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***Research Paper***

# The Effects of Different Explicit Syntactic Marker Types on Sentence Comprehension of EFL Learners

**Malihe Afhami** [*] **Mohammad Saber Khaghaninejad** [**]

## Abstract

**This study was designed to highlight the potential effects of different types of Explicit Syntactic Markers (ESMs) on the sentence comprehension of EFL learners of different age-range and proficiency levels. Consequently, two hundred and forty beginners, intermediate, and advanced Iranian EFL learners were selected via purposive sampling procedure from an initial pool of six hundred and sixty learners. They were selected based on their McMillan Placement Test (MPT) performance. Subsequently, they were categorized into two age groups teenagers and adults. An online software application *(Com-Chron)* was utilized to provide learners with a set of ESM and non-ESM English sentences on the screen to measure the accurate comprehension and the elapsed time needed for the perception of the presented sentences. Data analyses revealed that participants had a significantly superior performance for comprehending the ESM items (though they were longer sentences than non-ESM items). Furthermore, it was revealed that proficiency level, unlike age, caused a statistically significant difference in comprehending the ESM sentences. It was also concluded that different types of explicit syntactic markers imposed different degrees of comprehension difficulty both in terms of accuracy and the needed time for the participants' comprehension; sentences with punctuation marks and conjunctions were the easiest for the participants, while those including determiners and link breaks were the most challenging. Results also indicated that all the ESMs (except for the link breaks) can significantly account for English sentence comprehension and can be assumed as comprehension predictors to various degrees.**

***Keywords****:* English Sentence Comprehension, Explicit Syntactic Markers (ESMs), Comprehension Difficulty, Comprehension Time and Accuracy

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[*] Ph.D. Candidate, Shiraz University, maliheafhami@gmail.com
[**] Assoicate Professor, Shiraz University, mskhaghani@shirazu.ac.ir, Corresponding Author

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Both native and non-native speakers seem to have some preferences in comprehending sentences, but the exact approaches to their syntactic processing are still not that manifest (Frenck-Mestre, 2005; Nitschke, Kidd & Serratrice, 2010). It was previously supposed that comprehenders might assign syntactic structure on a word-by-word basis (e.g., Frazier, 1987; Frazier & Rayner, 1987). This was challenged by studies using techniques such as examining eye movements while reading syntactically ambiguous sentences or self-paced reading tasks (e.g., Ferreira & Henderson, 1990; Ferreira, 2003; Rayner, 2009) in favor of a clause-by-clause basis for sentence processing and comprehension.

There are several hypotheses about sentence processing and comprehension mechanisms, namely *modularity* versus *interactive* processing and *serial* versus *parallel* analyses (Ferreira, & Çokal, 2016). Cosmides and Tooby (1994), Fodor (2000) and Robbins (2007) supported a *modular approach* regarding the architecture of the linguistic system by proposing that the relationship between syntactic and other cognitive levels of analysis is independent and processing occurs only on the output of particular modules. In better words, syntactic analysis output happens without input from the contextual information, so each module is processed separately and independently without being affected by other modules (Friederici, 2002). On the other hand, an *interactionist approach* supports mutual impact among the different cognitive processes during the analysis of the linguistic input (Spivey et al., 2002). Interactive advocates assume that all the available information can be processed simultaneously and instantly affect the final analysis's output. This model insists on the interaction between the structural, lexical, and phonetic levels of sentence processing (Chambers et al., 2002).

Traditionally, it is considered that the longer the sentences, the longer the time of comprehension would be, and consequently, this longer processing time alludes to the mental challenge and difficulty in their comprehension (Gaines, Runyan & Meyers, 1991; Zackheim & Conture, 2003; Sawyer, Chon & Ambrose, 2008). On the other hand, based on the *Derivational Theory of Complexity* (Chomsky, 1957 & 1965), the structures that have endured some changes in their derivations were considered more difficult to process. For example, passive or negative forms of sentences were considered to be more difficult. This claim is empirically documented by Caplan and Waters (1999), Van Berkum, Brown, and Hagoort (1999), Van Berkum et al. (2003), Carlson (2009) and Van Gompel and Pickering (2006).

Although the last decades have witnessed an increase in examining syntactic parsing and sentence processing, very small attention has been given precisely to the effectiveness

of Explicit syntactic markers (ESMs) in the area of language learning and psycholinguistics (Barahuyee, Khaghaninejad, & Moloodi, 2019; Grant, 2013; Huettig, Rommers, & Meyer, 2011; Levy, Roger, Slattery, & Rayner, 2010; McRae & Matsuki, 2013; Patson & Ferreira,2009). ESMs are syntactic words or phrases that make the sentences longer; however, they can be omitted from the sentences without making them ungrammatical; *complementizers* (e.g., that, if, and whether), *relative pronouns* (e.g., who, that, which, whose, where, and when), *determiners* (e.g., articles, demonstratives, possessive determiners, cardinal numerals, quantifiers, distributive determiners, and interrogative determiners), *conjunctions* (e.g., coordinating conjunctions, correlative conjunctions, conjunctions of time, and subordinating conjunctions), *punctuation marks*, and *link-breaks* are the most known ESMs (Frenck-Mestre, 2005; Truss, 2004; Paterson, Liversedge, & Underwood, 1999; Warren, 2013) and have been the focus of this inquiry.

