammatical subjects. This meant that writers in all the three disciplines selected the grammatical subject as a starting point of clause. Findings reported the dominance of the real world domain (e.g., deduction, study participant), which occupied 75% of all the grammatical subjects. Discourse participants (e.g., we) and hypothesized and objectivized domains (e.g., the possibility) realization was found only at 5.7 and 4.4% respectively as against the dominant domain (e.g., the study). The other domain which received much use was the discourse domain, especially its interactive discourse entities, emphasizing the interactive nature of research article introduction between writer(s) and the discourse community member(s).

Ebrahimi and Chan (2014) investigated the functional use of grammatical subject in 60 research article abstracts selected from Economic and Applied Linguistics disciplines. They used Gosden's (1993) classifications of grammatical subject's types and discourse functions. They found that disciplinary differences were quite clear regarding the functions performed through using grammatical subjects. They concluded that academic writings such as research article abstracts are shaped based on the rules and conventions of disciplinary writings.

The literature reviewed here could show that functional analysis of the grammatical subject (GS) in the results and discussion section of research article from different disciplines has not received much attention. This study could contribute to the existing literature by using both qualitative and quantitative approaches to analyze the frequencies

and discourse functions of GSs used in results and discussion sections as a challenging section in writing research article from different disciplines that realize two broad categories of science.

Method

Selection of disciplines and data

The first step in the sampling procedure was to determine discipline selection. As this study is cross-disciplinary in nature, the researchers needed to ensure that the selected disciplines could represent the spread of academic disciplines. In this regard, Becher's (1989, 1994) taxonomy offered a reasonable criterion for the selection of disciplines. As to Becher's (1989, 1994) categorization of disciplines, four disciplines of Psychology (soft-pure), Applied Linguistics (soft-applied), Chemistry (hard-pure) and Environmental Engineering (hand-applied) were selected. Henceforth in this study, the disciplines are referred to as AL (Applied Linguistic), Psy (Psychology), Che (Chemistry), and EE (Environmental Engineering).

The second step was selecting the journals to enable the sourcing of RAs that represented the disciplines. From each discipline, three high impact journals were selected. The selected journals were indexed in Thompson and Reuters and published by Elsevier. Such journals could be representative of RAs (in each discipline) written by successful researchers or considered as "good text" for the analysis (Mauranen, 1996).

The third step was the RA selection. Forty RAs (ten from each discipline) were selected considering these criteria: A) they had the fixed macrostructures of Introduction, Method, Result, and Discussion (IMRD) as proposed by Swales (1990). B) They were data based RAs. To give currency to the publications, the selected RAs were published between 2008 and 2012 (two RAs from each year). This helped to moderate changes that might occur in style preference as some journals might change their requirements as an update. From the forty RAs, results and discussion sections were extracted for the analysis.

Framework

Ebrahimi's (2014) framework for grammatical subject types identification and discourse functions was used. The details of the framework are stated as follow:

Table 1.

Framework of GS Types and Discourse Functions

	Types	Discourse Function (Definition and Example)
Grammatical Subject	***Research-related Object***	**Function**: To present materials, entities, and objects concerned with the physical world
		Example: ***The three disciplines*** were selected as examples of the sciences (biology), social sciences (linguistics) and humanities (philosophy). (AL 2)
	Research-related Process	**Function**: To present actions and procedures executed in or resulted from scientific research activities.
		Example: ***A movement away from the target*** is seen as avoidance behavior, with negative valence. (Psy 1)
	Introducing (part of) the study	**Function**: To refers to integral, parts or internal entities of a discourse.
		Example: ***The purpose of this paper*** is to present a generic description of discursive practices in law as they emerge from two different international academic and professional contexts of written communication. (AL 7)**Example:** ***This paper*** reports on a study of master's theses from a cross-disciplinary perspective using both textual and interview data. (AL 2)
	Personal Citation	**Function**: To refers to earlier researches by citing the authors' names of earlier studies.
		Example: ***Ryalls et al. (1997)*** reported that females produced longer positive VOTs for voiceless plosives and smaller negative VOTs for voiced plosives. (AL 1)
	Impersonal Citation	**Function**: To refers to earlier researches by citing the community-validated studies.
		Example: ***Studies*** suggest that perfectionism may be important in social anxiety disorder. (Psy 4)

