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Metadiscourse Devices in English Scientific Research Articles Written by Native and Non- Native Speakers of English

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Abstract

The present study examined the frequently used metadiscourse devices in English scientific research articles written by native (English researchers) and non-native (Arab English researcher) and sought to determine whether differences exist in the use of these devices between Arab researchers of scientific research articles and Native English researchers of scientific research articles. Data was collected from forty research scientific articles written and published in international journals and Arab journals; analysis was done in accordance with Hayland's model. The analysis revealed that frequently used metadiscourse devices in scientific articles written by native English writers and Arab English writers include evidentials code glosses, frame markers, and endophoric markers; and hedges; boosters; and attitude markers. The results also showed that native English writers of scientific articles embrace more metadiscourse resources than Arab English researchers of scientific academic articles. This confirms that native English writers of scientific articles are more proficient at English than Arab English researchers given the differences in the frequency of metadiscourse resources used. This finding has implication to Arab researchers of scientific research articles.

Keywords: Metadiscourse devices, Research articles, Native speakers, Non-native speakers, Scientific research article

1. Introduction

As suggested by Hyland (2004) writers should take into account two important factors when writing research articles: presenting propositional fact to readers; and meeting their expectations with regard to the credibility; intelligibility; and interests. Hyland (2004) further suggested that writers of academic articles can ensure that work is accepted by specialists in a discourse community as well as the target readers by taking into account specific conventions of different disciplines. Supporting this view, Hyland and Tse (2004) suggested that academic article writers can achieve this aim by embracing metadiscourse, because they allow them to represent features of the discourse community. According to Hyland and Tse (2004) writer can use metadiscourse as linguistic resources to project their writing to readers to signal their perspective and attitude towards the audience and content of the text. This view is reinforced by Dafouz-Milne (2008) that writers of academic articles can use metadiscourse as self-reflective expressions to engage with readers and express their viewpoint as well as to negotiate interactional meanings contained in a text. The importance of metadiscourse has also been recognized elsewhere. For example, Dahl (2004) noted that metadiscourse accentuates the audience's role and enables writers to have a clear of sense of their audience while making it easier for them to perform the writing task. This view was reflected in the comment by Intaraprawat and Steffensen (1995) that metadiscourse enables writers of academic articles to focus on the audience. In such a way, they gain an insight into the concepts that can be easily understood by the target audience and those concepts that need to be supported and explained as well as understand how to write the text that will be effective, interesting and easy to understand (Intaraprawat & Steffensen, 1995). In the same vein, Hyland (1998) argued that metadiscourse forms part of the everyday language and plays a key role in the way people communicate various settings and genres; allows writers of academic articles to engage and address their audience in a developing dialogue. It also enables writers to explicitly identify a sentence in a text thus increasing its cohesion and creating relationships between paragraphs, sentences and other explicit textual units (Hyland, 1998). It is also argued that metadiscourse is beneficial to second language learners (L2) (non-natives) and learners of EAP course as it is believed to facilitate the learning of conventions of the second language discourse community and enhance the ability of EAP learners to: (a) describe the arguments/presentations of other persons; (b) appreciate strategies of lecturers and academic writers through text books and articles; (c) write free-flowing and flawless academic essays; and (d) write good compositions (Steffensen & Cheng, 1996; Intaraprawat & Steffensen, 1995). As can be inferred from these studies, metadiscourse is linked to the expectations and norms of particular professional and cultural communities and serve the purpose of facilitating social interaction. They require writers to have the sense of audience by rationally exposing and manipulating the interactive features with a view to gain acceptance of academic claim (Hyland, 1998; Dahl, 2004). In line with these arguments, it has been argued that native speakers of English differ from non-native speakers of English when it comes to the interactional metadiscourse devices used in writing English research articles.

1.2 Statement of the Study Problem

Metadiscourse brings out the fact that the writer acknowledges the need of the audience for explanation, confirmation, and engagement. Such traits imply the critical role metadiscourse plays in passing the desired message to the audience via text and to enlighten people why the topic is believed to be a critical topic of study for researchers. The role of metadiscourse and its elements has raised interests among researchers for conducting studies in this field (Salek, 2014; Asghar, 2015; Gholami and Ilghami, 2016). Most of these studies have considered metadiscourse and its influence on researchers' academic writing across disciplines and cultures. Unlike native English researchers, Arabic speaking researchers lack knowledge in employing metadiscourse devices in their researches; this in turn may affect conveying their ideas effectively.

