

Agreement Attraction Errors among Saudi Non-Native English Speakers

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Abstract

Agreement attraction errors are one of the errors that language users make, and psycholinguists examine as a window into how language processing functions. Agreement attraction errors arise if a sentence has a complex noun phrase with the main noun acting as the controller of agreement and a local noun acting as the attractor for agreement. Earlier research has shown that phrases tend to have more agreement errors than clauses among native speakers of English. This study investigated whether agreement attraction errors are more in phrases than clauses among non-native English speakers with varying proficiency levels from Saudi Arabia, as little has been done on non-native speakers of English. The study used a forced-choice task by instructing the participants to select either singular or plural verbs for each complex noun phrase that was displayed. The quantity and quality of their agreement errors—whether in prepositional phrases or relative clauses—were examined in the study. Furthermore, it contrasted reaction time for items with prepositional phrases to items with relative clauses. Proficiency level was also reviewed to determine how it affected agreement attraction errors. No statistically significant difference was found between the two types, but processing items with prepositional phrases took longer than processing items with relative clauses. Despite past research suggesting that agreement errors are more common in phrases than clauses, the current study did not find this difference to be of significance. The complexity of both sorts of errors is equal among the sample, and proficiency proved to be irrelevant.

Keywords: agreement, attraction, errors, proficiency, production, reaction time, Saudi non-native speakers

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Introduction

Language users' errors can provide a window into understanding how language processing works and agreement attraction errors are a particular type of these errors. Attraction errors occur when a sentence has a complex noun phrase consisting of the main noun, also known as the head or controller, and a local noun, also known as, the attractor (Patson & Husband, 2016). The phrase "the key to the cabinets" contains a head, "key," and a local noun, "cabinets." This local noun attracts agreement and leads language users to produce a plural verb "are" erroneously instead of "is."

Research on agreement attraction errors has extensively investigated these errors among native speakers (Christianson, 2015; Franck, Vigliocco, & Nicol, 2002; Hammerly, Staub, & Dillon, 2019; Franck & Wagers, 2020; Lago & Felser, 2018; Parker & An, 2018; Wagers, Lau, & Phillips, 2009). This research attempted to investigate the types of agreement errors that native speakers are sensitive and insensitive to in both comprehension and production. Little research has been done on non-native English speakers (Chen, Shu, Youyi, & Jingjing, 2007; Christianson, 2015; Lago & Felser, 2018), and up to the researcher's knowledge, none has been done on Arabic non-native English speakers. A growing body of research on agreement errors has been done on L2 learners with different L1 backgrounds, such as German (Lago & Felser, 2018), Swedish (Jackson, Morner, & Brehm 2018), Korean (Kwon & Sturt, 2016), and French (Franck et al., 2002). However, up to the researcher's knowledge, none has been done on Saudi non-native English speakers. The goal of this study, thus, is to add to this line of inquiry by examining the agreement attraction errors among Saudi non-native English speakers. It also investigates the quantity and quality of these errors and sheds some light on proficiency level as a crucial factor for interpreting the findings. The study aims to answer the following research questions:

1. What is the difference in processing time between prepositional phrases and relative clauses?
2. How many agreement attraction errors exist in prepositional phrases compared to relative clauses among Saudi L2 English learners?
3. What is the effect of proficiency, if any, on the quantity and quality of agreement errors among Saudi L2 English learners?

Literature Review

Theoretical Understandings

Research has examined whether non-native speakers show the exact developmental stages that native speakers go through while acquiring English. To illustrate, a U-shaped development is traced among learners where, in the first stages of acquiring English, for example, they use the irregular past tense correctly, then they go through a phase of consistent distorted performance due to overgeneralizing the regular past tense rule, and eventually reform it again (Bybee & Slobin, 1982). Siegler, Strauss, & Levin (1981) and Siegler (1983; 2004) argued for the same developmental stages concerning different morphological units. In cognitive psychology, Ervin and Miller (1963) also indicated a U-shaped development regarding comprehension skills where the early stages of comprehension are characterized by the correct integration of different skills.