The primary objective of this study was to examine whether longer sentences with ESMs are comprehended faster and more accurately by EFL learners. Moreover, the contribution of different ESMs types and the potential effects of EFL learners' age and proficiency level on the speed and the accuracy of ESM sentence comprehension were focused. Hence, the following research questions were formed:

- Is there any significant difference between the comprehension difficulty of sentences with and without ESMs for EFL learners?
- Do ESMs affect the sentence comprehension of EFL learners of different ages and English proficiency levels?
- Are there any significant differences in the EFL learners' comprehension of English sentences with different ESM types? If yes, which ESM types can statistically predict the sentence comprehension of EFL learners?

## Literature Review

### Sentences Processing Models

As a subfield of psycholinguistics, sentence processing focuses on interpreting sentences (Frazier, 1979). The *two-stage model* or *garden path* was one of the first sentence processing models introduced and developed by Frazier (1987). The model considers that once a parse or interpretation is built for a sentence based on the *Minimal Attachment operation*, it constraints the parser to build redundant syntactic nodes. Besides, *Late Closure* causes the parser to attach new linguistic input to the nearest constituent. Moreover, the database of phrase structure rules is considered the only information the parser has access to when building a syntactic structure; consequently,

the information associated with lexical items cannot be consulted by the parser. The essential characteristics of the *two-stage model* are (a) that information is incrementally used to construct an interpretation, (b) different interpretations are built and evaluated serially, and (c) only the syntactic information and prosodic vocabulary of the processing module can be used during the initial stages of processing.

Over the past decades, *the two-stage model* has evolved to consider the evolutions in linguistic theory and psycholinguistics findings (Frazier & Clifton, 1997; Frisson & Pickering, 2001). One significant modification is the idea of *Construal,* which relates constituents to a specific thematic domain in a sentence. Another evolution is that prosody has an essential role in determining how parsing proceeds from the earliest stages of processing (Price et al., 1991; Millotte, Wales & Christophe, 2007; Nakamura et al., 2012). Different kinds of prosodic and intonational information are to restrain the parser's syntactic analyses and assist in constructing semantic meanings.

In the 1980s, the *connectionist model* challenged and criticized the *two-stage model* (Rumelhart & McClelland, 1986; Seidenberg & McClelland, 1989). There are general underlying considerations regarding the *connectionist model*. Initially, different possibilities are activated and assessed in parallel. Also, any related source of information can be used to control the activation of levels and let the most probable analysis win (Macdonald et al., 1994). By applying these considerations, the following principles are created regarding sentence processing. First, the heavy burden of analysis falls on the lexicon instead of resorting to grammatical rules. By revising ideas in linguistic theories, lexicons were assumed to activate the words, their meanings, and the syntactic frames (Pesetsky, 1995). In this regard, all the essential information is stated in the lexicon, and the syntactic rules are redundant. Thus, in this architecture, all possible analyses are considered and weighted by their frequency of use in parallel. To further control the activating levels of processing lexical, contextual, and pragmatic constraints can be used. In summary, the sentence processing system is incremental; however, different possible interpretations are switched on in parallel. Furthermore, all potential sources of information can be used at all stages of sentence processing, making the system interactive. Otero and Kintsch (1992) have shown that occasionally the readers are indifferent to ambiguities in texts, besides frequently failing to renovate their interpretations when later information undermines the datum stated previously. It seems that processing is not completely dependent on the syntactic reanalysis and sometimes is unsuccessful in revising all the incorrect elements in the initial parse of the syntactic structure or the semantic consequences.

Sanford and Sturt (2002) introduced a kind of processing implementation that allows representations to be underestimated. *Construal model* explicates that syntactic structures are not perpetually wholly connected, and particularly adjunct phrases may merely be associated with a processing domain and floating until disambiguating information is reached, consequently the parser stays unattached or uncommitted (Gompel & Pickering, 2006). Townsend and Bever (2001) in *Late Assignment of Syntax Theory* (LAST) proposed that each sentence is processed twice: Initially, the first non-modular heuristics stage yields a meaning, and then the second modular syntactic computations yield a fully connected, syntactic analysis. The purpose of the second process is to make sure that the meaning obtained for a sentence is consistent with its form.

Two processing models similar to LAST have been proposed by Garrett (2000) and Ferreira (2003). Garrett (2000) offered a synthesis model including the production system to create top-down effects in the former. First, the bottom-up process uses syntactic information to generate a simple interpretation. Then, the language production system uses that parse to create a detailed syntactic structure. Ferreira (2003), on the other hand, considered the tendency to wrongly interpret passive sentences, chiefly when expressing an improbable event with reversible semantic roles. Applying heuristics in the first modular stage yields a wrong interpretation; a right syntactic parse would provide the opposite of the correct interpretation; however, the model assumes that it is subject to interference.

