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An Investigation of the Linguistic Complexity of IELTS Writing Topics Based on the Levels of Discourse Representation and the Degree of Meaning Coding

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Abstract: The current study focused mainly on the role of the linguistic complexity of IELTS writing Task 2. In other words, it investigated the differential effects of two interrelated linguistic complexities of writing Task 2 on the three levels of discourse representation and what IELTS candidates perceived through analyzing IELTS writing topics both at the sentence and idea levels was taken into consideration. The participants were 10 Iranian modest and competent users of English. A total of 10 writing topics, randomly selected from 70 Task 2 of Cambridge’s passed administered IELTS writing tests (every 7th) was the main instrumentation of a five-week period of data collection. The data analyses were based on a codification scheme adapted from, and a software analyzer known as the Lexical and Syntactic Complexity Analyzer. The effects of lexical and syntactic complexity of writing task on CAF of language production were calculated through separate statistical

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PUBLIC INTEREST STATEMENT

The ability to write fluently and effectively in English is getting to be more important in today’s world because this skill is known as an essential ability for different reasons in both education and business. This study investigated the effects of two aspects of English language in writing (lexical and syntactic) in the context of Iran, which are crucial in international exams, especially IELTS. The results of the study indicated that lexical complexity used in IELTS writing topics had greater influence on IELTS candidates’ understanding of the IELTS writing topics than syntactic complexity. Furthermore, Iranian IELTS candidates were initially attracted to situational feature of IELTS writing topics. The finding of this study can help teachers, particularly instructors, who are responsible for preparing candidates of international examinations. They also open new windows to learners, IELTS candidates in particular, to pay more attention to the linguistic complexity of writing topics from both syntactic and semantic aspects.
analyses. The results of the study revealed that lexical complexity applied in IELTS writing topics had a greater influence on IELTS candidates’ understanding of the IELTS writing topics than syntactic complexity. Furthermore, Iranian IELTS candidates were initially attracted to the situational representation of IELTS writing topics.

Subjects: Educational Research; Education Studies; Research Methods in Education; Theories of Learning; Teachers & Teacher Education; Teaching Assistants; Theory of Education; Curriculum Studies; Education Policy & Politics; Educational Psychology

Keywords: Linguistic complexity; Surface representation; Propositional representation; Situational representation; Meaning coding

1. Introduction

The capability to write fluently and effectively in English is getting to be progressively critical in today’s advanced world since communication through language has to be increasingly essential. This skill is known as an essential ability for diverse reasons in both education and business-related issues. In reality, it plays a critical part in individuals’ professional lives. English learners who are in the process of writing in an additional language ought to see the same movement of cognitive abilities, subsequently, permitting them to progress the complexity of their writing skill. With age, more experienced writers’ underlying cognitive capacities permit them to go to extra writing characteristics, such as coherence and cohesion utilized to increase complex language structures to relate thoughts and arranging and reexamining to guarantee the piece’s interpretation by the reader. In order to see how L2 writing capability progresses, it is more than necessary to realize the linguistic improvement of L2 writers. Also, there have been various attempts to recognize a variety of linguistic features of second language writing quality concerning quantitative strategies (e.g., Crossley et al., 2011; Lu, 2011).

Analysts have utilized measures such as content length, lexical density, lexical variety, and syntactic complexity as significant features of L2 writing capability or second language writing improvement. To exemplify, lexical capability and syntactic complexity have been reliably detailed as necessary properties of L2 composing capability (Crossley et al., 2012; Lu, 2011, 2012). Having the knowledge of how these lexical and syntactic complexity measures contribute to writing quality and which characteristics among the linguistic complexity measures are essential signs of total writing capability can hold important implications for analysts and instructors in terms of L2 learning and writing progress.

With this understanding in the field of second language writing investigation, the majority of researchers’ studies have centered on unique viewpoints of either basic grammatical features or lexical features. Syntactic complexity has been recognized as a vital pointer of capability measures in L2 writing (Ortega, 2003; Wolfe-Quintero et al., 1998). Analysts have endeavored to illustrate the significance of analyzing lexical and syntactic features in second language writing tests, but this has been constrained to explaining a restricted number of linguistic highlights (e.g., centering on either lexical highlights or syntactic complexity measures or analyzing one perspective of common linguistic measures). Moreover, there exist differences around the conceptualization of and the utilization of the measures as linguistic indicators of second language writing proficiency.

To date, researchers have fundamentally focused on investigating the influence of task complexity on the skill of speaking. It has been only recently that the notion of how the complexity of a task can impact second language writing has begun to attract researchers’ attention. Similar to studies conducted in the field of speaking skill, the majority of studies on writing have concentrated on the relationship between task complexity and the products of task performance,
particularly, the linguistic quality of written output (e.g., Kuiken & Vedder, 2007, 2008; Ong & Zhang, 2010).

Building an excellent command of EFL writing, although a dream for the majority of language learners, cannot be effortlessly accomplished. The nonappearance of the communicative objectives in planning ELT educational modules in particular in Iranian settings might have boosted the circumstance. Running investigation pointing at improving the conceivable ways through which Iranian EFL learners could progress their target language writing capacity is sufficiently appealing. Most of the Iranian learners as FL learners discover it problematic to express themselves well in this skill, particularly when it comes to the moment of writing (Piri et al., 2012).

There is no question that the plausibility of improving writing capacity is closely related to the truth that the more a person does write intentionally, the superior their writing capability level will be regarding different factors affecting writing skill, including grammar and vocabulary (Zhang & Chen, 1989). However, writing skill at the sophisticated level, particularly in English language exams, including IELTS, encompasses a higher degree of linguistic complexity, which was the main purpose of the current study.

2. Research questions

RQ 1: Which type of linguistic complexity (syntactic or lexical) is mostly processed at the time of coding meaning for IELTS writing topics?

RQ 2: Which level of writing discourse representation (surface, propositional, situational) is mostly applied when IELTS candidates are exposed to writing topics?