1.3 Objectives of the Study

The present study seeks to achieve the following objectives:

- identifying the Metadiscourse Devices used by native English speakers and non-native speakers of English (Arab English speakers) in their English scientific research articles;

- determining the frequency of the types of metadiscourse devices used in the researchers' articles;

- Finding out whether differences exist in the use of the devices between Arab researchers and native English researchers of scientific research articles.

1.4 Hypotheses of the Study

The hypotheses of the study are as follows:

- Ho: Arab researchers of Scientific English articles (NNSs) employ the same amount of metadiscourse devices as English researchers (NSs) of English scientific research articles and have same level of proficiency as English researchers of scientific

- H1: Arab researchers of English articles (NNSs) differ in terms of the amount of metadiscourse devices used in Scientific Research Articles from English researchers of English articles and differ in their level of proficiency from English researchers (NSs).

1.5 Significance of the Study

Ancient academic writers believe that researchers need to be objective and express impersonal approaches at the time of reporting their trends in academic writing (Bruce, 2010). In his assumptions, Bruce (2010) implies the desires and general trends in academic works. The persistent view of academic articles has been debated by many scholars. It has been argued that the interaction of the written texts can be done as ones in the communicated texts although they will have various effects because of the different channels. Such views have displayed a view of academic writing as a social involvement that entails engagement between authors and audience. The rapid increase of studies on academic authored discourse and in English for academic reasons specifically about communication has involved research

processes into the language and interaction tools that scholars and students have to attain to be socialized into the writing fraternity. It is hoped that this study give insights into understanding how native and non- native English speakers employ the metadiscourse devices in the writing of their scientific research articles.

2. Literature Review

2.1 Metadiscourse Taxonomies and Devices

Researchers have identified several metadiscourse taxonomies and metadiscourse devices that play a role in negotiating interactional meanings within a text: Vande Kopple's revised taxonomy (1985; 2002); Hyland's revised taxonomy (Hayland, 2005; Hyland's taxonomy (1999); and taxonomy by Crismore et al. (1993). These taxonomies take the form of tripartite conception of metafunctions advanced by Halliday (1994) which create a distinction between interpersonal functions (i.e., ways of determining the language participatory function); and the text ideational elements or the actualization of the interpersonal and ideational meanings (i.e., the ways in which writers encode their experiences of the world).

The first metadiscourse taxonomy was introduced by Vande Kopple (1985). Vande Kopple (1985) also presented two categories of metadiscourse; interpersonal and textual metadiscourse. Textual metadiscourse encompasses four strategies of text connectives; illution markers, narrators; and code glosses. On the other hand, interpersonal metadiscourse comprise three strategies of attitude markers, commentaries and validity markers. These were found to overlap and vague functionally. Crismore et al. (1993) presented a revised model which retained two major categories of interpersonal and textual metadiscourse. However, two categories of subcategories of interpretive and textual markers were created. These subcategories separated evaluative functions and separate organizational functions (Crismore et al., 1993). Hyland (2005) proposed another metadiscourse model that identified two categories of metadiscourse markers: interactional and interactive markers. In this model, Hyland (2005) included the engagement and stance markers. An interactive dimension was created by Hyland (2005) that concerns an attempt by the writer of academic articles to constrain and shape a text with a view to accommodate the needs and interests of readers as well as set out a proper and rational argument. Five categories were created from the interactive markers involving frame markers, code glosses, evidentials, frame markers, and endophoric markers. Conversely, the interactional dimension concerns the involvement of readers in the text and the efforts made by the writer to establish a relationship to data, audience and arguments and control personal within a written text (Hyland, 2004; Hyland, 2005). This dimension of metadiscourse encompasses five categories of markers: hedges; boosters; attitude markers; self-mentions; and engagement markers (Hyland, 2004). Hedges are devices used by the writer to withhold full commitment to any proposition. According to Hyland (2005) hedges serve as an index for recognizing alternative possibilities, viewpoints, and voices. Boosters are used to highlight the force or impact of proposition in a text as well as to express certainty in a text (Hyland, 2004). Engagement markers are used to explicitly address readers either by including them as discourse participants or focusing their attention through second person pronouns, asides, question forms or imperatives (Hyland, 2005).