**Sentence Processing and Comprehension**

During sentence processing, a variety of information sources are utilized for sentence processing. Lexical and syntactic constraints, prosodic information, and the discourse and visual context underline and flesh out some meanings and interpretations (Traxler & Tooley, 2007; Reisberg, 2010; Roberts, 2012; Spivey-Knowlton, Trueswell, & Tanenhaus, 2013). Syntactic and semantic processing, the time of interpretation, and the role of cognitive systems such as working memory in sentence interpretations are considered some of the relevant issues included in processing (Trueswell, Tanenhaus, & Garnsey, 1994; Van Gompel et al., 2005).

The field of sentence processing has been associated with the idea that syntactic information is at the heart of successful language comprehension (Traxler & Tooley, 2007). Almost all theories assume that structure-building processes are critical for successful comprehension (Frazier & Rayner, 1990). Phrase-structure parsing is one key component that refers to the hierarchical process of identifying constituents and

groupings. The parser creates a structural analysis showing the subordinate and main clauses. With this analysis, the correct meaning of sentences can be derived. Another complication concerning the syntactic analysis of a sentence is that the grammar permits constituents to be moved from their positions. Passive sentences are examples of this complication (Grimshaw, 1990; Jackendoff, 1990).

Moreover, sentence processing can be influenced by words and affixes that explicitly mark the syntactic structures that can be omitted without making a sentence ungrammatical, namely, explicit syntactic markers (Warren, 2013). For instance, by considering the response time of the participants during a phoneme-monitoring task, it was revealed that the listeners analyzed the sentences easier when the syntactic structures were clearly marked (Engelhardt, 2014). Some studies utilized eye movement measurements while reading tasks and acknowledged the usefulness of ESMs in language processing. For instance, Reisberg (2010) investigated the usefulness of *that* as a complementizer in making a sentence structure clearer and more manifest. Consequently, it was concluded that the more complex a sentence structure is, the more helpful ESMs would be. ESMs are abundant in language and generally short; thus, they are argued to be useful anchors for processing (Warren, 2013). Punctuations and link breaks are similar to prosodic features like intonation or phrasing cues during spoken language, making syntactic structures clearer and more explicit (Allbritton, McKoon, & Ratcliff, 1996; Kennedy et al., 2009).

However, the potential effects of ESMs in sentence comprehension are addressed in some languages like French (Fayol et al., 2006), Dutch (Sandra et al., 1999; Bosman, 2005; Sandra and Van Abbenyen, 2009), German (Betzel, 2015), Greek (Protopapas et al., 2013), and English (Warren, 2013; Kennedy et al., 2009) to various degrees. As a pedagogical necessity, more research is needed to focus on the roles of ESMs and their types on smooth comprehension.

Cognitive maturation was claimed to be critical in resolving the misanalysis of ambiguous sentences. Accordingly, it was argued that the limited cognitive abilities of children could not cope with parsing conditions such as a Garden-Path trap (Choi & Trueswell, 2010). On the contrary, Lany, Gómez and Gerken (2007) examined aging effects in Garden-Path sentence comprehension and concluded that older adults experienced a tougher time comprehending embedded clauses than younger ones. "Proficiency level" was also found to be an influential factor for sentence processing and comprehension (e.g., Roberts, 2012; Khodadady, Alavi, & Khaghaninezhad, 2012). Pakulak and Neville (2011), for example, suggested that adult native speakers of English

who vary in language proficiency differ in the recruitment of syntactic processes, so to fully understand the syntactic comprehension processes, proficiency levels must be included. Roberts (2012) also found that the more proficient learners benefit from a higher working memory capacity in processing the input. Parpanchi (2014) referred to the strong association between the English proficiency level and comprehension of ambiguous structures. Abbasian and Moeenian (2015) also attested to the impact of "proficiency level" on the parsing strategies and concluded that the usage of appropriate strategies is associated with the participant's language proficiency level.

To recapitulate, lexical and syntactic constraints are at the heart of the structural options considered through the processing system. Considering the scarcity of empirical psycholinguistic studies in an EFL context and the discrepancy of the findings, this study attempted to investigate the possible impacts of age, proficiency level, and ESM types on Iranian EFL learners' sentence processing and comprehension.

## Method

### Participants

Following a quantitative research design, this study included two hundred and forty male and female participants selected via a purposive sampling procedure from Zand, Navid and Shiraz University language learning centers. The participants were divided into three groups of beginner, intermediate, and advanced and were recruited based on their performance on a McMillan Placement Test (MPT) from the initial pool of 664 EFL learners. Furthermore, two age groups of teenagers (i.e., 13 to 18 years of age) and adults (i.e., older than 18) were specified from both genders. The participants' consent was gained before the initiation of the inquiry. Table 1 depicts the recruited participants' demographic information.