Research has also examined whether adult L2 learners can develop a nativelike ability to recognize morphological errors during online tasks. Some research has found that L2 learners are less sensitive to agreement errors than native speakers (e.g., Jiang, 2006; Keating, 2009; Sato & Felser, 2007), whereas others have argued that non-native processing is not qualitatively different from native processing (e.g., Foote, 2011; Hopp, 2006; Jackson, 2008; Sagarra&

Herschensohn, 2010; Tokowicz & Warren, 2010). Regarding agreement attraction errors, scholars have defined and conducted some studies to understand the nature and the reason behind these errors. Attraction is also known as proximity concord, and it has been defined by Quirk et al. (1985) as “agreement of the verb with a closely preceding NP in preference to an agreement with the head of the NP that functions as a subject” (p. 757). This definition suggests that attraction results simply from the linear occurrence of an NP between the head noun and the verb and is not sensitive to syntactic structures. This line of research has shown how the linear distance between the head noun and the verb can cause agreement errors. The *linear distance hypothesis* proposes that constituents between the head noun and the verb are linearly organized, and keeping track of the head noun can be difficult and lead to more agreement errors because of the occurrence of these linear items (Franck et al., 2002).

A closer account of the *linear distance hypothesis* is the working memory that attempted to explain the source of these errors (Cunnings, 2017). Remembering the controller or the head noun becomes challenging when more items are integrated. In this respect, native and non-native speakers cannot access the controller anymore as they cannot remember it, and this phenomenon occurs during cue-based retrieval (Badecker & Kuminiak, 2007).

However, an exciting challenge can be put forth against the *linear distance hypothesis* and working memory by using Bock and Cutting's (1992) fundamental study. The authors found that agreement errors in comprehension among native English speakers were more associated with prepositional phrases than relative clauses. The claim was that native speakers made more agreement errors in “the editor of the history books” than in “the editor who rejected the history books.” These examples can challenge the *linear distance hypothesis* because the number of items in the phrase with the relative clause is more complex. They should attract more agreement errors than those in the prepositional phrase. Native speakers seemed to perceive agreement correctly with the relative clause. Examples, as such, can also contradict the working memory proposal because the presence of a relative clause is supposed to demand more activities by the brain. Bock and Cutting (1992) argued that there is an organization of a “clause packaging” where local nouns with mismatching number agreements interfere and cause errors if they are linearly or simultaneously coded in the same clause, such as the case of the sentence with the prepositional phrase above. Local nouns in relative clauses should not pose problems because they are encoded in a different clause than that of the controller or the head noun. This view, also known as, the *clause packaging hypothesis*, is referred to by Franck et al. (2002). Processing of language production syntactically takes place in two steps following this perspective. First, it assumes relating grammatical characteristics to abstract lexical items, and the second involves organizing them in left-to-right order. Scholars think that agreement takes place first. Attractors or local nouns in relative clauses should not attract errors as they are processed in different stages. “Babies” is supposed to attract agreement errors in the sentence “The claim (that wolves were stealing babies) was rejected” (Franck et al., 2002, p. 375). However, it did not do so because it is positioned in a different clause than the phrase “the claim was rejected.”

Previous Research on Agreement Attraction Errors

Bock and Cutting (1992) differentiated between two records for the interaction of agreement errors similar to the two hypotheses mentioned above. The sequential record is designed after an augmented transition network model of the parsing of irregular conditions. It proposes that the controller is held in working memory until the point in the string at which an attractor shows

up. The second theory, advanced from a hierarchical model of language production, predicts that controllers and attractors within the same clause are concurrently specified. Using a methodology to elicit verb agreement errors in speech among native English speakers, the researcher found that agreement errors were more common after phrases than clauses that isolated the head word from its attractor. The researchers also used the experiment to check agreement comprehension errors, and they found that longer phrases attracted more errors, whereas longer clauses did not produce such errors.