3. Literature review

As opposed to SLA analysts who have continuously considered linguistic complexity a measure for learners’ ability in the target language, a descriptor for task performance, and an index to benchmark improvement, and hence an inherently variable concept (Norris & Ortega, 2009), most of the twentieth century most hypothetical etymologists have concurred that based on langue, all natural languages in terms of complexity must be similar. Subsequently, linguistic complexity was assumed to be invariant, such that there were no ‘simple’ or “complex” languages. However, after all, the starting of the twenty-first century has seen a number of basic surveys of the thought that all languages are, under all circumstances, similarly complex (see Karlsson et al., 2008).

3.1. Task-based planning

Polio (2001), Robinson (2003, 2005, 2011) and Skehan and Foster (1997, 1999, 2001)) propose two different perspectives on task design and features of task implementation (task complexity) named Cognition Theory and Limited Attentional Capacity Model, respectively. These task performance paradigms have led to discussions among SLA researchers.

Skehan and Foster’s Limited Attentional Capacity Model draws on speculations of short-term memory (working memory) (Ruiz-Funes, 2014) and as the name illustrates, considers that human processing capacity is constrained and can concentrate on one dimension of language performance at one time. However, in Robinson’s perspective, human’s attentional faculties are not restricted. He takes “a multiple-resource view of processing” (Ruiz-Funes, 2014) and specifies that assignment sequencing must be based on increment in cognitive complexity of tasks. Robinson states that expanding assignment complexity along with the resource directing aspect (preventing learners from planning time) would result in declined performance in CAF. However, boosting task complexity along with the resource directing aspect would bring almost advancement in task performance (CAF). Despite the fact that these two models are distinctive in their assumptions and expectations concerning how a task should be outlined and sequenced in the second language classroom, both of them theorize that preventing learners from planning time adversely influences task performance.
3.2. CAF measures in TBLT literature
Concerning the impact of the cognitive complexity of tasks on task performance features in the CAF areas in the task-based language teaching (TBLT) literature, an area of interest in the TBLT literature as well as the second language writing literature, the constructs of CAF are observed and measured. In the task-based language teaching literature, the tendency is predominately in the impacts of task complexity on CAF in the production of language. In the literature of L2 writing, tasks influences on CAF have not been much of a concern, but a number of second language studies have examined how CAF in composing tasks relate to L2 capability levels or the quality of L2 writing (Ortega, 2003; Polio, 2001; Wolfe-Quintero et al., 1998).

About academic writing literature, measures of CAF have been utilized in a considerable bulk of studies exploring the effects of the cognitive complexity of tasks on task performance in the three areas (accuracy, complexity, fluency). In doing so, the complex variables of planning time (See Ellis, 2009), here and now (e.g., Ishikawa, 2007), reasoning (Robinson, 2007), and task structure (e.g., Kormos, 2011) have been considered the most.

As Polio (2001) characterizes it, scientific accuracy is “a broad term that generally has to do with the absence of errors.” Errors generally encompass morphological and syntactic, as well as errors related to lexical choice, spelling, and punctuation.

Linguistic complexity includes two measures. Syntactic complexity is illuminated in L2 writing on the basis of the way(s) grammatical structures vary (Foster & Skehan, 1996; Ortega, 2003; Wolfe-Quintero et al., 1998). This type of complexity has been taken into account as a vital measure in L2 teaching and research since progress in this complexity type is a significant issue of an L2 learner’s overall target language development. A wide range of indices has been proposed to specify syntactic complexity in second language writing—most of these attempt to statistically specify one of the following in one way or another: length of production units (i.e. clauses, sentences, and T-units), amount of subordination, amount of coordination, range of surface syntactic structures, and degree of sophistication of particular syntactic structures (Ortega, 2003).

To a great extent, more than syntactic complexity, lexical complexity has been considered as a multifaceted global construct. Also, lexical richness is the term utilized in the literature (Read, 2000). Lexical complexity, as a global construct, is applied to represent a set of lexical features differentiating texts from one another in lexical diversity (variation), lexical density, and lexical sophistication/rariness (Polio, 2001; Wolfe-Quintero et al., 1998). These lexical highlights are more likely to be seen as sub-constructs of lexical complexity. Particularly, based on Read (2000), lexical variation refers to the number of various words used in connection to the total number of words in a text, lexical density has to do with the percentage of lexical words in a text to that of grammatical words, and lexical sophistication or rareness refers to the number of advanced/rarer words or word families utilized out of the total number of words or word families in a text.

3.3. Memory for text
Concerning the field of psychology, there is a considerable bulk of research on human cognitive faculty in general, and significant studies on memory for discourse in particular. It is worth considering the major discoveries on the working of memory generally.

Particularly, recalling the content of text needs reconstruction. This conclusion confirms the investigation conducted by cognitive researchers about memory for ordinary (nonliterary) discourse. Based on this research, three levels of representation are created as a part of a text is read. Surface structure (surface representation) is the first which contains data about the choice and arrangement of words as well as syntactic phrase structure in the text (Jarvela, 1971). Although this type of memory representation depends on the sentence parsing, it does not illuminate the meaning of the sentence. The second one is text-based (propositional representation) and reflects the semantic content of the text (Kintsch & Keenan, 1973). A range of co-referential propositions is frequently
applied to show the content of the text. Importantly, the characteristics of the text are concepts located semantic memory and not a distinction of the words of the content per se.

Finally, the last issue is the “situation model,” (situational representation) which indicates the visual and spatial state of the text (Kintsch & Keenan, 1973). This representation is sometimes represented as a spatial or visual representation of the entities reflected by the text and their connections. Regularly, knowledge and inferences are used to build a situation model even if that data is not expressly specified in the text. Some previous studies on each representation are mentioned in the practical framework of this section.