Self-mention	**Function**: To present the author(s) mostly through the use of 'we,' even in the case where there is a single named author.
	Example: ***We*** perceive speech sounds categorical that is to say, we are more likely to notice the differences between categories than within categories. (AL 5)
This	**Function**: Unattended anaphoric pronoun that can refer to antecedents of varying length.
	Example: ***This*** results in the INTRODUCTION and BODY sections of Opinions to be less than a concise and focused statement of the relevant law, and therefore leads Italian writers to give their Opinions a feel of a legal Essay. (AL 7)
Empty Theme	**Function**: To postpone research-related entities and events characterized by seemingly formulaic patterns
	Example: However, ***it*** appears that the IAP might be an even more promising instrument than the IAT. (Psy 1)

Analysis Procedure

To meet the aim of this study, these steps were followed. First, ten RD sections from each discipline, forty RD in all, were saved and converted into a word file. Second, the researchers read all the RD sections and identified the main clauses and their GSs. Then, three PhD students in AL were called to check a sample of 8 RD sections for identifications of main clauses and GSs. Third, the researchers used Ebrahimi's (2014) framework to aid the descriptive analysis concerning GS's types and functions. Fourth, to increase reliability of the analysis, researchers asked the same raters to check the analysis for the detected types and functions of GSs. In this step, researchers intended to mitigate false identification of types and functions caused by the lack of understanding of the topics covered in the RDs by discussing the RDs with students or researchers from the target discipline. Finally, the frequency and percentage of occurrence of the GSs types and functions were recorded and tabulated to enable discussion across the disciplines and sciences to answer the research questions.

Results and Discussion

The grammatical subject types reported to be found in the data were *a research-related object, research-related process, empty theme or GS, introducing (part of) study*, and *self-mention.* The results are first compared and discussed according to GS frequency of occurrence concerning discipline. Thereupon, the frequency results are presented according to the division of hard and soft sciences. Then the absence and presence of the various discourse functions were discussed.

Research-related Object

Table 2, presents the occurrence of the research-related object GS in all four sets of RD sections. The results indicated that AL writers practiced the highest incidence of research-related object GS. Given this result, AL RD sections could be said to be more topic-based due to the emphasis put by writers on situating objects, and materials on which the researchers work on and information in this regard are located in the GS position. The last occurrence of this GS is found in the Psy and EE RD sections. This could make the texts portray a greater sense of impersonality thus giving a more indirect presence of the researcher.

The research-related object GS was used to perform three discourse functions in the RD sections analyzed (see Table 3). Stating the materials and objects on which research is based was found across the four disciplines (Example 1-4). Such discoursal use is not unusual as most writers normally restate some aspects of the research method at the beginning of the RD section to give a clear overview of how data are collected. The methodology is often the backbone of research as problems with the method design would have disastrous results for a study. Thus such information would be prudent for the re-establishing of initial credibility so that the reader has greater confidence in the section on data analysis.

Example 1: ***Only a few of the introductions from linguistics*** (just as is the case in biology) develop a justification for the study being reported both regarding deficiencies and/or scarcity in previous research. (AL 2)

Example 2: Nonetheless, ***the patients in the reactive group*** scored significantly higher on the Y-BOCS compulsions subscale. (Psy 5)

Example 3: Therefore, ***the factors affecting DNA-binding affinities of the complex*** can be usually considered from the planarity and plane area of an interactive ligand, the energy, and population of the lowest unoccupied molecular orbital (LUMO, even and LUMO + x) of the complex molecule. (Che 2)

Example 4: ***A high difficulty to precisely evaluate the oxide layer thickness*** (up to 50% of uncertainty) is encountered as well as the dispersal of the particles diameter measures (up to 25%) owing to low distribution homogeneity. (EE 4)

The next discourse function was that of stating a specific finding or claim by referring to one of the research's objects or materials (Example 5-8). This discourse function could serve the nature of the RD section in which the writers, in addition to highlighting the overall findings, likely saw as the necessity of going into detailed and clearly stated specific findings. Stating specific striking findings imposed writers to relate to the materials and objects used in the study by situating them in the GS position. This manner of presenting the findings helped writers to alert the community clearly to the novelty and significance of their study.

Example 5: ***These biology theses*** have what Dudley-Evans (1999) labels the traditional format. (AL 2)

Example 6: ***All patients*** received pharmacological treatment, but we found no significant differences in medication type between the groups (Table 1). (Psy 10)

Example 7: ***The air samples*** were collected in 10-L Tedlar bags through a vacuum sampler (ACEN Co. Ltd., Korea). (Che 3)

Example 8: ***The multiple regression technique*** is employed in the statistical analysis of data. (EE 1)

In Psy and Che RD sections, this GS was used explicitly to indicate the limitations and implications of a study and to suggest further studies (example 9-10). This discourse function might suggest that Psy and Che writers tended to highlight the limitations of the study more than the AL and EE. Psy and Che also tended to include information on further studies to create a research space for other disciplinary members.