Franck et al. (2002) compared agreement attraction errors in English and French using a forced-choice task for sentence production. The syntactic structure of the errors was explained using two accounts: the local noun's distance to the verb in the linearized sentence (linear distance hypothesis) and the processing simultaneity of the head and local nouns in the same clause (clause packaging hypothesis). Using items with double modifiers next to the controller, the study reported that intermediate modifiers attracted more errors than preverbal modifiers, contrary to both accounts. The study was concluded by suggesting that the syntactic distance between the interfering noun and the head noun at a stage where encoding grammatical features in syntactic units are organized in hierarchical structures determines attraction.

Lago and Felser (2018) examined attraction errors among native German speakers and Russian learners of German. In this respect, the study examined working memory among native and non-native speakers. Two hypotheses on whether grammatical distance to the subject resulted in more errors than linear distance to the verb were tested using a production forced-choice task. Two types of modifiers were presented to differentiate between linear and grammatical distance: embedded and coordinated constituents. The results showed that native and proficient German speakers exhibited similar attraction errors where embedded phrases resulted in more errors than coordinated constructions.

Similarly, Patson and Husband (2016) used a forced-choice task among native English speakers to examine agreement attraction errors in comprehension. They noticed that, although mismatches in number between head nouns and local nouns lead to more agreement errors, these errors can be reduced when the local noun phrase has a plural feature. They concluded that the comprehenders' interpretations of sentences are usually inaccurate to the linguistic input in complex noun phrases.

Using a different approach, Chen et al. (2007) examined the Event-Related Potential (ERP) responses of a subject-verb agreement by tracking the participants' eye movement. The performance of Chinese non-native and native English speakers was compared. In the processing of syntax, the findings revealed that late second language learners show distinct ERP responses from native speakers when syntactic characteristics are lacking in their first language. However, their patterns of behavior are close to those of native speakers. The conclusion supported the claim that language-specific experiences with the first language influence the neural processing structure in the second language.

The literature survey showed little had been done on the agreement errors of non-native English speakers, mainly Arabic English learners and specifically Saudi non-native speakers of English. This paper examines agreement errors among Saudi non-native English speakers to investigate whether local nouns in prepositional phrases attract more agreement errors than local nouns in relative clauses. Some have examined it in the literature using the sequential record and the hierarchical model (Bock & Cutting, 1992). Others have explored it using the same understandings but with different terminologies, such as the *linear distance hypothesis* and the

clause packaging hypothesis (Franck et al., 2002). The current study uses the latter's orientations to define agreement errors throughout the analysis as it is more updated than the former approach. It examines the quality (whether errors occur more in prepositional phrases or relative clauses) and the quantity of these agreement attraction errors. It also incorporates the language proficiency of the participants to interpret the results. The study adopts a psycholinguistic production experiment similar to that in Lago and Felser (2018), where the participants are provided with the items in a forced-choice task and are asked to choose either singular verb (is), or plural verb (are) to complete the items. In this respect, their production skills are assessed without articulating the verb, as sound software cannot sometimes be trusted.

Method

This section describes the method used in the study to collect data. This study uses an online psycholinguistic experiment (see the procedure below for more information) that collects reaction time from the participants for two reasons. First, the participants were enrolled in a virtual class, so using an online experiment suits them better than asking them to come to campus. Second, online psycholinguistic experiments have proved to be more reliable than paper and pencil exams because they measure and interpret how and where processing difficulty takes place by collecting time spent regressing on an element.

Participants

Participation in this study was based on voluntary sampling. Voluntary sampling was used to ensure valid and reliable conclusions since only those interested in the study could participate, and those not interested did not have to join the study. The researcher sent the study's link to all second-level female students in the Department of English Language and Literature at King Saud University in 2022. The researcher chose second-level students for two reasons: their proficiency results from the common year, a semester they took before enrolling in their preferred majors, can be used in the study, and their answers were based on their English knowledge and not a result of explicit instruction because there is a lesson on complex noun phrases in the Course ENG 106 that second-level students are supposed to take during the final weeks of the semester.