Self-mentions denote the extent of explicit author attendance and presence in a text. These self-mentions are represented through possessing adjectives and first person pronouns (Hyland, 2005).

2.2 Studies on the Use of Metadiscourse Devices

Researchers have investigated the use, function, and type of metadiscourse devices/resources in different contexts and genres, including advertisements; academic lecturers and talks; textbooks; science popularizations; researcher papers, and newspaper discourse (Hyland, 1999; Varttala, 2001; Fuertes-Olivera et al., 2001; Hempel & Degand, 2008; Le, 2004; Eslami & Eslami-Rasekh, 2007; Pérez & Macià, 2002; Thompson, 2003; Hyland, 2007; Mauranen, 1993; Zarei & Mansoori, 2007; Moreno, 1997; Dahl, 2004).

There are also studies that examined the use of different types of metadiscourse markers and their use in different articles, languages and fields (Abdi, 2002; Bunton; 1999; Crismore et al., 1993; Mauranen, 1993). For example, Abdi (2002) examined how interpersonal metadiscourse markers were used in the Natural Sciences (NS) and Social Sciences (SS) fields to illustrate the choices of markers by the writer and to reveal their identity. In this study, Abdi studied interpersonal metadiscourse and specifically metadiscourse markers: hedges; emphatics; and attitude markers. The analysis of these markers revealed that interpersonal metadiscourse markers were predominantly used by SS writers than NS writers. However, little differences were noted between NS writers and SS writers with regard to their use of attitude markers and hedges.

Bunton (1999) investigated the use of metadiscourse markers by Hong Kong research students in PhD theses. Two types of metatexts that featured in the PhD theses were compared: lower level references and higher level metatext references. It was observed that Hong Kong PhD students more frequently use higher level metatext references that lower level references to make text in their writing more coherent and cohesive.

Hyland and Tse (2004) conducted a study to investigate the Metadiscourse in different disciplines. Their corpus consisted of postgraduate theses and dissertations from different academic fields. The findings showed that writers in the Ph.D. dissertations applied many elements of Metadiscourse than the writers in master's theses. They discovered that the fields of humanities and social sciences used more of these elements (Faghih, 2009). The disciplines applied interactional features more than the interactive forms. Following these findings, the researchers concluded that Metadiscourse is as an aspect of language that provided a bond between writing and disciplinary culture that helped explore the rhetorical contexts through defining a number of the expectations and understanding of the readers targeted by the text.

Others (e.g., Povolná, 2016) took a shot at the utilization of printed metadiscourse in business sites. The researcher constructed his work in light of an arrangement on metadiscourse proposed by Hyland in 1998. In another investigation, Dafouz-Milne (2008) broke down the job of metadiscourse in the development of influence in 40 1000 word same topic sentiment sections of two English and Spanish daily papers. Dafouz-Milne thought metadiscourse

classes are relational as they take the learning, knowledge, and requirements of peruses into account (Povolná, 2016). In the same vein, Hyland (2012) investigated how the communicative agenda of the various rhetorical parts of research articles and case reports in English influence the rate and the class distribution of the modulation gadgets. Hedges were identified through contextual evaluation, their frequencies were noted in the differentiated rhetorical fields of the 15 writings and their percentages over the total number of the running words were computed. The option of expression of the tentativeness and flexibility is defined through the levels of argument the authors wish to launch, the overall pattern of the discourse and its intended communication as well as the pretension to university and generalization. In

Another study was conducted by Steffensen and Cheng (1996). The researchers investigated how the Metadiscourse elements could impact on the writing abilities of students. The researchers taught the forms, functions and purpose of Metadiscourse to students in the experimental group. The students (control and experimental groups) were asked to use the elements of Metadiscourse in their writing. The results identified that the students in the experimental group had high results than the ones in the control group.