Table 1
*Participants' demographic information*

| Age-group | Proficiency level | Gender | Number | % |
|---|---|---|---|---|
| Teenagers | beginner | male | 18 | 0.075 |
| | | female | 22 | 0.091 |
| | intermediate | male | 17 | 0.070 |
| | | female | 24 | 0.100 |
| | advanced | male | 21 | 0.087 |
| | | female | 19 | 0.079 |
| Adults | beginner | male | 22 | 0.091 |
| | | female | 17 | 0.070 |

| Age-group | Proficiency level | Gender | Number | % |
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| | | female | 22 | 0.091 |
| | intermediate | male | 17 | 0.070 |
| | | female | 24 | 0.100 |
| | advanced | male | 21 | 0.087 |
| | | female | 19 | 0.079 |
| | intermediate | male | 16 | 0.066 |
| | | female | 23 | 0.095 |
| | advanced | male | 19 | 0.079 |
| | | female | 22 | 0.091 |
| **Total** | | | **240** | **100.0** |

## Instruments

*McMillan Placement Test* was conducted to diagnose the proficiency levels of the participants. MPT is a quick diagnostic placement test the purpose of which is to allocate the participants to their appropriate levels of proficiency. This test indicates the different proficiency levels of students, ranging from beginner to advance. In MPT, the score range is from 0 to 50. Based on the guidelines, the participants with a score range of 0 to 15 are considered to be beginners, the score range of 25 to 45 is regarded as to be intermediate, and those with higher scores than 45 are judged to be advanced EFL learners. The reliability of the test is reported as .89 by Warren (2013).

The researchers designed a software application (Com-Chron) to determine the accuracy and time needed to comprehend sentences. Com-Chron provided the learners with a series of sentences and illustrated the elapsed time for each EFL learner to reveal their understanding of the presented sentences on the screen. Forty-two sentences were with ESM, Forty-two sentences were without ESM sentences, and 16 sentences were filler items. By using the fillers, the specific purpose of an experiment can be obscured so that the participants are kept from anticipating what is next. Several linguistic parameters have been taken into account for constructing the items, such as the length of the words and the sentences, the frequency of the words, and the semantic relatedness between words in a language (Cowles, 2011). To minimize the pitfall in the tests, they were read by a group of four experts in the field to examine the test content and accuracy. The items were also pretested on a group of examinees similar to the target group to determine the appropriacy of the item characteristics. Consequently, a couple of the test items were modified and replaced. Moreover, to make sure the tests were reliable, the test-retest reliability data over one month suggested no significant differences in scores

between time 1 and time 2. The two sets of responses were compared and the reliability coefficient was reported to be .93, which was acceptable.

A comprehensive assessment of sentence comprehension was done by focusing on the number of correct answers and the time needed for them. Three different sets of items were designed for the three different proficiency levels considering the study's item construction criteria, such as the sentences comprising words' frequency (all the content words of the sentences were among the 5000 frequent words in English), the sentences lengths (all the sentences contain between eight to twelve words) and the proportionate number of items for the six ESM types (i.e., punctuation marks, conjunctions, complementizers, relative pronouns, determiners and link breaks). Consequently, 300 multiple-choice test items were fed into Com-Chron to examine the possible effects of age, proficiency level, and ESM types on the participants' comprehension of English sentences.

**Data Collection Procedure**

To collect the necessary data, the participants were asked to take two tests; first, a test for determining their levels of proficiency and another for testing the comprehension of ESM and non-ESM sentences. After classifying the participants into beginner, intermediate and advanced learners also considering their age groups (teenagers and adults), the participants' comprehension of ESM and non-ESM sentences were analyzed; for each proficiency level, 100 (i.e., 42 ESM sentences, 42 non-ESM sentences, 16 fillers) English statements were fed into the software. The participants could see a list of possible answers and were asked to click on the right answer. Furthermore, the time spent on answering each test item was exactly measured. The comparisons were made based on the number of correct responses to ESM and non-ESM sentences and the time spent for each participant to answer each question. Moreover, based on the comparison of the performance of participants on different types of ESM sentences, a hierarchy for the difficulty of comprehending different structural types was offered. A codebook was developed to specify the question numbers, variable names, and values of the variables to facilitate data entry and data analysis. The data went through several statistical analysis procedures (i.e., paired and independent-samples *t*-tests, ANOVA and multiple regression) to answer each research question.

## Results and Discussion

### Results

To compare participants' performance on comprehending English ESM and non-ESM sentences, their answers and the elapsed time for answering each item were determined and compared. This was done with the aid of two paired-sample *t*-tests.