Example 9: However, ***this instrument*** did not originally include the adult antisocial criteria. (Psy 6)

Example 10: However, ***further studies*** with animals are required to confirm these results. (Che 6)

Inferring from the results in Table 2, soft science writers are more inclined to use the research-related object GS. This could be explained by the subjective nature of soft science which is more disposed to seek for validation of their studies. In other words, situating research materials and objects in a GS position acts as a self-evidence feature that contributes to the validity of a study.

Table 2.

Frequency and Percentage of the Research-related Object GS in RARD

	Soft Science		**Hard Science**	
	AL	Psy	Che	EE
Research-related Object	659(65%)	513(52%)	802(62%)	648(53%)

Table 3.

Discourse Functions of the Research-related Object GS in RARD

	Discourse Function	**AL**	**Psy**	**Che**	**EE**
1	State research's materials and objects	✓	✓	✓	✓
2	State a specific finding or claim	✓	✓	✓	✓
3	State limitations and implications and suggest further studies	*	✓	✓	*

Research-related Process

A visible disciplinary variation about the manifestation of the research-related process GS was depicted by the data analysis. As is made clear in Table 4, the highest and lowest employments were reported in the EE and AL RD sections, respectively. This result suggested that EE writers made more reference to the process, which was executed in or had emerged from a research activity (Gosden, 1993). Concerning AL RD sections, it seemed that AL writers preferred to focus more on the objects of the study. This was reinforced by a comparison of the related data presented in Tables 4 and 2. A plausible justification for this finding is the nature of the two disciplines. In this study, AL studies were mostly focused on text analysis; therefore, it is usual if they were to refer to the research objects more while EE studies were experiment-oriented in which writers likely needed to refer more to the processes and sub-processes.

Writers used this GS to present two discourse functions (see Table 5). The first discourse function, which was found in all four disciplines, referred to the explanation of an experiment-related process (Example 11-14). The presence of such a discourse function is common as the RAs analyzed were experimental. It seemed that writers felt the necessity to refer to the experiment-related procedures employed in the method section. These procedures helped writers to situate and justify the findings obtained.

Example 11: Thus, ***the INB negotiations*** are carried out by two opposite teams, which may permit a team member to be relatively passive. (AL 5)

Example 12: ***A traumatic event typically*** occurs outside oneself, which suggests attention is drawn to the outer world, hence a vivid visual memory. (Psy 3)

Example 13: ***The quenching of serum albumin fluorescence*** may be considered as a result of the formation of Phe–SA and COL–SA complexes. (Che 1)

Example 14: In some homes ***inspections (evaluation of dampness)*** were not allowed (mainly as they were time-consuming) and as a result reports on dampness were collected for less than 172 (out of 209) homes. (EE 2)

The second discourse function was presenting the experiment-related process or intellectual processes from which the findings emerged. This discourse function was again found in all the RD sections analyzed (Example 15-18). A tie-up mention between process of data analysis and findings might lead to valid findings and in the event contribute towards the convincing of the readers of the worth of the experiment.

Example 15: Consequently, ***the analysis of hedging*** here highlights the need for writers to temper their full commitment to claims (AL 7)

Example 16: ***A comparison of the DS and DSQ scores of the three groups of children as identified with the behavioral test***, indicated that children who had chosen the old or fallen pieces of chocolate displayed significantly lower disgust sensitivity scores as compared to children who had chosen the fresh pieces of chocolate. (Psy 2)

Example 17: ***The TLC analysis of compounds 1, 2, 3, 4 and 5*** gave mobilities, which matched to reported Rf values of limonin, LNA, ILNA, SG and LG respectively. (Che 6)

Example 18: ***The linear correlation observed between KS and rmax for THD, and MAD assays*** suggest a constant affinity over various levels of NH3, meaning that the inhibition of rmax rather than variations in specific affinity dictates the shapes of the family of Monod curves obtained from these kinetic values (Fig. 2). (EE 9)

The results in Table 4 clearly show that the hard science writers paid more attention to the use of the research-related process. Although the data in this study represented that these two sciences were experimental, it would seem that hard science writers are more inclined to situate the experiment-related process in the GS position compared to their counterparts in soft science. In doing so, the hard science writers shifted

the focus of the responsibility for the research activities and the generated findings onto the experiment itself. This consequently resulted in less 'person' directed writing of the RD sections.

Table 4.