2.3 Comparative Studies on Non-Natives and Natives' Use of Metadiscourse Devices

Other comparative studies on first and second language use of metadiscourse devices have suggested that first language may influence both the amount as well as the type of metadiscourse markers used by a writer of a text (Mauranen, 1993; Crismore et al., 1993; Dahl, 2004; Burneikaitė, 2008). For example, in a contrastive study by Crismore et al. (1993), American's persuasive writing was compared to those of Finnish students with a focus on the type and amounts of metadiscourse. Results revealed that all categories and subcategories of metadiscourse were used by both the Finnish and American students. However, some delicate differences were noted in the types and amounts of metadiscourse items used by American students and Finnish students. Similarly, relationship between Metadiscourse and first language and culture was assessed by Maureen (1993) investigating the English texts done by Finnish and Anglo-American students. The researcher analyzed the English texts written by the native and the non-native students founded on the use of Metadiscourse elements as text organizers. She identified that the Anglo-American students applied more of the Metadiscourse elements than the Finnish students. The results showed that Finnish is not a reader-based language as the writers have a behavior of guiding their readers through the text. This trait is reflected in the English writing of the Finnish learners. The difference in communicating with the reader was related to the distinction between the two traditions in norms of politeness and rhetorical explicitness. Maureen concluded that the Anglo-Americans made efforts to be explicit as possible in their writing.

In a similar contrastive study, Faghih and Rahimpour (2009) contrasted the use of metadiscourse markers in Persian and English applied linguistic research articles. Results revealed that the use of metadiscourse devices by writers of Persian and English article was influenced by their awareness of conventions of rhetorical functions of the target language. Results also showed that writers embraced and used more frequently interactive

metadiscourse markers (i.e., frame and transitions markers) than interactional metadiscourse markers (i.e., attitude markers, boosters and hedges).

Investigating a similar subject, Dahl (2004) investigated the use of metadiscourse devices by French, Norwegian and English writers in research articles in three disciples: medicine; linguistics; and economics. The focus of the investigation was on the impact of culture and academic discipline on the use metadiscourse markers. The findings showed that Norwegian writers and English Writers largely utilized metatext in linguistics and economics than French writers. However, writers of medicine discipline largely used fixed structure when writing introduction, results, methodology and discussion sections.

In another contrastive study, Blagojevic (2004) investigated the utilization of metadiscourse markers in research articles which were authored by English and Norwegian native speakers. In this study, Blagojevic (2004) specifically studied differences and similarities of writers with different cultural and language backgrounds in their use of metadiscourse markers. Results showed small but insignificant differences in use of metadiscourse devices by Norwegian and English writers. It was noted that differences in the use of metadiscourse devices by the Norwegian and English writers were discipline-specific but not culture or language-specific.

In the same vein, Burneikaite (2008) considered the utilization of metadiscourse devices in academic writings of English language L1 and L2 by reviewing linguistics Master's theses. Findings demonstrated similar use of metadiscourse markers in the two languages and noted that the differences in the use of the metadiscourse markers by these writers largely dependent on writers' cultural background; mother tongue; instructional traditions and commonalities; and writers' specific style of writing.

Similarly, Atai and Sadr (2008) examined the effect of writer's culture and language on the use of metadiscourse devices (i.e., hedging devices) to linguistic research articles' discussion section written by Persian native speakers and English native speakers. Results revealed significant differences in the utilization of hedging devices by Persian and English native speakers noting that English native speakers tend to use more and variety of hedging markers than Persian native speakers.

It is conceivable that exceptionally important research works including biomedical works are dismissed by lofty diaries just to be composed in poor English as Primack (2009) expresses that 77% of articles submitted to their own particular diary are rejected and one of the general reasons is destitution of composing style and by and large introduction. As indicated by him, articles are acknowledged with higher rates from created nations where English is the primary dialect. He declares that a complex of good assets for research and great capacity in English written work absolutely gives writers in these nations leeway. Along these lines, the association of compositions as per measures of English dialect to advance the shot of distributing the composed works appears to be essential (Povolná, 2016).

As demonstrated in the reviewed studies, researchers have made immense contribution in the area of metadiscourse with emphasis on the use of various metadiscourse devices in various

contexts, genres, different articles, languages and fields. Comparative studies have also demonstrated the differences in the use of metadiscourse devices by non-natives and natives English writers. However, there is scant literature on the use of metadiscourse devices in English scientific research articles written by native and non- native speakers of English. This study seeks to fill the gap by investigating the use of metadiscourse devices in English scientific research articles written by native and non- native speakers of English (Arab researchers).