Table 2

*Comparing the comprehension of ESM and non-ESM sentences based on the participants' scores*

| | | Mean | Std. Deviation | Std. Error Mean | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|
| Pair 1 | Total ESM scores - Total non-ESM scores | -2.604 | 5.857 | .378 | 6.889 | 239 | .000 |

Table 3

*Comparing the comprehension of ESM and non-ESM sentences based on the elapsed time*

| | | Mean | Std. Deviation | Std. Error Mean | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|
| Pair 1 | Total ESM time - Total non-ESM time | -21.504 | 46.955 | 3.031 | -7.095 | 239 | .000 |

As discernible from Tables 2 and 3, there were statistically significant differences in the performance of participants on ESM and non-ESM sentence comprehension tasks both in terms of their scores and the amount of elapsed time needed for comprehension. The calculated effect sizes for both comparisons (0.16 and 0.15) referred to large, substantial and remarkable differences. Indeed, non-ESM sentences were found to be more challenging (though they were shorter) than ESM ones based on the participants' scores and considering the needed time for sentence comprehension.

An ANOVA was utilized to compare the comprehension of ESM sentences for basic, intermediate, and advanced EFL learners both in terms of the elapsed time for the designed items and their scores on ESM sentence comprehension tasks.

Table 4

*Comparing the performance of beginner, intermediate and advanced participants on comprehending ESM sentences based on their scores*

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 456.658 | 2 | 392.329 | 6.746 | .001 |
| Within Groups | 654.137 | 237 | 29.916 | | |
| Total | 1110.795 | 239 | | | |

Table 5

*Multiple comparisons of beginner, intermediate and advanced participants on comprehending ESM sentences based on their scores*

| | | Mean Difference | | |
|---|---|---|---|---|
| (I) ProLevel | (J) ProLevel | (I-J) | Std. Error | Sig. |
| Advanced | Intermediate | 3.250 | 7.435 | . 991 |
| | Basic | 22.717* | 9. 941 | .002 |
| Intermediate | Advanced | -3.250 | 7.435 | .991 |
| | Basic | 28.662* | 8.794 | .006 |
| Basic | Advanced | -22.717* | 9.941 | .002 |
| | Intermediate | -28.662* | 8.794 | .006 |

As Table 4 depicts, the overall performance of participants with different proficiency levels was statistically different. In Table 5, this difference between the intermediate and the advanced participants was not statistically significant. Interestingly, the same results were obtained by comparing the measured elapsed time for comprehending the ESM sentences by beginner, intermediate and advanced participants (Tables 6 and 7).

Table 6

*Comparing the performance of beginner, intermediate and advanced participants on comprehending ESM sentences based on the elapsed time*

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 32784.658 | 2 | 16392.329 | 6.746 | .001 |
| Within Groups | 575890.137 | 237 | 2429.916 | | |
| Total | 608674.796 | 239 | | | |

Table 7

*Multiple comparisons of beginner, intermediate and advanced participants on comprehending ESM sentences based on the elapsed time*

| (I) ProLevel | (J) ProLevel | Mean Difference (I-J) | Std. Error | Sig. |
|---|---|---|---|---|
| Advanced | Intermediate | 2.125 | 7.794 | . 960 |
| | Basic | 25.787* | 9. 940 | .003 |
| Intermediate | Advanced | -2.125 | 7.794 | .960 |
| | Basic | 23.662* | 8.394 | .007 |
| Basic | Advanced | -25.787* | 9.940 | .003 |
| | Intermediate | -23.662* | 8.394 | .007 |

Two independent-sample *t*-tests were used to check the possible effect of age on the comprehension of ESM sentences based on the scores and the elapsed time for teenager and adult EFL learners. Tables 8 and 9 show that, unlike proficiency level, age was not an effective parameter for comprehending the ESM sentences because of the accuracy and the time needed for perception. In better words, the performance of participants in comprehending ESM sentences was not affected by their age.

Table 8

*Comparing the performance of teenagers and adults based on their scores on ESM sentences comprehension tasks*

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | |
|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference |
| Total ESM scores | Equal variances assumed | 3.201 | .075 | .700 | 63 | .485 | .525 | .750 |
| | Equal variances not assumed | | | .700 | 62.52 | .485 | .525 | .750 |

Table 9

*Comparing the performance of teenagers and adults based on the elapsed time for comprehending ESM sentences*

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | |
|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference |
| Total ESM time | Equal variances assumed | 5.267 | .098 | .876 | 63 | .761 | .589 | .561 |
| | Equal variances not assumed | | | .876 | 62.76 | .761 | .589 | .561 |

Due to the common practice of measuring the response-time for judging the comprehension difficulty in psycholinguistic studies (Just & Carpenter, 1980; Rayner, Kambe, & Duffy, 2000), two ANOVAs were utilized to check the imposed difficulty of different ESM types both in terms of the accuracy of comprehension and the needed time for that. Table 10 implies that a statistically significant difference was found regarding participants' comprehension of English sentences with different ESM types. In better words, comparing the participants' scores on the test items assessing the comprehension of sentences containing different ESM types, it was revealed that different ESM types affected the sentence comprehension of the participants to statistically significant degrees.