Overall, 59 students participated in the study. The researcher excluded one participant because she reported that Arabic is not her native language. They spoke Arabic as their first language and English as a second language. The average age of the participants was from 19 to 20. Regarding the years of learning English, 23 participants have been learning English for more than nine years, 17 participants for four years, 9 participants for five years, and 9 participants for six years. Proficiency levels ranged from A to C. It was mentioned in the curriculum framework description of the common year that proficiency levels are assessed using the Common European Framework of Reference. Thus, level A represents the beginner level, referred to as A1. On the other hand, B means elementary, referred to as A2, and C is for intermediate, referred to as B1. Ten participants reported being in level A, 26 in level B, and 22 in level C.

Research Instruments

The current study uses a forced-choice task similar to that of Lago and Felser (2018), where participants are provided with complex noun phrases on a screen, and the researcher asks them to choose between "is" or "are." For the exact noun phrases in each item, 32 sentence preambles were adapted from Bock and Cutting (1992) to examine the difference between prepositional phrases

and relative clauses in attracting agreement errors. Further measures needed to be taken when adapting their stimuli since the researcher administered their study on native speakers; this is to ensure that the participants in this study understood all the vocabulary used in the preambles and that any wrong answer is not provided because of ill-understanding. The researcher checked all the vocabulary in the preambles in the Cambridge English Vocabulary List, which provides the common words appropriate to the beginner, elementary, and intermediate levels of the Common European Framework of Reference. These are the levels expected of the participants based on their proficiency levels.

Every preamble consisted of a complex subject phrase containing two noun phrases. One was the head or controller (the first noun phrase), and the other was the local or attractor (the second noun phrase). The attractor was part of a prepositional phrase constituent or a relative clause, which functioned as a postmodifier for the controller. The controller was always singular, and the attractor was always plural to allow for a deeper analysis of the phenomenon (Bock & Cutting, 1992; Franck et al., 2002). Two conditions were represented for each noun phrase with the controller: one with a prepositional phrase postmodifier and the other with a relative clause postmodifier, as shown in the examples below:

1. The booklet from the British government agencies
2. The booklet that described the government agencies

In this respect, extra validity measures are considered. This will directly examine whether prepositional phrases attract more agreement errors than relative clauses while holding other factors constant, such as using the same head noun, the same number of syllables, and the same stress patterns. It is essential to note that items with the exact controller noun phrase were not consecutively presented. Items with different controller noun phrases separated this sequence because giving the same item with different conditions (i.e., one for prepositional phrases and the other for relative clauses) can affect the reliability of the data. It will seem like the participants are allowed to revise the controller noun phrase. The examples below further illustrate this point.

1. The confession of the famous television interviewer
2. The advisor who directed the students
3. Filler
4. The advisor for the chemistry students
5. The confession that involved the television interviewers
6. Filler

The researcher also used fillers to distract the participants from the study's objective, which is a testing agreement in complex noun phrases, as it was essential to judge how they process language instantly, resembling a real-life situation. That is not where they thoroughly think of the correct answer. The researcher prepared the distractors, and they tested the participants' knowledge of count and noncount nouns. A distractor was used between every two consecutive preambles.

Research Procedures

The researcher built the experiment using *Gorilla*, a free, online experiment builder that collects accurate reaction times. The participants can take the experiment without being present in a language lab with this online tool. The researcher did a pilot trial of the experiment to make sure that everything looked on the screen as expected. The experiment consisted of three parts. In the first part, the participants' informed consent was obtained, and some facts about the study were presented. If the participant agreed to take the study, the participant would proceed to the next part, asking for general demographic information

to understand the sample better. The third and last part was the main experiment, and the researcher presented a forced-choice task to the students. Only one sentence preamble was shown on the screen, and the participant was asked to choose between the singular verb “is” in the bottom left of the screen or the plural verb “are” in the bottom right for each preamble. Once the participant selected the answer, the participant would proceed to the next; the participant could not return to a previous item. The singular verb “is” was always the correct answer since all controllers were singular. For every preamble, the participants were given 60 seconds with a countdown icon to show the time left to decide. The researcher sent the link for the experiments in week six of the academic year 2022 to the participants in the chat section during the first 20 minutes of their virtual ENG 106 class. The participants were asked to click on the link and answer the questions during class time to ensure that students took the experiments seriously. The researcher assured the students that their answers would be used for research purposes and would not affect their achievement in the course. The researcher then statistically analyzed the responses using R, a software for data analysis.