3. Methodology

3.1 Corpus of the Study

The materials used in this study were retrieved from International Academic Journals with a variety of study sections of scientific research articles written by native and non-native speakers of English. The data for this study comprised a total of forty English scientific research articles from two fields namely, engineering and medical sciences. Twenty articles were written by native speakers of English and published in international scientific journals; twenty are written by non-native speakers (Arabs) and published in some Arab university scientific journals. It is worthy to mention that the selection of the articles was based on the researchers' institutional affiliation written on top of the paper. This study focused on four rhetorical sections of research articles: introduction, materials & methods, results & discussion, and the conclusion. The corpus is limited to 5-year duration (i.e., between 2013 and 2018). Because of limited space, the writings of the corpus are not recorded in this article.

3.2 Procedure

Concordance software program (AntConc 3.5.7) was utilized in the present study for text analytics to enable the researcher identify phrases or words in a corpus. The program functions by searching words or phrases in text files. A list of items was used to conduct this study because of lack of an agreed-upon list that could represent all the metadiscousre devices/items. This was based on the idea that metadiscourse is by nature an open-ended category. The procedure involved identifying metadiscourse elements from the text and classifying them into subcategories. This was achieved by identifying 40 articles English scientific research articles from two fields namely, engineering and medical sciences of which 20 were written by NSs and 20 were written by NNSs. In particular, 20 articles were written by native speakers of English and published in international scientific journals; twenty are written by non-native speakers (Arabs) and published in Arab university scientific journals. Word-by-word analysis of the corpus was performed in line with the Model suggested by Hyland (2004). A list of metadiscourse devices was obtained. The list of identified metadiscourse devices was further classified into different subcategories: transitions; frame markers; evidentials; code glosses; endophoric markers; and boosters. This study focused on four rhetorical sections of research articles: introduction, materials & methods, results & discussion, and the conclusion.

3.3 Analysis

The possible differences in the frequency of metadiscourse devices use in scientific research articles authored by NNSs (Arab writers) and NSs (English writers) in engineering and medical sciences were determined using a descriptive analysis method. Ch-Square test was used to generate the frequency of use of metadicourse devices in scientific articles authored by NNSs and NSs.

The study applied the taxonomy of metadiscource markers by Hyland (2004) as a model of analysis (table 1). The markers are divided into two expanded categories where each has a set of sub divisions. The interactive markers allowed the writer to control the flow of information so as to give their desired interpretations. Interactive resources consist of code glosses; evidentials; frame markers; and transitions. On the other hand, the interactional markers engage the audience in the argument and they focus on the participants of the interaction and meant to show the persona of the author and the tenor entailed the norms of the disciplinary society. Interactional resources include self-mentions; attitude markers; hedges; boosters; and engagement markers (table 1).

Table 1. Hyland's Interpersonal Model of Metadiscourse (2005)

Category	**Functions**	**Examples**
Interactive	Help to guide reader through text	Resources
Transitions	Express semantic relation between main clauses	In addition/but/thus/and
Frame makers	Refer to discourse acts, sequences, or text stages	Finally/to conclude/ my purpose is
Endophoric makers	Refer to information in other parts of the text	Noted above/see fig./in section 2
Evidential	Refer to source of information from other texts	According to X/ (Y,1990)/ Z states that
Code glosses	Help readers grasp meanings of ideational material	Namely/e.g/ such as/in other words
Total		
Interactional	Involve the reader in the argument	Resources
Hedges	Withhold writer's full commitment to proposition	Might/perhaps/possible/about
Boosters	Emphasize force or writer's certainty in proposition	In fact/definitely/it is clear that
Attitude makers	Express writer's attitude to pro-position	Unfortunately/I agree/surprisingly
Engagement makers	Explicitly refer or build relationship with reader	Consider/note that/you can see that
Self-mentions	Explicit reference to author (s)	I/we/my/our
Total		

4. Results and Discussion

4.1 Results

The results of the study reveal that interactive metadiscourse devices were frequently used by native English researchers and non-native researchers (Arab English researchers) in their English scientific research articles, include transitions, evidentials code glosses, frame markers, and endophoric markers as shown in the table below:

Table 2. The Frequency of Interactive Metadiscourse Devices in the English Scientific Articles (figures in percentage)