3.4. Practical framework

3.4.1. Previous research on task planning and writing performance

Ong and Zhang (2010), in their recent study applied resource-dispersing dimensions of task complexity to detect the effects of task complexity on the fluency and lexical complexity of learners’ argumentative writing. They manipulated task complexity using two factors: availability of planning time and provision of ideas and macrostructure. There were four groups to which different levels of planning time were given: extended pre-task, pre-task, and free-writing. One of these four groups was the control group. Moreover, the provision of the ideas and macrostructure had three levels: topic, ideas, and macrostructure group; topic and ideas group; and topic group. They came to the conclusion that as task complexity increased, with regard to the planning time continuum, it significantly contributed to more fluency when it was measured by the mean number of words produced per minute of the total time spent on the task and lexical complexity. In addition, Ong and Zhang (2010) claim that tasks, which were complex through the provision of ideas and macrostructure, resulted in greater lexical complexity. However, they had no impact on fluency when measured by the average number of words produced per minute of transcription.

Tovakoli and Rezazadeh (2014) explored the differential impacts of collaborative and individual pre-task planning on argumentative writing task performance of Iranian EFL learners. The learners who participated in the study were categorized according to collaborative and individual pre-task planning conditions and the results of their performance measured regarding complexity, accuracy, and fluency suggested that collaborative planners wrote a more accurate text while individual planners created more fluent text. Concerning the complexity of their performance, no unique distinction was observed between the two groups.

With regard to Robinson (2005) Cognition Hypothesis and Skehan and Foster’s (2001) Limited Attentional Capacity Model, Kuiken and Vedder (2008) conducted a study in L2 writing which was based on the relationship between linguistic performance and cognitive task complexity. In their research, 91 Dutch university Italian students and 76 French students were required to complete two writing tasks with prompts of different cognitive complexity level. The indexes of syntactic complexity, lexical variation, and syntactic accuracy provided support for the Cognition Hypothesis insofar as the written products of the more complex task came to be more accurate.

3.5. Previous studies on memory for discourse

3.5.1. Surface structure

According to an often-cited study, Jarvella (1971) observed that verbatim memory for spoken discourse decreased extraordinarily at sentence and clause boundaries. In this investigation, participants listened to pairs of sentences and were intermittently interrupted and inquired to recall a part of the previous item. When they remembered the part which was in the current sentence, what they remembered and uttered was significantly better than when the same words were from a preceding sentence, even while the following position was accurately controlled. What Goldman et al. (1980) observed through investigating children’s reading performance was the same finding: verbatim recalled was significantly superior at the time that the things to be
considered were from the sentence concurrently being read rather than the preceding sentence, even when some intervening words were similar. Such findings are commonly considered as proposing that surface structure is kept up while a sentence is being processed in mind (probably to support syntactic processing and interpretation); however, it is relatively lost rapidly after the sentence has been realized and the information which is added to the text base.

3.5.2. Text base (semantic content)
The second memory of discourse which is shaped by readers of text is a representation of the semantic content or meaning of the content. It is obvious that this form of representation is different from a representation of the words of the text since, for illustration, perusing time accelerates with the frequency of propositions in a text, even when the number of words is similar (Kintsch & Keenan, 1973). Researchers have observed that although memory for this perspective of the text keeps going longer than memory for surface structure, it is far from veridical even after a simple delay. As an illustration, Kintsch et al. (1990) calculated estimations of memory that were related to accuracies of 64% after 40 m and 60% after two days. Also, since what a reader recalls relies on the representation made by them and not the real words of the text, it is conceivable for them to think they recall sentences that are not really in the text but conceivably could have been. For illustration, Bower (1979) inquired subjects to read descriptions of ordinary tasks (such as eating in a restaurant or going to a dental practitioner) and found that normal activities were regularly recalled even if they were in the content. Hence, memory based on the content base includes reconstruction and is subject to similar distortions and biases generally documented for memory.

3.5.3. Situation model
The last level of the memory representation is a “situation model” that illustrates the situation anticipated by the content. This model contains data about the entities, such as people, places, and things indicated by the text and the connections among those elements. Occasionally, in building a situation model, readers will make inferences related to the appearance arrangement, and other properties concerning those entities regardless of whether such information is not shown in the content. A considerable bulk of research shows that this model is built in addition to the text base. For instance, readers can make inductions concerning spatial relations portrayed by the text that would be difficult or slow utilizing just the information in the text from the propositional point of view.

In almost the same way, under a few conditions, readers tend to track the spatial dimension of the protagonist in the story world (Morrow et al., 1987). Research has discovered that readers have a better memory for this model than for the text base or surface structure. Undoubtedly, following a day or more, readers are probably going to have the capacity to recall just information in the situational model (e.g., Kintsch et al., 1990). Fundamentally, circumstance models are influenced by the desires and information of the readers. Over four decades later, a similar pattern of results utilizing distinctive materials and more popular present-day technique was replicated by Kintsch and Greene (1978). Both of the examinations show the focal part of reconstruction in the narrative recall.

Bransford and Johnson (1972) found that readers of text no matter it is a writing topic or a long text likewise depend on and apply world information as a powerful influence for the comprehension of content. In an important examination, their participants were given a short text in which a notable assignment was depicted.

3.6. Validity of syntactic complexity analyzers (Lu, 2012)
Syntactic Complexity Analyzers (Lu, 2012), as a computational system, by taking advantage of the fourteen syntactic complexity measures, computes the syntactic complexity of English language samples through deep syntactic parsing. In this system, a written English language sample in plain text format is taken as an input, and consequently, it outputs fourteen indices of syntactic complexity of the sample based on the fourteen measures.
Nasseri (2015) investigated the dissertation abstracts selected from 150 graduate students in Applied Linguistics and any other English as a foreign language-related discipline written by EFL, ESL, and NS students regarding syntactic complexity. The EFL students were all Iranian master's students with varying L1s who studied in various universities in Iran. The ESL and NS students are all master's students who studied and submitted their dissertations in various universities in the UK; the ESL students were from different nationalities and language backgrounds. The participants were selected from a homogeneous age group (20–40 years old) of female and male students; a total of 150 abstracts, fifty abstracts from each group. The corpus was analyzed using the Syntactic Complexity Analyzer (L2SCA), a computational system for the automatic analysis of syntactic complexity developed and reliability-tested by Lu (2012). The findings revealed that the EFL group produced significantly shorter sentences (MLS) and shorter T-units (MLT) than the NS group, supporting the results of Ai and Lu (2013) and Tavakoli and Foster (2008).