Frequency and Percentage of the Research-related Process GS in RARD

	Soft Science		Hard Science	
	AL	Psy	Che	EE
Research-related Process	86 (9%)	163 (16%)	209 (16%)	295 (24%)

Table 5.

Discourse Functions of the Research-related Process GS in RARD

	Discourse Function	AL	Psy	Che	EE
1	State an experiment-related process	✓	✓	✓	✓
2	State experiment-related or intellectual process behind findings	✓	✓	✓	✓

Introducing (part of) the study

A clear disciplinary difference can be detected from the results plotted in Table 6 concerning the employment GS when introducing the study in the four groups of RD sections. The employment of this GS fluctuated between 6% in EE and 11% in Psy RD sections. This finding might mean that congruent with Gosden (1993), in Psy RD sections, the writers were less visible, and the discourse was less interactional. Also, this finding might reflect Psy writers' focus on research findings and claims rather than on the researcher who reported findings or made claims.

As revealed in Table 7, among the discourse functions stating the research findings and claims was found accompanied in the GS in all four sets of RD sections (Example 19-22). It supports the notion of the GS in adopting a manner of fronting the data to speak for itself rather

than attributing the responsibility of the job to the researcher as fronted material.

Example 19: ***The findings*** from this study indicate that the length of the text does not determine the presence of this step that previews text organization, a kind of textual metadiscourse. (AL 2)

Example 20: ***This result*** indicates that children with high levels of self-reported disgust sensitivity were less inclined to choose outdated or ‘‘contaminated’’ chocolate during the behavioral test, which of course provides support for the validity of both disgust questionnaires. (Psy 2)

Example 21: ***The results*** obtained from some human-made source areas generally showed excessively high concentrations of toluene (e.g., 2625 ppb). (Che 3)

Example 22: ***The study*** suggests that during all seasons the impact of tree cover on nocturnal UHI tends to flatten out when the tree cover crosses the 40% mark. (EE 1)

The second discourse function found across the four sets of RD sections was that of comparing and contrasting findings with the literature (Example 23-26). This discourse function is seen as essential for writers to link their study to the literature. This helped in establishing the rigor of research as it showed writer's awareness of the literature that surrounded the issue under investigation and additionally, that the writer was able to highlight the individuality of his contribution vis an existing vis works. As Ghadessy (1999) noted, comparing and contrasting findings with existing literature contributes to the meaningfulness of findings.

Example 23: ***This finding*** fits well with Diessel's (2006) proposal that demonstratives are a special class of linguistic expressions that must be kept separate from both content words (e.g., lexical nouns) and grammatical markers (e.g., pronouns and determiners). (AL 9)

Example 24: ***This finding*** is contrary to the hypotheses presented by Juster et al. (1996) and Clark and Wells (1995), and supports the hypothesis of Alden et al. (2002). (Psy 4)

Example 25: ***The results*** of the present study can be compared with those of Ketola et al. [30] who attempted to conduct simultaneous detection of MEK, MIBK, T, and X. (Che 3)

Example 26: ***Results*** are in contrast with those reported by Nafstad et al. [9], Verhoeff et al. [10], and Williamson et al. [2], who showed stronger associations between health effects and inspectors' observations than to occupants' reports. (EE 2)

Describing and discussing the findings reported in tables or figures is another discourse function accomplished by the use of this GS (Example 27-30). Via this discourse function, writers intended to emphasize the fact that the findings presented in tables or figures might be of limited value in case of not being described and discussed. These descriptions and discussions helped readers to have a better interpretation of the intended meaning of reported findings. The co-occurrence of the description and discussion of findings presented in tables or figures could be justified based on the necessity of having to state and comment on the findings as two necessary moves in the RD section of the RA.

Example 27: ***Table 8*** shows that Italian writers encode the certainty patterns in conclusion statements by the higher incidence of the present indicative form, as in the following examples. (AL 7)

Example 28: ***Table 4*** demonstrates that the prevalence of only two criteria, using a weapon and physical cruelty towards people before age fifteen, were significantly higher among those with ASPD/anxiety disorder. (Psy 6)

Example 29: ***Table 1*** reveals that a similar composition, the melting temperature (Tm) of the copolymers is more or less independent of the molecular weight and the macro-initiator used. (Che 7)

Example 30: ***Fig.*** Seven clearly shows that the percentage of N2O in the off-gas increased with the nitrite concentration in the reactor. (EE 8)

Directing the reader's attention to the results stated in tables or figures is another discourse function found in the RD section of the four disciplines (Example 31-34). A plausible reason for such use of this GS might be the desire to direct the reader's attention to the findings stated in

tables or figures in order to facilitate interpretation of the findings. In the RD section, there was generally more than one table or figure that is used to display the findings; therefore, writers felt a necessity to explicitly direct the reader's attention to those tables or figures in order to mitigate any misunderstanding. In some cases, the findings presented in tables or figures were very important for the sake of interpretation of the findings because these findings, displayed in tables or figures, are not described in the RD section.