Table 10

*Comparing the difficulty of English sentences, including different types of ESMs based on the participants' scores*

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 367781.733 | 2 | 183890.867 | 180.919 | .000 |
| Within Groups | 240893.063 | 237 | 1016.426 | | |
| Total | 608674.796 | 239 | | | |

Similarly, another ANOVA was conducted to compare the response time of the items assessing the comprehension of sentences, including different ESM types. The findings referred to a statistically significant difference in the response time of these items (i.e., the comprehension of the sentences containing different ESM types happened in statistically significant different durations). Overall, inspired by the findings, among the ESM types, sentences with "punctuation marks" were the least demanding for the participants to comprehend, while sentences including "link break" were found to be the most challenging to perceive. Consequently, the ESM sentences, including "punctuation marks", "conjunctions", "complementizers", "relative pronouns", "determiners," and finally, "link break," can be ordered in terms of the comprehension challenge they impose on the learners. Table 11 depicts the means of the elapsed time for each ESM type and Table 12 presents the multiple comparisons of ESM sentences on the basis of the time they took for perception.

Table 11

*The means of the elapsed time for each ESM type*

| | Mean | Std. Deviation |
|---|---|---|
| **PM** | 17.67 | 3.823 |
| **CONJ** | 19.68 | 6.114 |
| **COM** | 20.65 | 5.671 |
| **RP** | 20.42 | 3.832 |
| **DET** | 22.57 | 4.703 |
| **LB** | 28.43 | 4.193 |

Table 12

*Comparing the performance of the participants on different types of ESM sentences based on the elapsed time*

| (I) TYPE | (J) TYPE | Mean Difference (I-J) | Std. Error | Sig.[b] | 95% Confidence Interval for Difference | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| PM | COMP | .442 | 1.020 | .000 | -2.582 | 3.465 |
| | CONJ | 8.342 | 1.255 | .001 | 4.621 | 12.062 |
| | DET | 5.454 | 1.003 | .000 | 2.481 | 8.427 |
| | RP | 5.600 | 1.089 | .000 | 2.372 | 8.828 |
| | LB | 1.592 | 1.202 | .000 | -1.972 | 5.156 |
| COMP | PM | -.442 | 1.020 | .000 | -3.465 | 2.582 |
| | CONJ | 7.900 | 1.117 | .011 | 4.588 | 11.212 |
| | DET | 5.012 | 1.082 | .000 | 1.804 | 8.221 |
| | RP | 5.158 | 1.010 | .007 | 2.164 | 8.153 |
| | LB | 1.150 | 1.070 | .000 | -2.023 | 4.323 |
| CONJ | PM | -8.342 | 1.255 | .001 | -12.062 | -4.621 |
| | COMP | -7.900 | 1.117 | .011 | -11.212 | -4.588 |
| | DET | -2.887 | 1.185 | .234 | -6.402 | .627 |
| | RP | -2.742 | 1.113 | .118 | -6.043 | .560 |
| | LB | -6.750 | .987 | .000 | -9.676 | -3.824 |
| DET | PM | -5.454 | 1.003 | .000 | -8.427 | -2.481 |
| | COMP | -5.012 | 1.082 | .000 | -8.221 | -1.804 |
| | CONJ | 2.887 | 1.185 | .234 | -.627 | 6.402 |
| | RP | .146 | 1.038 | .031 | -2.932 | 3.224 |
| | LB | -3.863 | 1.137 | .010 | -7.235 | -.490 |
| RP | PM | -5.600 | 1.089 | .000 | -8.828 | -2.372 |
| | COMP | -5.158 | 1.010 | .000 | -8.153 | -2.164 |
| | CONJ | 2.742 | 1.113 | .118 | -.560 | 6.043 |
| | DET | -.146 | 1.038 | .031 | -3.224 | 2.932 |
| | LB | -4.008 | 1.075 | .004 | -7.197 | -.820 |

| (I) TYPE | (J) TYPE | Mean Difference (I-J) | Std. Error | Sig.[b] | 95% Confidence Interval for Difference | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| LB | PM | -1.592 | 1.202 | .000 | -5.156 | 1.972 |
| | COMP | -1.150 | 1.070 | .000 | -4.323 | 2.023 |
| | CONJ | 6.750 | .987 | .000 | 3.824 | 9.676 |
| | DET | 3.863 | 1.137 | .010 | .490 | 7.235 |
| | RP | 4.008 | 1.075 | .004 | .820 | 7.197 |

In the same vein, Table 13 depicts the means of the comprehension scores for each ESM type, and Table 14 presents the multiple comparisons of ESM sentences based on the participants' accuracy of comprehension.