4. Method

4.1. Participants
Participants of the current study were ten male and female (5 males, five females) Iranian IELTS candidates randomly chosen from 30, who were getting prepared for the IELTS examination in an English institute in Shiraz and were to take IELTS examination. They were between 18 and 30 years old and chosen from modest and competent users of English. Participants’ background knowledge of writing had been checked through the institute placement test. The sampling technique aimed to have writers with a good range of L2 proficiency levels of IELTS writing tasks to obtain samples of writers with equivalent language proficiency. In addition, there were two qualified and experienced IELTS teachers as assessors (coders) of the candidates’ writing papers.

4.2. Instrumentation
A total of 10 writing topics, randomly selected from 70 Task 2 (essays) of Cambridge’s passed administered IELTS writing tests (every 7th), were used and given to each IELTS candidate to answer research questions (see appendix 4). The writing test included argumentative essays. There was a minimum requirement for word number (at least 250 words).

In the directions for the writing tasks, the students were instructed to write a minimum of 250 words in 40 minutes (IELTS standard time allotted criterion). In the independent writing task, candidates were supposed to observe the standard criteria from which their essays were to be rated: idea development and support about the prompt and the task, organization, and flow of ideas, and language use (in syntax, lexis, etc.). In order to investigate the lexical complexity issue, the researcher took advantage of the Lexical Complexity Analyzer (Lu, 2012) in which all essays’ introductions or conclusions, and 10 IELTS writing topics were analyzed concerning all three subconstructs of lexical complexity: lexical diversity, lexical density, and lexical sophistication. Besides, a codification scheme adapted from Yang et al. (2002), was used to explore the syntactic complexity of the IELTS candidates’ essays’ introductions or conclusions as well as IELTS writing topics through a computational software—L2 Syntactic Complexity Analyzer (L2SCA) (Lu, 2010).

4.3. Data collection procedures
First, with the help of a homogeneity test (institute placement test which is a mock IELTS test), 30 IELTS candidates were chosen. The classification criterion was based on IELTS band scores ranging between 5 and 6 (standard IELTS cut of scores for modest and competent users of English). Since a serious problem in a study, particularly in qualitative studies, can be too much data usually consisting of a mixture of field notes and processing sizeable and heterogeneous datasets can involve a lot of work, ten participants whose scores fell between 5 and 6 out of the maximum IELTS band score 9 were randomly selected for being tested out of 10 IELTS writing topics. That is to say, in the present study, processing too much data usually including transcripts of various recordings as well as documents of a diverse nature and length needs a lot of work, it was practically
impossible to assess a lot of students’ essays in order to identify their writing features. Besides, in this study, the researcher would reach saturation with a few candidates’ writing papers.

Second, in order to reduce the learning effect in writing skill, all candidates’ writing papers were collected in five weeks. It was also worth mentioning that all the participants were informed of the fact that all 10 IELTS writing topics given to each candidate, at regular intervals of two writing topics per week, were administered as mock IELTS writing examinations and they were not aware of the purpose of this study so as to control the halo effect in testing.

Having collected writing papers, since the main purpose of this study was to explore the impacts of IELTS writing prompts’ linguistic complexity on both candidates’ understanding of lexical and syntactic complexities, illustrated in their writing papers, and the type of memory representation applied in their writing tasks, merely all writing papers’ introductions or conclusions were analyzed to investigate the candidates’ command of writing overviews. An overview in the academic IELTS writing task 2, either in the introduction or in conclusion, or both, is a purpose statement which is a declarative sentence summarizing the specific topic and goals of a document based on what has been perceived out of the writing topic. In other words, exploring candidates’ writing overviews was the main source to analyze the linguistic complexity of writing papers indicating what an IELTS candidate had grasped from the writing topics. The process of analyzing candidates’ writing papers was done by two experienced assessors based on IELTS standard criteria.

Principally, the overview of an IELTS writing paper is typically included in the introduction in order to provide a precise, concrete understanding of what the essay will cover to the reader and what the reader can perceive from reading it. It is worth mentioning that because in this study the base of data analysis was the frequencies of both lexical and syntactic complexities, in essays that the candidates had illustrated the overviews in both introductions and conclusions, only the overviews of introductions would be observed. This would enable the researcher to hinder the additional features of linguistic complexity which might be included in conclusions influencing the results of the current study.

4.4. Operationalization of variables
For the operationalization of both linguistic complexity including syntactic and lexical complexities and the type(s) of writing discourse memory representation, the current study examined the following measures.

4.5. Lexical complexity measures
Lexical complexity is measured with the help of the sub-constructs of lexical diversity, lexical sophistication, and lexical density. In this study, all sub-constructs were taken into consideration in that the proportion of both 10 IELTS writing topics’ lexical complexity and ten introductions for each candidate reflecting their understanding of writing topics’ lexical complexity were used as the measure. Lexical complexity concept is based on Laufer and Nation (1995) and Read (2000) in which words beyond the most frequent 2,000 words in English are classified as more advanced, sophisticated, and lower frequency words. The sophisticated words include most academic vocabulary, domain-specific words, as well as other less frequently used words. Also, lexical diversity is measured by analyzing the number of different words used concerning the total number of words in a text. Based on Laufer and Nation’s categorization, lexical density encompasses the proportion of lexical words in a text to that of grammatical words. To obtain the indices for the proportion of these three variables in the introductions and the conclusions of candidates’ writing papers as well as IELTS writing topics, the Lexical Complexity Analyzer (Lu, 2012) was used.

4.6. Syntactic complexity measures
Generally, eight different measures are used for syntactic complexity (SC), representing different dimensions of the multi-dimensional construct (Norris & Ortega, 2009). The eight measures include global SC
measures: mean length of sentence (MLS), mean length of T-unit (MLTU), clausal coordination measure–T units per sentence (TUS), measure tapping into overall clause complexity–mean length of clause (MLC), subordination measures–finite dependent clauses per T-unit (DC/TU) and nonfinite elements per clause (NFE/C), phrasal coordination measure–coordinate phrase per verb phrase (CP/VP), and noun–phrase complexity measure–complex noun phrases per verb phrase (CNP/VP).