Example 31: ***The results of our analyses of the individual frequency of occurrence of the three verb tenses in the 11 moves in both Corpus A and Corpus B*** are listed in Table 4. (AL 4)

Example 32: ***The results*** are in Table 4. (Psy 4)

Example 33: ***The results obtained with both calibration approaches (DI and TD method)*** are summarized in Table 3 concerning calibration slope values for each compound. (Che 3)

Example 34: ***The results of the design of the experiment*** are summarized in Table 2. (EE 4)

Except for the EE RD sections, this GS was used to restate the aim and objective of the study (Example 35-37). The salient point concerning this application is the positioning of the discourse function in the discussion of RA. It occurred mainly at the beginning of the section (Basturkmen, 2012), and had the value of reminding the reader of the aim of the study which is also usually stated at the beginning of an RA. This re-occurrence is thus seen as a possible move in the RD section.

Example 35: ***The study*** aimed to develop a description of the discussion section in Dentistry and investigate if a framework based on a different discipline was applicable. (AL 10)

Example 36: ***The present study*** examined the relationship between disgust sensitivity and a broad range of psychopathological symptoms in a sample of non-clinical children. (Psy 2)

Example 37: ***The main objective of this study*** was to evaluate the sensitivity of the random copolyesteramides towards hydrolytic chain cleavage. (Che 7)

Finally, except for AL RD sections, the introducing (part) study GS was employed to restate the methodology of study (Example 38-40). This discourse function occurred mostly at the beginning of the result section with a role similar to that of linking the section to the aims and objectives of the study. This again showed the recursiveness of academic discourse as the writer saw the need to recap and restate information that was deemed to provide important cohesive links in the discourse.

Example 38: Consequently, ***analyses on the IAP data*** were performed on 31 participants. (Psy 1)

Example 39: ***This method*** is very quick and provides a quantitatively reliable data set based on measurements of thousands of single mineral grains. (Che 4)

Example 40: ***The analysis*** is carried out in two stages: stage-1 is the trend analysis, and stage-2 is the statistical analysis of data. (EE 1)

Inferring from the results presented in Table 6, introducing (part of) the study GS was used slightly more by the soft science writers compared to writers in hard science. This point to soft science studies being generally more subjective; therefore, writers tended to state the findings and claims in a way that the responsibility is left to the data analysis.

Table 6.

Frequency and Percentage of the Introducing (Part) Study GS in RARD

	Soft Science		**Hard Science**	
	AL	Psy	Che	EE
Introducing (Part of) Study	92 (9%)	110(11%)	108 (8%)	78 (6%)

Table 7.

Discourse Functions of the Introducing (Part) Study GS in RARD

	Discourse Function	**AL**	**Psy**	**Che**	**EE**
1	State research's findings and claims	✓	✓	✓	✓

2	Compare and contrast findings with literature	✓	✓	✓	✓
3	Describe and discuss findings reported in tables or figures	✓	✓	✓	✓
4	Direct readers' attention to results stated in tables or figures	✓	✓	✓	✓
5	Restate aim and objective of the study	✓	✓	✓	*
6	Restate methodology of the study	*	✓	✓	✓

Self-mention

Another GS that warranted some discussion is the presence of self-mention GS in the four sets of the RD section. The higher employment was found in social science disciplines Psy (7%) and AL (4%) while the hard science (Che and EE) registered 3%. While the percentage difference is not noticeably significant, it nonetheless represented a rhetorical strategy used in the discourse. Self-mention shows uptake of direct responsibility of the writers to account for their findings and claims. Hard science writers seemed to be marginally less inclined to use the strategy, and conversely are more likely to "protect themselves against falsification of their research findings and claims through impersonalization" (Karahan, 2013, p. 307). On the whole, there is greater deference to more objective writing whereby the writers had chosen not to convey their voice through a strong self-mention and had therefore used them rather sparingly. Inferring from Table 9, this GS was associated with the dispensing of four discourse functions. As mentioned, taking direct responsibility for the findings and claims was a discourse function served by self-mention in all four sets of RD section (Example 41-45). This reflects "the highest degree of author presence" and the authors' self-assurance in presenting the results and claims making (Karahan, 2013, p. 318).