Results

This section aims to answer the three research questions related to the reaction time of processing prepositional phrases and relative clauses, the number of errors by type, and the effect of proficiency level on the quantity and the quality of errors identified earlier.

Reaction Time in Prepositional Phrases and Relative Clauses

This section reports the average reaction time in milliseconds (ms) needed for answering items with prepositional phrases and relative clauses, as shown in Table One. Items with prepositional phrases require slightly more time than relative clauses because the average for prepositional phrases is marginally higher than relative clauses, accounting for 7251 and 7020 ms, respectively.

Table 1. Average reaction time in prepositional phrases and relative clause

Item Quality	Mean Reaction Time	SD
Prepositional phrases items	7252	27932
Relative clauses items	7020	27716

Performing a statistical test of the difference between types, like a paired sample t-test, is not possible since the Standard Deviation (SD) of both types is very close to each other. It can be concluded that, while prepositional phrase items take slightly more time, the difference between prepositional phrase and relative clause items is not statistically significant. Processing both types is similar concerning difficulty among the participants of Saudi non-native English speakers. Figure 1 below further illustrates the mean reaction time taken for each item.

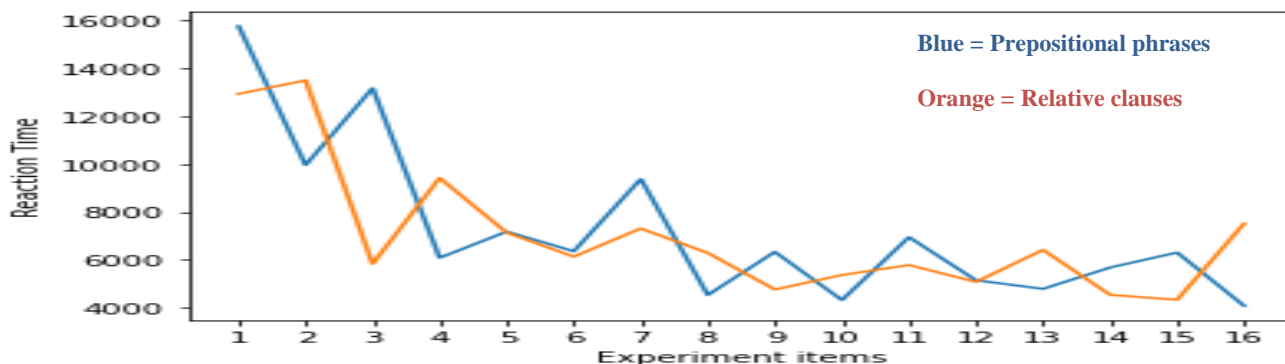


Figure 1. Reaction time for every item by error type

The figure further proves that prepositional phrase items take longer comparable to relative clause items. Prepositional phrase items ranged from almost 16000 to 4000 ms, whereas relative clause items ranged from 13000 to 4000 ms. It is also clear that the participants took more time at the beginning than at the end. Some items took more time than others. The results indicated that they consisted of more words than the items that took less time for both categories of prepositional phrases and relative clauses. For instance, “the confession of the famous television interview” and “the confession that involved the television interviewers” consisted of more words than the other items because the attractor “interviewers” is further modified by another noun, “television.” This might be more complex to process than a preamble with a simple attractor, such as “the picture that embarrassed the politicians.” Thus, while processing prepositional phrases consumes more time, the attractor nature (whether simple or complex) also results in more time to process. Table two below presents examples of simple and complex attractors.