Intended measures’ indices in this study were the proportions of T-units (T/S), overall clause complexity (MLC), and of dependent clauses to clauses (DC/C). T-units are usually formed in full clauses and sentences (Norris & Ortega, 2009). The number of words divided by the number of clauses, which according to Foster and Skehan (1996) is a reliable measure of clause coordination, measures overall clause complexity (MLC). The last intended measure in the current study is the proportion of dependent clauses to clauses (DC/C), which examines the degree of subordination in the text (Wolfe-Quintero et al., 1998).

4.7. Writing discourse memory representation measures
Concerning the writing discourse memory representation, three type(s) of memory representation were investigated through analyzing writing papers’ introductions or conclusions with. For surface representation (surface representation), the syntactic phrase structure as well as the choice and order of words of the candidates’ writing papers are taken into account. In terms of propositional representation, the semantic content of the candidates’ writing papers; sets of co-referential propositions is often used to describe the content for base text. The state of affairs alluded by the candidates’ writing papers; the spatial or visual representation of the entities described by the candidates’ writing papers’ content and their relationships are considered as the situational representation of the text.

4.8. Statistical analysis
The data analysis method was based on a codification scheme adapted from Yang, Lu and Weigle, 2002 and a software analyzer known as the Lexical and Syntactic Complexity Analyzer (Lu, 2010, 2012). To address research question one on the effects of the type of lexical and syntactic complexity of writing the task on CAF of language production, separate descriptive analyses using all possible lexical and syntactic sub-con structs regression were conducted for each task, with writing topic as the dependent variable and selected CAF features as the predictor variables. The proportions of the predictive power for all intended lexical sub-constructs, already calculated by Lexical and Syntactic Complexity Analyzer in each candidate’s writing paper’s introduction or conclusion, were compared with the proportions of each intended IELTS writing topic’s lexical sub-constructs through conducting repeated measure test and Paired Samples Test, and the same was done for all intended syntactic complexity sub-levels.

In regard to the second research question, the candidates’ writing papers’ introductions or conclusions were compared with what they had grasped from the writing topics in order to distinguish the type(s) of memory representation through calculating the total number of each memory representation feature(s) in all writing topics and the total number of each memory representation feature(s) in candidates’ writing papers’ introductions or conclusions mentioned above. Then the proportions of all writing discourse memory representations in both total writing topics and total writing papers’ introductions or conclusions were compared by current versions of popular statistical analysis program, SPSS (version 23) as to which level of memory representation was mostly applied by IELTS candidates in their writing papers.

5. Results
The first research question of the current study explored which linguistic measures were mostly applied by IELTS candidates while writing an overview. In doing so, first, the average of some major syntactic complexity measures in 10 topics and 100 overviews were calculated. Then, the intended syntactic and lexical complexity measures in 10 randomly selected writing topics and 100 overviews were analyzed, and the average application of each was calculated. In doing so, a set of descriptive statistics was used to discover the potential significant differences among the
three intended syntactic and lexical measures. Means, standard error of mean and standard deviations of these measures are presented in Table 1, Table 2, Table 3, Table 4 and Table 5.

Based on Table 2, the obtained results from descriptive statistics showed that there were significant differences among the three measures when syntactic complexity was measured. The average number of dependent clauses per T-unit, overall clause complexity, and the T-units per sentence in writing topics were 0.7, 0.3, and 0.69 respectively. It would appear that the construction of IELTS
writing task 2 topics is to a great extent based on both T-unit calculated per sentence usually formed in full clauses and sentences, and dependent clauses per T-unit, which is the measure of subordination. The dependent clause correlates well with other measures of complexity and nonfinite elements per clause. Also, these two measures are followed by the percentage of overall clause complexity, examining the number of words divided by the number of clauses.

Based on Table 3, the average number words divided by the number of clauses (MLC) in writing overviews was 0.8755 followed by the mean of dependent clauses per T-unit and T-units per sentence at 0.828 and 0.5867 respectively. The results of calculating three intended syntactic measures out of 100 writing overviews revealed that IELTS candidates particularly tended to take advantage of much more complex sentences since the mean of clause complexity ranked first. This tendency is followed by applying more subordination, which is the indication of utilizing dependent clauses per T-unit and the average number of T-unit in full sentences.

The results of three major lexical complexity measures in writing topics, as indicated in Table 4, illustrated that in general lexical diversity, which is the tendency to apply different words to the total number of words in a text, was the most popular lexical complexity index in the selected IELTS writing topics (0.5844). Similarly, lexical density, the proportion of lexical words in a text to that of grammatical words and lexical sophistication, which is the number of more advanced, sophisticated and lower frequency words, were popular measures after lexical diversity (0.5150 and 0.1095 respectively). It can appear that while constructing IELTS writing task 2 topics, among three major lexical complexity measures, priority is mostly given to lexical variation in order to create the concept which is fundamentally the most important aspect of IELTS writing Task 2 question.

According to Table 5, the average application of lexical diversity, lexical density, and lexical sophistication in writing overviews were 0.5670, 0.5083, and 0.1252 respectively. It means, Iranian IELTS candidates paid more attention to lexical diversity, which is the tendency to apply different words to the total number of words in a text. Therefore, it can be concluded that as the number of different words varies in IELTS writing task 2, the IELTS candidates’ tendency toward applying a variety of topic-related vocabularies varies as well. In other words, there is a one-to-one correspondence between the number of topic-related words included in IELTS writing topics and the candidates’ interest to utilize separate words in the introduction section of an essay.

### 5.1. Results of the first research question

To answer the first research question of the current study exploring which linguistic measure (lexical or syntactic) of IELTS writing task 2 topics is mostly applied by Iranian IELTS candidates while writing an overview, having standardized both lexical and syntactic complexity indexes (being in scale with one another between 0.00–1.00) through SPSS version 23, a repeated measurer test and a Paired Samples Test for the mean difference between lexical and syntactic indexes in both writing topics and overviews were applied.