Example 41: Among the evaluative acts in the documents in the corpus, ***we*** have found direct requests in the form of imperatives, as in example (9), though they are not the most common. (AL 1)

Example 42: ***We*** indeed believe that children, in general, perceive themselves as being in control. (Psy 1)

Example 43: Still ***we*** think that P-containing Ca–Cl-particles could be the only apatite. (Che 1)

Example 44: ***We*** infer that the fixed (or complexed) ions are due to the presence of PAA carboxyl groups on the surface of the PSF/PAA membrane. (EE 3)

In all four sets of RDs, self-mention was also employed to highlight the similarities and differences with earlier findings (Example 45-48). The direct persona is extended to the move of "evaluating the current findings with those from previous studies" (Kanoksilapatham, 2005 p. 282) and emphasizing the greater bearing of personal responsibilities.

Example 45: ***We*** share her view and presume that the changes of the frequency of occurrence of the three most frequently used verb tenses in these moves may be related to the basic functions of each tense and the attitude changes of medical RA writers. (AL 4)

Example 46: ***Our findings*** cannot definitively resolve the debate regarding Shafran et al.'s (2002, 2003) unidimensional, the intrapersonal definition of perfectionism, which focuses on high standards in combination with rigorous self-evaluation. (Psy 4)

Example 47: ***Our DL values*** can also be compared concerning mixing ratios (ppb) with those derived by TD-GC-FID [32]; these authors were able to achieve DL values near 4 ppb level for MEK, i-BuAl, MIBK, and BuAc by adopting active sampling combined with thermal desorption. (Che 3)

Example 48: So, ***we*** noted that our results are partly following the previous results despite the differences between studies in their settings, materials and experimental designs. (EE 5)

Except for AL RD sections, self-mention was also seen in recounting the experimental procedures and methodology (Example 49-51). In these elaborations, the writer's presence through self-mention could help the reader to trace the steps of an experiment more visibly (Karahan, 2013).

Example 49: Before analyzing the lower and higher anxious groups, ***we*** tested for IAP effects in the whole group, with a 2 (combined phases)

_ 4 (categories) ANOVA with repeated measures, in order to describe the working of the task with children in general. (Psy 1)

Example 50: As we stated at the beginning of this contribution (see Section 1), ***we*** used XRF for this. (Che 4)

Example 51: In our study, ***we*** used three doses of 15, 75 and 150 mg/kg/day which are lower than the doses applied to the rodents. (EE 5)

In the AL and Psy RD sections, self-mention was applied to serve the discourse function of organizing the RD section and guiding the reader through the arguments (Example 52-53). Through personal sign postings, the reader could be given a better sense of interaction with the writer. However, this sense of rapport is not overly done and is likely a cautious restrain as academic writing is generally seen as not being a highly interactive discourse in the pursuit of being socially friendly.

Example 52: In the following sections, ***I*** will describe the patterns found in the three categories under investigation and provide examples of them. (AL 1)

Example 53: In this study, ***we*** tested a new measure that indirectly assesses anxiety-related perceived control: the Implicit Association Procedure (IAP). (Psy 1)

Soft science writers indicated a greater disposition towards the use of self-mention (see Table 7). This might reflect the more impersonal and objective nature of the hard science RD sections. This impersonality could be based on the fact that hard science studies are usually carried out based on rigorous standards.

Table 8.

Frequency and Percentage of the Self mention GS in RARD

	Soft Science		**Hard Science**	
	AL	Psy	Che	EE
Self-mention	43 (4%)	71 (7%)	37 (3%)	34 (3%)

Table 9.

Discourse Functions of the Self mention GS in RARD

	Discourse Function	AL	Psy	Che	EE
1	Display full ownership for findings and claims	✓	✓	✓	✓
2	Highlight similarities/differences of current and earlier findings	✓	✓	✓	✓
3	Recount experimental procedures and methodology	*	✓	✓	✓
4	Organize and guide readers through the arguments	✓	✓	*	*

Empty GS

There appears to be a small disciplinary variation found concerning the employment of the empty GS across the four sets of RD section (see Table 10). This strategy serves to shift the attention from the writer to the research outcomes and claims (Hewings & Hewings, 2002). The strategy involves in the postponing of the 'real' GS to the end of a clause, and instead, an empty GS is used to fill the subject position of the clause (Hewings & Hewings, 2002; Quirk Greenbaum, Leech, & Svartvik, 1995; Bloor & Bloor, 1995). In this regard, Hasselgard, Johansson, and Lysvag (1998) argued that such clausal structure is a linguistic choice in fulfilling the "information principle," whereby at times, it could be desirable to use a longer structure to carry a high load of information in the rhematic position of a sentence. One possible effect is to build up the anticipation of the delayed 'real' GS or to build up a sense of depersonalization in academic discourse further.