Metadiscourse Devices	**Introduction**		**Materials & Methods**		**Results & Discussion**		**Conclusion**		**Total**	
	NSs	NNSs	NSs	NNSs	NSs	NNSs	NSs	NNSs	NSs	NNSs
Transitions	3.6	1.9	5.6	3.7	6.2	5.8	1.9	0.2	17.3	11.6
Frame M.	5.4	3.2	3.9	3.1	3.5	2.3	2.1	1.3	14.9	9.9
Endophoric M	5.7	2.6	2.2	1.4	2.7	1.8	0.9	0.3	11.5	6.1
Evidentials	4.4	2.3	1.2	0.8	2.7	1.2	0.5	0.4	8.8	4.7
Code glosses	4.3	2.7	3.2	0.6	2.3	0.3	1.1	0.7	10.9	4.3
Total	23.4	12.7	16.1	9.6	17.4	11.4	6.5	2.9	63.4	36.6

A succinct look at table 2 above, we can observe that the dominantly used metadiscourse interactive devices by native English researchers and Arab researchers are transitions (NSs-17.3 and NNSs-11.6 per 1000 words); frame markers (NSs-14.9 and NNSs-9.9 per 1000 words); endophoric markers (NSs-11.5 and NNSs-6.1 per 1000 words) (table 2). However, as revealed in table 2 native English researchers tend to use more interactive metadiscourse devices (total metadiscourse devices-63.4 per 1000 words) in the introduction (NSs-23.4 vs. NNS-12.7 per 1000 words); materials & methods (NSs-16.1 vs.NNS-9.6 per 1000 words); results & discussion (NSs-17.4 vs. NNS-11.4 per 1000 words) and conclusion (NSs-6.5 vs. NNSs-2.9 per 1000 words) parts of the scientific articles than Arab researchers (total metadiscourse devices-36.6) (table 3; table 4 below). The differences in the use of interactive metadiscourse devices by native English researchers and Arab researchers is statistically significant (t-stat (0.901402) <t-critical (2.228139) (table 3).

Table 3. T-test Result Comparing Differences in Means of Interactive Metadiscourse Resources Used by NSs and NNSs

t-Test: Two-Sample Assuming Equal Variances		
	NSs	NNSs
Mean	21.13333	12.2
Variance	437.9307	151.376
Observations	20	20
Pooled Variance	294.6533	
Hypothesized Mean Difference	0	

df	10	
t Stat	0.901402	
P(T<=t) one-tail	0.194284	
t Critical one-tail	1.812461	
P(T<=t) two-tail	0.388569	
t Critical two-tail	2.228139	

Table 4. Descriptive Statistics of the Total Interactional Metadiscourse Resources Used by NSs and NNSs

	N	**Mean**	**St Dev.**	**SE Mean**
Total NSs	20	21.133	20.9268	8.543
Total NNSs	20	12.2	12.3035	5.023

In view of the use of the interactional metadiscourse resources, the table below gives an overview of the study results:

Table 5. The Frequency of Interactional Metadiscourse Devices per 1000 Words in the Scientific Articles Written by NSs and NNSs

Metadiscourse Devices	**Introduction**		**Method**		**Result**		**Conclusion**		**Total**	
	NSs	NNSs	NSs	NNSs	NSs	NNSs	NSs	NNSs	NSs	NNSs
Hedges	8.2	5.3	1.8	0.2	4.2	3.3	2.7	1.6	16.9	10.4
Boosters	4.8	2.7	3.1	2.9	3.8	2.1	1.2	0.7	12.9	8.4
Attitude	3.9	1.8	4.6	2.6	4.2	3.4	2.5	2	15.2	9.8
Self-mentions	2.7	3.6	1.8	2.9	1.2	1.8	1.9	1.3	7.6	9.6
Engagement	1.5	0.7	0.6	0.2	3.2	2.1	0.7	0.2	6	3.2
Total	21.1	14.1	11.9	8.8	16.6	12.7	9	5.8	58.6	41.4