Table 13

*The means of the comprehension scores for each ESM type*

| | Mean | Std. Deviation |
|---|---|---|
| **PM** | 18.67 | 4.823 |
| **CONJ** | 15.68 | 3.114 |
| **COM** | 17.65 | 3.671 |
| **RP** | 15.42 | 2.832 |
| **DET** | 15.98 | 2.703 |
| **LB** | 11.40 | 3.193 |

Table 14

*Comparing the performance of the participants on different types of ESM sentences based on the comprehension accuracy*

| (I) TYPE | (J) TYPE | Mean Difference (I-J) | Std. Error | Sig.[b] | 95% Confidence Interval for Difference | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| PM | COMP | .389 | 1.020 | .000 | -1.582 | 3.465 |
| | CONJ | 8.124 | 1.255 | .001 | 3.621 | 11.089 |
| | DET | 6.474 | 1.003 | .003 | 2.423 | 7.445 |
| | RP | 6.450 | 1.089 | .004 | 2.189 | 8.912 |
| | LB | 1.943 | 1.202 | .000 | -1.662 | 4.452 |
| COMP | PM | -.462 | 1.020 | .002 | -2.464 | 2.571 |
| | CONJ | 7.130 | 1.097 | .018 | 4.834 | 10.818 |
| | DET | 4.078 | 1.082 | .009 | 1.394 | 8.214 |
| | RP | 3.155 | 1.892 | .017 | 2.100 | 7.143 |
| | LB | 1.857 | 1.709 | .000 | -2.078 | 3.315 |
| CONJ | PM | -7.344 | 1.255 | .007 | -12.078 | -4.621 |
| | COMP | -6.657 | 1.117 | .761 | -12.289 | -4.588 |

| (I) TYPE | (J) TYPE | Mean Difference (I-J) | Std. Error | Sig.[b] | 95% Confidence Interval for Difference | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| | DET | -2.887 | 1.185 | .524 | -6.402 | .629 |
| | RP | -2.767 | 1.113 | .198 | -4.056 | .560 |
| | LB | -6.750 | .923 | .006 | -9.676 | -3.824 |
| DET | PM | -5.454 | 1.003 | .003 | -8.427 | -2.456 |
| | COMP | -5.012 | 1.082 | .009 | -8.221 | -1.804 |
| | CONJ | 2.887 | 1.185 | .524 | -.627 | 6.402 |
| | RP | .146 | 1.038 | .031 | -2.456 | 3.242 |
| | LB | -3.863 | 1.137 | .010 | -7.235 | -.490 |
| RP | PM | -5.600 | 1.089 | .004 | -7.828 | -2.372 |
| | COMP | -5.158 | 1.010 | .017 | -6.159 | -2.164 |
| | CONJ | 2.742 | 1.113 | .198 | -.560 | 6.043 |
| | DET | -.146 | 1.038 | .031 | -3.224 | 2.912 |
| | LB | -4.008 | 1.023 | .001 | -7.197 | -.820 |
| LB | PM | -1.534 | 1.202 | .000 | -5.167 | 1.923 |
| | COMP | -1.150 | 1452 | .000 | -3.009 | 2.023 |
| | CONJ | 5.750 | .987 | .006 | 3.824 | 9.676 |
| | DET | 3.812 | 1.137 | .010 | .498 | 7.278 |
| | RP | 4.045 | 1.789 | .001 | .820 | 7.112 |

As Tables 12 and 14 suggest, the accuracy and the response time for comprehending sentences containing different ESM types, "punctuation marks," and "link breaks" were the most and the least helpful ESMs for EFL learners of different proficiency and age groups. In effect, "punctuation marks" helped the participants comprehend the ESM sentences in the shortest time spans and in the most accurate way, while "link breaks" brought about the maximum degree of challenge and ambiguity. Moreover, "determiners", "conjunctions," and "relative pronouns" functioned more or less identically since no statistically significant differences were found in the comprehension of the sentences which contain these ESMs types.

Finally, a multiple regression was utilized to check the contribution of each ESM type to comprehension tasks. According to Table 15, 81.5 percent of the participants' performance on ESM sentence comprehension tasks can be explained by the combination of different ESMs types, which alludes to a statistical significance (sig. =.000).

Table 15

*Regression model summary for ESMs*

| Model | R | R Square | Adjusted R Square | Std. The error of the Estimate |
|---|---|---|---|---|
| 1 | .903[a] | .815 | .810 | 38.396 |

As Table 15 depicts, all ESMs types can significantly predict sentence comprehension except for the "link breaks". In effect, among the ESMs, "relative pronouns" and "determiners" had the highest contribution, "punctuation marks", "conjunctions," and "complementizers" were in the next succession, while the "link breaks" had the least contribution of the ESMs to the comprehension tasks.