The empty GS was seen to enact three discourse functions in the RD sections (see Table 11). The four groups of writers used this GS to postpone research's outcomes and claims (Example 54-57). In using this discourse function, it can be tentatively suggested that writers could have preferred less visibility in association with the reporting of the research outcomes and claims. According to Swales (1990, p.125), this reduced visibility is common sense, in the RA genre, writers are more disposed to a more objective style of reporting due to the nature of scientific discourse

Example 54: ***It*** was found that two additional parts were often present (AL 1)

Example 55: ***It*** was found that PTSD trauma memories were characterized by more re-experiencing than PDA panic memories, which in turn had more re-experiencing elements than the trauma memories of controls. (Psy 3)

Example 56: ***It*** was found below a critical temperature the extruder torque was suddenly overloaded, caused by the solidification of the blend melt near the extruder die exit. (Che 8)

Example 57: Generally, ***it*** was found that the membrane morphology changes from the finger (or macro voids) to sponge-like structures with the increase of polymer concentration or with the addition of the second polymer as polyvinylpyrrolidone (PVP). (EE 3)

The second discourse function enacted by the empty GS was to present writers' comments and viewpoints about research outcomes and claims (Example 58-61). Writers sometimes leave their authorial stances when giving their comments about the findings and claims of their studies to absolve somewhat their responsibilities. Thus writers used empty GS along with an adjective complement to encode an evaluation that could influence the interpretation of the presented information (Hunston & Sinclair, 2000). These comments could lessen the effects of possible weaknesses of research outcomes and claims.

Example 58: ***It*** will thus be clear that non-verbal backchannelling in the form of head nods is the predominant form of backchannelling in the material analyzed here. (AL 5)

Example 59: So, ***it*** is not very surprising that the IAP could not differentiate anxiety groups in this older sample. (Psy 1)

Example 60: ***It*** is worth mentioning that the range of temperature used in DMA depends on the sample melting temperature. (Che 7)

Example 61: ***It*** was clear that elevated CO2 triggered a greater biomass increase for the two Lolium species grown under Cd stress than under no Cd stress. (EE 7)

The third discourse function reported in Table 9 was to present writers' evaluative comments on earlier findings (Example 62-65) which enables writers to show their stance about earlier findings of relevant studies. These comments "play a significant role in interactional thematization" (Gosden 1993 p. 66). In these comments, writers used the empty GS along with reporting verbs, which mitigate the chance of acceptance, rejection, or remain neutral about the findings of earlier studies (Thompson, 1994).

Example 62: ***It*** may be argued that scholarly credibility is currently established by a deliberate, cautious expression of scientific claims, rather than by the official stance of an 'omniscient' academic. (AL 6)

Example 63: ***It*** has even been suggested that panic attacks may act like traumatic stressors and sometimes even provoke PTSD symptoms. (Psy 3)

Example 64: ***It*** has been previously reported that N, N-dimethylacrylamide can polymerize by irradiation either with c or X-rays. (Che 9)

Example 65: ***It*** is known that aminotransferases are very active in the liver and their activity can be detected in small amounts. (EE 5)

The results illustrated that both sciences showed a similar tendency towards including the empty GS (see Table 10). This similarity might be sourced from the fact that all three discourse functions performed through the use of the empty GS were imposed by the nature of the RD section. In this section, writers need to state the research outcomes and claims objectively and then make comments on their or others' earlier research outcomes and claims. Writers needed to state this information since it is obligatory.

Table 10.

Frequency and Percentage of the empty GS in RARD

	Soft Science		**Hard Science**	
	AL	Psy	Che	EE
Empty GS	77 (7%)	62 (6%)	74 (6%)	89 (7%)

Table 11.

Discourse Functions of the Empty GS in RARD

	Discourse Function	AL	Psy	Che	EE
1	Postpone research's outcomes and claims	✓	✓	✓	✓
2	Present writers' comments and viewpoints about research's outcomes and claims	✓	✓	✓	✓
3	Presenting writers' evaluative comments on earlier findings	✓	✓	✓	✓

In summary, Tables 12 and 13 present an overview of the salient information that has been discussed concerning the use of GS above.

Table 12.