Table 2. *Examples of simple and complex attractors*

Simple Attractor	Complex Attractor
1. The consultant for the growing firms	3. The bright light in Doctor Smith’s examination rooms
2. The consultant who advised the firms	4. The bright light that lit the small examination rooms

Number of Errors in Prepositional Phrases and Relative Clauses

Table three below shows the numbers and percentages of errors among the participants by their quality and quantity, either in prepositional phrases or relative clauses. Both errors frequently occurred in the experiment, but prepositional phrase errors were slightly higher. 36% of errors were identified for prepositional phrases, accounting for 337 items, and 33% of errors were assigned for relative clauses, accounting for 312 items.

Table 3. *Quantity of errors in prepositional phrases and relative clauses*

Error Type	Number of Errors	%
Errors in prepositional phrases	337	36
Errors in relative clauses	312	34
Correct guesses	280	30
Total	929	100

It is clear that the number of errors in both categories is very close to each other, so both relative clauses and prepositional phrases can be considered within the same level of difficulty. Thus, both types of errors were equally frequent in the experiment. Figure two illustrates that the means are very close to each other: 5.8 for prepositional phrases and 5.3 for relative clauses. This also further proves that processing both prepositional phrases and relative clauses is very close to each other among the participants.

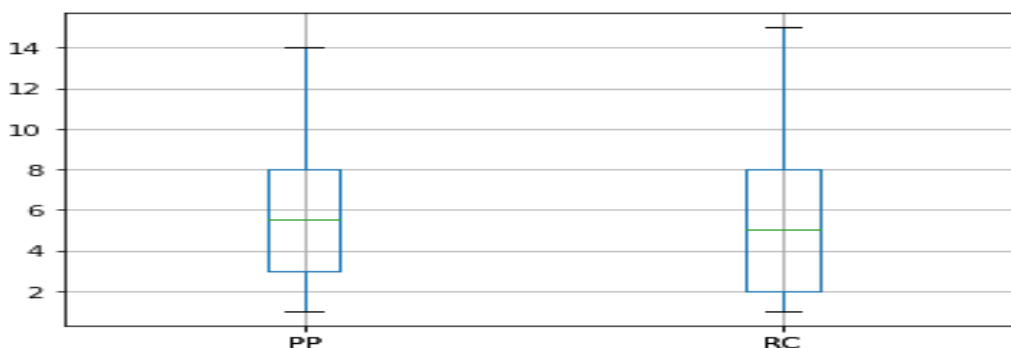


Figure 2. Means of errors by type

Proficiency Level by Error Quantity and Quality

Table four below presents the number of errors and their types by proficiency level. The researcher traced a U-shaped trend by comparing the quantity and the quality of errors by proficiency level. Indeed, level A participants seem to have the least number of errors for both prepositional phrases and relative clauses. Group B, on the other hand, seems to have the highest number of errors for both types, but this number decreases with group C. In other words, a U-shaped trend for agreement attraction errors is identified among the participants who are Saudi non-native English speakers. Beginners start to grasp the concept of agreement and use it; then, as they develop to elementary, it becomes distorted. Later, they begin again to learn how to manipulate it as they advance to the intermediate level. Table four also shows that the number of errors in prepositional phrases is higher among the A and B groups but lower among the C group. However, the difference is significant since both types for each proficiency level are very close, if not similar.

Table 4. *Quantity and type of errors by proficiency level*

Proficiency level	A (Beginner)	B (Elementary)	C (Intermediate)
Errors in prepositional phrases	51m (3.7)	170m (5.9)	116m (5.4)
Errors in relative clauses	37m (4.8)	155m (5.9)	120m (5.1)
Total of errors	88m (8.8)	325m (12.5)	236m (10.7)
Number of participants	10	26	22

A further step was to calculate the frequency of errors to ensure that the difference in the number of errors was valid and not only a result of the difference in the number of participants in each proficiency group. Figure 3 below illustrates the frequency of errors expected for every 10 participants for each proficiency group. The frequency count also proves that A-level participants have the most minor agreement errors (88 errors). Group B has the highest frequency of errors (125 errors). The frequency of errors in Group C is between Groups A and B (115 errors).