Table 5 shows that the frequently used interactional metadiscourse resources in scientific articles authored by native English researchers and non-native (Arab) researchers are hedges (NSs-16.9 vs. NNSs-10.4 per 1000 words); boosters (NSs-12.9 vs. NNSs-8.4); and attitude markers (NSs-15.2 vs. NNSs-9.8) (table 4). Interestingly, the table indicates that non-native researchers use self-mentions more frequently compared to native ones. This, however, has a negative indicator on the part of the researchers. In fact, in scientific academic writing style the passive construction is more preferable than the active one; the reader needs to focus on the result of an action rather than the person doing the action. In view of this study findings, we observe that native English researchers used statistically significantly more hedges, boosters, and engagement in the introduction (NSs-21.1 vs. NNS-14.1 per 1000 words); method (NSs-11.9 vs. NNS-8.8 per 1000 words); result (NNS-16.6 vs. NSs-12.7 per 1000 words); and conclusion (NSs-9 vs. NNSs-5.8 per 1000 words) sections than non-native (Arab researchers) in scientific articles (table 5; table 6; table 7).

Table 6. T-test Result Comparing Differences in Total Interactional Metadiscourse Resources Used by NSs and NNSs

t-Test: Two-Sample Assuming Equal Variances		
	NSs	NNSs

Mean	19.53333	13.8
Variance	384.2947	189.696
Observations	20	20
Pooled Variance	286.9953	
Hypothesized Mean Difference	0	
df	10	
t Stat	0.586179	
P(T<=t) one-tail	0.285374	
t Critical one-tail	1.812461	
P(T<=t) two-tail	0.570748	
t Critical two-tail	2.228139	

Table 7. Descriptive Statistics of the Total Interactional Metadiscourse Resources Used by NSs and NNSs

	N	**Mean**	**StDev**	**SE Mean**
NSs	20	19.533	19.6034	8.003
NNs	20	13.8	13.773	5.623

4.1 Discussion

This study sought to identify Metadiscourse Devices frequently used by native English researchers and non-native researchers (Arab English researchers) in their English scientific research articles. Commonly used interactive and interactional metadiscourse resources include, evidentials code glosses, frame markers, and endophoric markers; and hedges; boosters; and attitude markers. As noted by Hyland (1998, hedges can be used to show the unwillingness of the writer to present categorically propositional information. On the other hand, Boosters are used to writers to express uncertainty. Attitude markers are useful in indicating the author's appraisal propositional information. The tendency to frequently use hedges, boosters, and attitude markers in academic scientific articles by native and non-native English writers was also reflected in the study by Mirazapour, and Mahand (2010). In this study, Mirazapour and Mahand (2010) confirmed that hedges and boosters were frequently used by non-native and native writers of computer science and library information science articles.

This study further investigated whether Arab researchers of scientific English articles (NNSs) employ the same amount of metadiscourse devices as English researchers (NSs) of English Scientific Research Articles and have same level of proficiency as English researchers of Scientific. T-test results revealed that Arab researchers of English Articles (NNSs) differ in terms of the amount of metadiscourse devices used in Scientific Research Articles from English researchers of English articles and therefore differ in their level of proficiency from English researchers (NSs). These findings are consistent with those reported in previous studies (Khedri, & Konstantinos, 2018; Gholami, & Ilghami, 2016; Keshavarz, & Kheirieh, 2011). For example, consistent with the finding of this study Khedri, and Konstantinos (2018) observed differences in metadiscourse devices applied in introductory sections of chemistry

and applied linguistic research articles by native speakers of English and native speakers of English. Similarly, Gholami, and Ilghami (2016) found that native writers (American writers) and non-native English writers (Iranian writers) of biological research articles significantly differ in the frequency of interactional and interactive metadiscourse devices confirming that natives are significantly more proficient in English than non-natives in writing scientific research articles. In particular, Gholami, and Ilghami (2016) confirmed that native English writers employ significantly more interactional and interactive in scientific articles than non-native writers. In line with the finding of the present study, Keshavarz, and Kheirieh (2011) found that native English writers tend to use significantly more metadiscourse elements than non-native (Iranian) writers in civil engineering and applied linguistics.

5. Conclusion

Native English writers of scientific articles embrace more metadiscourse resources than Arab English researchers of scientific academic articles. This confirms that native English writers of scientific articles are more proficient at English than Arab English researchers given the differences in the frequency of metadiscourse resources used. The findings of the study have implications for teaching Arab writers of scientific English articles published in impact journals, and can help them make appropriate use of metadiscourse devices; create convincing research space, and investigate the use of markers in academic articles. Results of this study also provisionally confirm the important role of metadiscourse resources in organizing and facilitating coherence of articles for publication in high-impact journals.

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