Table 16

*Coefficients of ESMs and their prediction index*

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | 661.207 | 61.154 | | 10.812 | .000 |
| TOTALTIMEESM-PM | 1.869 | .207 | .289 | 9.031 | .000 |
| TOTALTIMEESM-COMP | .916 | .225 | .123 | 4.071 | .000 |
| TOTALTIMEESM-CONJ | 1.453 | .186 | .266 | 7.798 | .000 |
| TOTALTIMEESM-DET | 1.973 | .200 | .309 | 9.860 | .000 |
| TOTALTIMEESM-RP | 1.871 | .200 | .312 | 9.332 | .000 |
| TOTALTIMEESM-LB | .449 | .225 | .053 | 1.976 | .487 |

## Discussion

The last decades have witnessed a great deal in the development of theories of human sentence processing. The intention of such research was to identify the architectures and mechanisms that underlie human comprehension (Townsend & Bever, 2001). The findings of this study implied that the comprehension of ESM sentences was significantly easier than the non-ESM ones based on both the participants' scores and the needed time for answering the comprehension questions. Moreover, the "proficiency level," unlike the "age" of the participants, was found to affect the comprehension of ESM sentences significantly; however, the difference between the advanced and Intermediate EFL learners was not statically significant. It was also found that different ESM types have various degrees of contribution to comprehension tasks, and they (except "link breaks")

can be regarded as significant predictors of the successful perception of English sentences.

This study attested to the idea that syntactic information is at the heart of successful language comprehension (Traxler & Tooley, 2007). By comparing the comprehension accuracy and the response-time of the English sentences with ESMs and their counterparts without ESMs, it was designated that this traditional view "the longer the sentences, the more mental challenge the comprehenders face" (Carroll, et al., 1998; Frazer, 1987) is not empirically attested; in better words, although ESMs make the sentences longer, they can help comprehenders pass safely through the comprehension maze. Indeed, not only can ESMs illuminate the comprehension path, but also they can predict faultless comprehension in line with what Kemp et al. (2017) explicated regarding the facilitative role of ESMs in language processing.

As the efficacy of ESMs in sentence processing and comprehension is attested in a variety of languages (Fayol et al., 2006; Sandra et al., 1999; Bosman, 2005; Sandra and Van Abbenyen, 2009; Betzel, 2015; Protopapas et al., 2013), it seems that the expediency of different ESMs types on comprehension tasks are not language-specific. In effect, all types of ESMs assist the parsing mechanism and function under the mind's general comprehension competence as the comprehension troubleshooters (Kemp et al., 2017). It is genuinely believed that to comprehend a sentence, the comprehension needs to create a syntactic structure. ESMs accelerate this process by reducing ambiguities and increasing the speed with which one can construct syntactic trees (Warren, 2013).

The findings of this study were in line with Christianson et al. (2001), who found "age" as a non-effective variable for sentence processing and comprehension and in contrast to Yoo and Dicky (2011), who concluded that "age" plays a role in the sentence comprehending speed and the accurate perception of ambiguous structures. Similarly, Engelhardt (2014) found "age" as a significant predictor of the reading time of sentences containing syntactic ambiguities via the eye-tracking technique.

What was found regarding the effect of "language proficiency level" on sentence comprehension confirms what Abbasian and Moeenian (2015) claimed. They found that the parsing strategies are somewhat associated with the participant's language proficiency levels. Furthermore, Pakulak and Neville (2011) referred to the effect of language proficiency in precise syntactic processing. Barahuyee, Khaghaninejad and Moloodi (2019) also documented the language proficiency effect on the comprehension and disambiguation of Garden-Path sentences. And Lany, Gómez, and Gerken (2007)

recommended that prior experience and language proficiency level are two variables that highly modify the complexity of the structures the learners need to learn and comprehend.

The results of this study are also in contrast to Siddharthan (2006), who suggested that syntax simplification and deletion of syntactic markers potentially increase the accuracy of a parser without declining its performance by transforming long, complex sentences into shorter and more easily processed ones. The findings also challenge what Xu and Grishman (2009) found. By comparing the comprehenders' performance to the performance of translation machines, they reported a decrease in comprehension accuracy by adding explicit syntactic markers to the sentences.

## Conclusion

Reading comprehension is defined as the ability to process a text, understand it, and integrate the meaning with what the reader already knows (Miao et al., 2019). Since syntactic complexity and processing time are among the variables affecting reading comprehension (Brown & Lee, 2015), this study attempted to investigate the challenges learners might face comprehending ESM and non-ESM sentences and favored the presence of ESMs as facilitators of comprehension. Hence, there is a pedagogic need to familiarize EFL learners with ESMs and also to develop instructional techniques for tackling them in different contexts, such as newspapers, books, magazines, and even online blogs. The findings may recommend that teachers consider the difficulty level of sentences and also the time that learners need to process sentences while instructing or taking tests.

Parpanchi (2014) believed that the "punctuation marks", "relative clauses", "reduced relative clauses", and "relative pronouns" should be better clarified through classroom instructions. One can possibly extend this view to the spoken language in which "intonation" and "stressing patterns" might act as punctuation marks of written language, the proper use of which might disambiguate a sentence. Consequently, the study's results can lead to some principal pedagogical implications and have significant suggestions for EFL teachers, as ESMs are abundant in both writing and speech. Instructors can help learners read the texts phrase by phrase and get familiar with ESM types, which connect the chunks of words and sentences to make comprehension easier and faster. Teaching how to utilize and comprehend ESMs can enhance retrieving the meaning of sentences and lead to faster and more accurate comprehension.

## Declaration

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