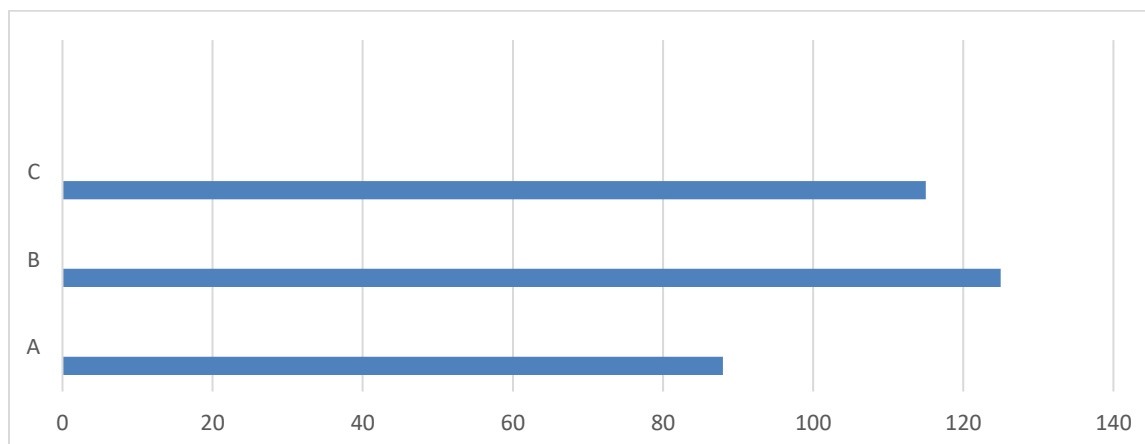


Figure 3. Error frequency by proficiency level

The researcher used a two-way ANOVA to examine further the statistical difference between proficiency groups concerning the two types of errors, as shown in Table five below.

Table 5. Two-Way ANOVA for statistical difference

	DF	Sum Sq	Mean Sq	F-Value	P-Value
Proficiency	2	53.2	26.613	2.034	0.136
Error type	1	5.4	5.388	0.412	0.522
Residuals	112	1465.3	13.083		

The table above suggests that no statistical relationship exists between proficiency level and error type among the participants of the current study since the P-value > 0.05 for both factors and the F-value < 3 . To further test the null hypothesis, *Tukey multiple comparisons of means* were also used to test whether any statistical difference exists between the proficiency groups and the error types and the relationship between them.

Table 6. Tukey multiple comparisons of means

	DF	Sum Sq	Mean Sq	F-Value	P-Value
Proficiency	2	53.2	26.613	2.034	0.136
Error type	1	5.4	5.388	0.412	0.522
Proficiency by error	2	9.1	4.551	0.344	0.710

As with the *two-way ANOVA* test, the *Tukey* test also proves the null hypothesis, where no statistical difference exists between the proficiency group or the error types. The *Tukey* test likewise does not show a relationship between proficiency groups and error types. As shown in Table six, the P values are 0.136 for proficiency, 0.522 for error type, and 0.710 for the relation between the two factors, and they are all > 0.05 . It can be suggested that they are within the same difficulty level among the participants since no statistical difference existed between the two types of errors.

Discussion

This section aims to answer and discuss the three research questions raised earlier by supporting the arguments from previous literature. The subsections are arranged according to the research questions. Each subsection below relates to a research question.

Reaction Time

The current study suggests that items with prepositional phrases consume more time than items with relative clauses. In other words, processing embedded phrases consume more time among the participants of Saudi non-native English speakers than packed clauses. Additionally, this study is consistent with Fine, Jaeger, Farmer, and Qian's (2013) proposal that participants speed up as they become accustomed to the experiment's nature and objective. If they slow down, it might be because the experiment became confusing to them. The participants in the current study took more time initially, but after a while, they started to speed up. The items that took longer had complex attractors (i.e., the attractor had a noun modifying it). This suggests that participants might have been confused and needed more time to judge whether the agreement should fall on the controller, the attractor, or the noun modifying the attractor. This could lend support to the *linear distance hypothesis* and the working memory proposal and is consistent with the previous suggestion that, as more items are being embedded in the sentence, participants are confused about the noun that should control the agreement. Increasing the length of the postmodifier could limit the capacity of the memory to access the controller of the agreement. It can be argued that processing agreements draw on the memory's ability to hold information regardless of its quality, whether prepositional phrases or relative clauses. In other words, maximizing the number of items between the head noun and the attractor results in more time to process both relative clauses and prepositional phrases. Therefore, it can also be argued that the complexity and the length of postmodifiers cost more time to process agreements. While Bock and Cutting (1992) suggested that prepositional phrases attracted more agreement errors than relative clauses, the current research indicates that the length and complexity of the attractor, whether in prepositional phrases or relative clauses, consumes more time in processing.