Table 6, through investigating 10 Cambridge’s passed administered IELTS writing tests (Task 2) and 100 writing overviews, indicates the descriptive statistics of six independent variables applied in this study. Since the lexical complexity index is differently weighted compared to the syntactic complexity

| N Valid | Lexical density | Lexical diversity | Lexical sophistication |
|---------|-----------------|-------------------|-----------------------|
| Mean    | .5083           | .5670             | .1252                 |
| Std. Error of Mean | .00325 | .00549 | .00305 |
| Std. Deviation | .03254 | .05494 | .03051 |
Table 6. Descriptive Statistics of the Intended Linguistic Complexity Measures Applied in 10 Writing Topics and 100 Overviews

| Factor | N  | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | Minimum | Maximum |
|--------|----|------|----------------|------------|---------------------------------|---------|---------|
|        |    |      |                |            | Lower Bound | Upper Bound |          |         |
|        |    |      |                |            |              |          |         |
| Ten    |    |      |                |            |              |          |         |
| Dependent clause per T-unit (DC/T) | 10 | .3100 | .27979 | .08848 | .1098 | .5102 | .00 | .67 |
| Overall clause complexity (MLC) | 10 | .1434 | .12387 | .03917 | .0548 | .2321 | .00 | .25 |
| T-unit per sentence (T/S) | 10 | .5466 | .39941 | .12630 | .2608 | .8323 | .11 | 1.00 |
| Lexical density | 10 | .4282 | .03435 | .01086 | .4036 | .4527 | .35 | .49 |
| Lexical diversity | 10 | .4811 | .04111 | .01300 | .4517 | .5105 | .42 | .58 |
| Lexical sophistication | 10 | .0907 | .01123 | .00355 | .0827 | .0988 | .07 | .11 |
| Total | 60 | .3333 | .26112 | .03371 | .2659 | .4008 | .00 | 1.00 |
| Overview |    |      |                |            |              |          |         |
| Dependent clause per T-unit (DC/T) | 100 | .3955 | .19784 | .01978 | .3563 | .4348 | .00 | .80 |
| Overall clause complexity (MLC) | 100 | .2000 | .08179 | .00818 | .1837 | .2162 | .00 | .29 |
| T-unit per sentence (T/S) | 100 | .4045 | .26818 | .02682 | .3513 | .4577 | .04 | 1.00 |
| Lexical density | 100 | .4241 | .02619 | .00262 | .4189 | .4293 | .36 | .48 |
| Lexical diversity | 100 | .4719 | .02965 | .00297 | .4660 | .4778 | .35 | .55 |
| Lexical sophistication | 100 | .1040 | .02349 | .00235 | .0993 | .1087 | .05 | .17 |
| Total | 600 | .3333 | .19399 | .00792 | .3178 | .3489 | .00 | 1.00 |
one, in order to apply the Paired Samples Test to answer the first research question, first, figures of six intended measures, regarding mean differences, were standardized to be placed between 0.0 and 1.00.

Based on Table 7, indicating the results of repeated measure test, the significance value for the mean differences between the six lexical and syntactic indexes in both writing topics and overviews is 0.000 and smaller than .05. It can be concluded that the differences between the six measures were statistically significant which means that the differences between lexical and syntactic measures in 10 writing topics and 100 overviews are statistically meaningful.

According to Table 8, the results of group statistics analysis, measuring mean differences in 100 writing overviews, indicated that IELTS writing task 2 topics mostly influenced candidates’ command of applying lexical complexity. In other words, through the analysis of Mean column illustrating the higher mean 0.5820 for lexical complexity measure in comparison with 0.4180 for syntactic complexity index, it would appear that the linguistic complexity of IELTS writing topics to a great extent impacted the application of semantic content of candidates’ writing overviews applied in either introduction or conclusion.

A Paired Samples Test between groups was used to provide a plausible answer to the first research question and to see whether there were any significant differences among the two linguistic complexity groups in measures of lexicon and syntax. According to Table 9, the significance value for the mean difference between lexical and syntactic means in overviews is 0.000 and smaller than .05 and the difference between the two means is statistically significant. It would appear that the linguistic complexity of IELTS writing topics to a great extent impacted the application of semantic content of candidates’ writing overviews applied in either introduction or conclusion.

5.2. Results of the second research question
The second research question of this study investigated the most influential type(s) of memory discourse representation by calculating the total number of each memory representation features in writing papers’ introductions or conclusions. In doing so, two qualified and experienced IELTS teachers as assessors (coders) analyzed 100 writing overviews based on the specific features of three memory representations, including situation, text base, surface and reported the findings. Table 9 illustrates the descriptive statistics of three memory discourse representations in 100 writing overviews in either introductions or conclusions.

| Table 7. Repeated Measure Results between 10 Writing Topics and 100 Overviews |
|-----------------|---------|-------|----------|-------|------|
| Variables Factors | Value   | F     | Hypothesis df | Error df | Sig.  |
| Wilks’ Lambda    | 0.001   | 1409.075<sup>p</sup> | 4.000   | 6.000  | .000  |
| Wilks’ Lambda    | 0.009   | 2525.794<sup>p</sup> | 4.000   | 96.000 | .000  |

Note. The mean difference is significant at the 0.05 level. * p < .05

| Table 8. Means and Standard Deviations of Lexical and Syntactic complexity Indices for100 Writing Overviews |
|-----------------|---------|-------|----------|-------|
| Variables       | N       | Mean  | Std. Deviation |
| Lexical complexity | 100   | .5820 | .09709  |
| Syntactic complexity | 100   | .4180 | .09709  |

Note. Group Statistics a. Variables = 2.00
Table 10, generally, illustrates that the most important memory discourse representation, illustrated in candidates’ overviews driven from the type of discourse presented in 10 IELTS topics, was situational representation. This finding highlights the impact of the situation which is predicted by the content of the IELTS writing topic. The second major memory representation was a propositional representation (text base) which is the semantic content of the candidates’ writing overviews through a set of co-referential propositions. It means that after visualization of the situation on which the topic is based, Iranian IELTS candidates were mostly attracted to the semantic representation in which a topic is planned to convey. The last level is the surface representation which drew the candidates’ attention the least.