Frequency and Percentage of the GS in RD

		Soft Science		**Hard Science**	
		AL	Psy	Che	EE
1	Research-related Object	659(65%)	513(52%)	802(62%)	648(53%)
2	Research-related Process	86 (9%)	163 (16%)	209(16%)	295 (24%)
3	Introducing (Part) Study	92 (9%)	110(11%)	108 (8%)	78 (6%)
4	Self-mention	43 (4%)	71 (7%)	37 (3%)	34 (3%)
5	Empty GS	77 (7%)	62 (6%)	74 (6%)	89 (7%)
6	*Others*	61 (6%)	70 (8%)	66 (5%)	80 (7%)
	Total	1018 (100%)	989 (100%)	1296 (100%)	1224 (100%)

*Percentages of GSs that were less than 5% in all the four disciplines categorized as **Others.**

Table 13.

Discourse Functions of the GS in RARD

	GS	Discourse Function	AL	Psy	Che	EE
1	Research-related Object	State research's materials and objects	✓	✓	✓	✓
		State a specific finding or claim	✓	✓	✓	✓
		State limitations and implications and suggest further studies	*	✓	✓	*
2	Research-related	State an experiment-related process	✓	✓	✓	✓
		State experiment-related or intellectual	✓	✓	✓	✓

	Process	process behind findings				
3	Introducing (Part) Study	State research's findings and claims	✓	✓	✓	✓
		Compare and contrast findings with literature.	✓	✓	✓	✓
		Describe and discuss findings reported in tables or figures	✓	✓	✓	✓
		Direct readers' attention to results stated in tables or figures	✓	✓	✓	✓
		Restate aim and objective of the study	✓	✓	✓	*
		Restate methodology of the study	*	✓	✓	✓
4	Self-mention	Display full ownership for findings and claims	✓	✓	✓	✓
		Highlight similarities/differences of current and earlier findings	✓	✓	✓	✓
		Recount experimental procedures and methodology	*	✓	✓	✓
		Organize and guide readers through the arguments	✓	✓	*	*
5	Empty GS	Postpone research's outcomes and claims	✓	✓	✓	✓
		Present writers' comments and viewpoints about research's outcomes and claims	✓	✓	✓	✓
		Present writers' evaluative comments on earlier findings	✓	✓	✓	✓

Conclusion

This study aimed to examine realizations and functions of GSs implied in RD section of RAs from four disciplines namely, Che and EE representing the hard sciences, and AL and Psy representing the soft sciences.

In the RD section, the disciplinary writers used the research-related objects GS to obviate the responsibility of the findings from the writer to the research. Such employment could be rooted in the writer's intention to mitigate their personality in the RAs and increase the sense of objectivity.

In the RD section, the frequency of the introducing (part) study GS was imposed by the disciplinary rules and conventions of writing. The more frequent use of the introducing (part) study GS in the Psy discipline

could suggest that the nature of the discipline has imposed on the writers to focus more on the findings than on the researchers. Thus, it can be argued that the nature of the discipline is the main cause for the frequency rate of GS types.

In the RD section, the effect of the macro structure of RD and the disciplinary nature are realized in the discourse functions that are enacted by the research related object GS. The research related object GS was used by the four groups of writers to serve the discourse function of stating research's materials and objects at the beginning of the RD section. This could show that this discourse function was imposed by the nature of this rhetorical section. This GS was also used to state limitations and implications and suggests further studies in only two disciplines of Psy and Che. This could help us conclude that this discourse function was imposed by the nature of these two disciplines.

Thus, the reported findings could motivate us to argue that the frequencies of grammatical subjects' types and discourse functions are guided by the disciplinary nature and macro functions of RD sections of RAs.

The findings could have some implications for a) teaching RD writing and b) EAP textbooks developers. A quick look at the currently available textbooks on teaching RD writing indicates that they generally focus on the move structures of the RD section. In contrast to move structure, the linguistic features, among which is GS, which are crucial to realizations of the movable structures of the rhetorical sections such as RDs have received little attention. Thus, the findings reported here could aid textbooks developers to cover delayed information about the use and functions of GS types in the RD writings.

In addition, the findings confirmed the fact that disciplinary conventions restrict disciplinary writings. Therefore, instructors need to keep in mind that learners must be fully aware of how selections, frequencies and functions of GS are imposed and restricted by disciplinary conventions.

This study had the following limitations and suggestions for further studies. The first limitation is sample size (ten RAs from each discipline) that may constrain generalizations of the findings. Thus, a further study with a larger sample could yield more generalizable findings. The second limitation is regarding the number of disciplines. To account for cross-disciplinary nature of the study, a further study that focuses on more than four disciplines possibly could yield more representative and generalizable findings.

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