5.3. A sample of analysis
Writing topic: Young people are encouraged to travel or work for one year after high school and before university studies. Write the advantages and disadvantages of this matter.

Sample overview: It is argued that countries should encourage young people to do jobs or to travel before attending university. Some people think that it is better for students to attend university, while others believe that traveling and working before joining university for formal education is better for students to understand the world.

5.3.1. Numeric results calculated by lexical and syntactic complexity analyzer (Lu, 2010, 2012)
Clause: 6

| T-unit: 2 |
| MLC: 0.6667 (Clause complexity) |
| DC/T: 2.0000 (Subordination) |
| T/S: 0.3333 (Clause coordination) |
| Word: 51 |
| Lexical density: 0.55 |
| Lexical sophistication: 0.00 |
| Lexical diversity: 0.65 |

Table 10. Descriptive Statistics of three Levels of Discourse Memory Representation in 100 Writing Overviews

|                | Surface representation | Propositional representation | Situational representation |
|----------------|------------------------|------------------------------|-----------------------------|
| N              | Valid                  | 100                          | 100                         | 100                         |
| Missing        | 0                      | 0                            | 0                           |
| Mean           | .3700                  | .5400                        | .8800                       |
| Std. Error of Mean | .04852                | .05009                       | .03266                      |
| Std. Deviation | .48524                 | .50091                       | .32660                      |
| Sum            | 37.00                  | 54.00                        | 88.00                       |
6. Discussion
Apart from different interrelated measures making writing as an extremely difficult cognitive activity which requires the learner to have control over various factors, such as strong comprehension ability involving grammar, vocabulary, conception, rhetoric and other parts of the language (Zhang & Chen, 1989), the type of stimulus regarding the degree of syntactic and lexical complexity of writing topic is a clear indication affecting writing skill. In other words, it is significant to explore the differential effects of two interrelated domains of writing (syntactic and semantic) first in order to explore the learners’ strategies to observe CAF measures (complexity, accuracy, and fluency) of language production in CSL essays, especially IELTS writing tasks. It means that coherence as the connection of ideas at the idea level, and cohesion as the connection of ideas at the sentence level can be influenced by what has been perceived through analyzing writing topics both at the sentence and idea levels. Therefore, his study attempted to shed light on this issue in order to draw more attention to the fact that differences in the recall of formal properties of English language such as the syntactic structure of the writing topic or lexical orientation of the input can be directly tied to the available processing levels in the original input in both content and rhetorical domains of transferring knowledge, rather than to perceptually ambiguous differences in response requirements.

In this regard, the manifestation of syntactic complexity in L2 writing skill refers to how varied and sophisticated the grammatical units and structures are (Foster & Skehan, 1996; Ortega, 2003; Wolfe-Quintero et al., 1998). The complexity of grammatical structures has been taken into account as a vital measure in L2 teaching and research since an improvement in this type of linguistic complexity is an integral part of an L2 learner’s overall target language development. This study also investigated lexical complexity, as a global construct, which refers to a set of lexical features differentiating texts from one another, including lexical diversity (variation), lexical density, and lexical sophistication (Polio, 2001; Examined, 2000; Wolfe-Quintero et al., 1998). These lexical highlights are more likely to be best seen as sub-constructs of lexical complexity. Among a large number of measures proposed for characterizing linguistic complexity in L2 writing, this study investigated six syntactic and lexical complexity measures as independent variables.

Through the analyses of Table 2 to 5, since the main focus of the study was on the differential impacts of the linguistic complexity of input on the output counterpart, initially, the analysis of input (10 writing topics) revealed that the construction of IELTS writing task 2 topics was to a great extent based on both the number of T-unit calculated per sentence usually formed in full clauses and sentences, and dependent clauses per T-unit, which was the measure of subordination. From the lexical point of view, lexical diversity (lexical variation) was the most popular lexical complexity index, which is the tendency to apply different words to the total number of words in a text. On the other hand, the output analysis illuminated that among three syntactic measures out of 100 writing overviews, IELTS candidates particularly tended to capitalize on much more clause complexity (complex sentences), while in the domain of lexical complexity the priority was mostly given to lexical variation. Therefore, lexically speaking, there is a one-to-one correspondence between the variation of topic-related words included in IELTS writing topics and the candidates’ tendency to take advantage of separate words in the introduction section of an essay. In terms of syntactic complexity, the subordination load and T-unit numbers in topic construction were mostly seen on the application of overall clause complexity.

The findings for the first research question, shown in Tables 8 and 9, revealed that the application of lexical complexity in 100 writing overviews was more noticeable than the use of syntactic complexity. This indicates that generally Iranian IELTS candidates were mostly under the influence of the complexity of lexicons used in IELTS writing task 2 topics while planning to construct overviews in either introductions or conclusions of IELTS essays. This finding backs up both Robinson’s Cognition Hypothesis (Robinson, 2005) and Skehan and Foster’s (2001) Limited Attentional Capacity Model in which as task complexity increases, it draws away learners’ attention from concentrating on the form of language to conveying the message of the content. In
other words, providing concepts through various linguistic complexity measures and contrastive discourse markers (which are vital in argumentative essays) does not necessarily channel attention toward specific features of the linguistic codes and structures. Therefore, in accordance with the results of the present study, variations in the linguistic complexity of IELTS writing task 2 topics to a great extent influence the lexical complexity level of candidates’ performance.

In addition, the findings observed in this study supported those of Ong and Zhang (2010) study in which increasing syntactic and lexical complexities of a task impacts the fluency and lexical complexity of learners’ argumentative writing. Through analyzing ideas and macrostructure, they concluded that increasing task complexity, with regard to the planning time continuum, contributed to significantly more fluency when measured by the average number of words generated per minute on the task and lexical complexity. Ong and Zhang (2010) also reported that the more complex task, through the provision of ideas and macrostructure, led to greater lexical complexity, but had no effect on fluency. As a result, it can be concluded that the level of argumentative writing complexity constructed by Iranian IELTS candidates was more lexically-oriented than syntactically.

Concerning the second research question investigating the type(s) of discourse memory representations, the findings of the study, indicated in Table 10, revealed that Iranian IELTS candidates initially paid more attention to the situational representation of IELTS writing topics as they were planning to construct an overview. It is the level in which information about the entities, such as, i.e., people, places, and things indicated by the text and the connections among those elements are comprehended.

This finding, highlighting the impact of the situation which is predicted by the content of the IELTS writing topic, is in line with a considerable bulk of research showing that the situational level is built in addition to the text base. For instance, readers can make inductions concerning spatial relations portrayed by the text that would be difficult or slow utilizing just the information in the text from the propositional point of view. In almost the same way, under a few conditions, readers tend to track the spatial dimension of the text (Morrow et al., 1987). Previous research has discovered that readers have a better memory for this model than for the text base or surface structure. Undoubtedly, readers are more likely to have the capacity to recall just information in the situational model (e.g., Kintsch et al., 1990). It is worth mentioning that, fundamentally, circumstance models are influenced by the desires and information of the readers.

The next major memory representation which drew the candidates’ attention was a propositional representation (text base) which is the semantic content of the candidates’ writing overviews. Text base representation encompasses a set of co-referential propositions often used to illuminate the semantic content. It is worth mentioning that having visualized the situation on which the topic is based, Iranian IELTS candidates were mostly influenced by the semantic representation in which a topic is planned to convey.

This conclusion is in line with the results of the first research question exploring the type of linguistic complexity processing that the candidates of the study had while being exposed to IELTS writing topics. The findings for the first research question highlighted the greater impact of the lexical complexity of writing topics on the intended candidates’ planning to construct an overview. Since lexical complexity measures, including lexical variation, lexical density, and lexical sophistication directly influence the semantic representation of a text, the results of the second research question revealed that there is one to one correspondence between the degree of linguistic complexity of IELTS writing task 2 topics and the type of memory representation through which a topic is processed in order to construct an overview in either introduction of an essay or conclusion. The surface dimension, encompassing paradigmatic and syntagmatic aspects of a sentence, was the least important level in this study.
7. Conclusion and implications

Linguistic complexity has been issued as a very substantial measure in second language teaching since progress in this type of complexity is a vital part of a learner’s overall target language development. In this study, after data collection involving pre and post-test, all candidates’ overviews, written in either the introduction or the conclusion sections of their essays, were typed onto the computer in order to be analyzed by L2 Syntactic and Lexical Complexity Analyzer (Lu, 2010). With regard to the first research question exploring the type of linguistic complexity (syntactic or semantic) processed while coding meaning for IELTS writing topics, the results obtained by L2SLCA thorough analyzing all overviews written by candidates revealed that lexical complexity applied in IELTS writing topics had a greater influence on IELTS candidates’ understanding of the IELTS writing topic than syntactic complexity. Furthermore, the findings of the second research question exploring the type(s) of discourse memory representations, involving three major levels (surface, propositional, situational), revealed that Iranian IELTS candidates initially were attracted to the situational representation of IELTS writing topics as planning to construct an overview.

The study’s findings are first of all significant to English language instructors. If teachers, particularly instructors who are responsible for candidates preparing for international examinations such as IELTS, are practically aware of differential effects of two interrelated linguistic domains of writing skills (syntactic and semantic), they might consider and ideally reconsider the ways in which they have been teaching writing skill. That is to say, they will be able to reconsider the practical implications of current study not only to explore the learners’ strategies to observe three major measures of language production (complexity, accuracy, and fluency) in CSL essays, in particular, the second IELTS writing task, but also what factors candidates should observe in order to have the appropriate command over the applications of writing features to enjoy international writing test criteria. What teachers should take into account is the differential significance of linguistic complexity of writing prompts on IELTS candidates’ type(s) of writing discourse memory representation so as to develop coherence referring to the “rhetorical” aspects of writing.

Second, the results of the current study open new windows to learners, in particular IELTS candidates, to concentrate more on the linguistic aspects of writing topics from both syntactic and semantic angles. These complexities of writing topics undoubtedly make great contributions to two major criteria of writing skill; coherence and cohesion. Both teachers and learners should know that coherence as the criterion to connect opinions at the idea level, and cohesion as the measure to connect opinions at the sentence level are influenced by what learners might perceive through analyzing writing topics both at the sentence and idea levels.

Through the process of this study, the researcher encountered some diverse issues that may pave the way for further research. As it was already noted, among eight syntactic measures proposed by Norris and Ortega (2009), this study did explore merely three issues. Further research could be carried out on other possible factors involved in measuring syntactic complexity. In the current study, gender was not included in the variables. There can be a comparison between male and female students’ types of memory representation and linguistic complexity while exposed to IELTS writing topics. That is to say, the extent to which the meaning of the IELTS writing topic is coded can also be explored in both genders. In this project, modest and competent users of English were our focus. Doing the same thing for advanced students might prove useful. The findings investigated the first and second research questions rejected the hypothesis that the syntactic complexity of the IELTS writing topic is mostly processed at the time of coding meaning and indicated the most influential type(s) of memory discourse representations, respectively. Other studies might be carried out to provide appropriate answers to the relationships between the linguistic complexity of the second IELTS writing task and the kind of memory discourse representation.

The main limitation was the fact that it was not practical for the researcher to examine the IELTS candidates’ writing ability in a real or mock examination since it was impossible to test the
participants for ten times. Therefore, the researcher merely administered IELTS writing section, including both tasks. Another limitation of the study was in terms of the choice of syntactic features. In terms of syntax, since analyzing all linguistic complexity features was practically a difficult and time-consuming process, the researcher had to choose only three main ones.

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