Quantity and Quality of Errors

Both types of errors frequently and almost equally occurred in the current study. Bock and Cutting (1992) and Franck et al. (2002) suggested that clause attractors yield fewer agreement errors than phrase attractors among native and non-native speakers. However, the present study found that both errors were similar in attracting agreement errors. This unexpected finding could be explained by the proficiency level of the participants of the present study. While the participants were assigned different groups based on their proficiency levels (A for beginners, B for elementary, and C for intermediate), they were not considered to be far away from each other. As mentioned, these three levels translate to A1, A2, and B1 in the Common European Framework of Reference. Thus, no statistical difference was identified among the groups. The proficiency levels of the participants could also explain both the reason why prepositional phrases and relative clauses attracted a similar number of agreement errors and the high number of errors in the experiment. Almost two-thirds of the items were identified as errors in agreement compared to the number of correct guesses, regardless of the nature of the attractor.

Another probable reason for the high number of errors could be the local nouns always being plural and the head nouns always being singular in the current experiment. This variation in the plurality of the head noun and the attractor, where the head noun is singular, and the attractor is plural, and not the other way around, produced asymmetry and yielded an impressive number of agreement errors. This finding is consistent with earlier studies (Bock & Cutting 1992; Bock & Miller, 1991) that suggested that singular head nouns and plural local nouns attract more agreement errors than plural controllers and singular local nouns. Such a conclusion remains preliminary for

the present study since it did not test the other condition of plural controllers and singular local nouns.

The current research proposes a challenge to the *clause packaging hypothesis*. Research on the *clause packaging hypothesis* stated that agreement attraction errors are more frequent if local nouns are posited in the clause. On the other hand, it is expected to be less if the same is positioned in another clause (Bock & Cutting, 1992; Lago & Felser, 2018). Contrary to such a proposition, the present study found that both embedded phrases and packed clauses attracted a similar number of agreement errors. This unexpected finding could be explained by the proficiency level of the participants of the current study. Since the participants of the present study were beginners to intermediate non-native English speakers, they could not have seen the boundaries of each clause yet. The subjects in Bock and Cutting's (1992) study were native speakers who were intuitive to see the boundaries of each clause. Thus, attractors in embedded phrases and packed clauses hold the same confusing position. The fact that the statistical test showed no difference between the errors in prepositional phrases and relative clauses supports the finding further, although this conclusion is still preliminary.

In this respect, the present study supports the *linear distance hypothesis*. The participants who were Saudi non-native English speakers could not hold information among the multiple layers of encoding regardless of whether this encoding occurred in different phrases or clauses. The occurrence of items between the head and the verb made it more challenging to identify the head that should hold the agreement. Thus, it led to more errors. Additionally, the participants could not access the head as they moved to read the following items, although the current study presented the items sentence by sentence on the screen rather than word by word or phrase by phrase. The occurrence of more items consumed more time to process and resulted in more agreement errors because the participants probably could not remember the controller for the agreement. Consequently, the present study supports the working memory proposal because packing longer items, whether in phrases or clauses, demanded more activities by the brain and resulted in more agreement errors. This is because the participants could not remember the head noun anymore.

Implications for a U-shape figure for Agreement Errors Development

The current study identified a U-shape figure for agreement error development. Beginner participants seemed to perceive agreement initially; then, such ability disappeared as they advanced to elementary. Nevertheless, it reemerged among the intermediate participants. The U-shaped development can still show that an evolvement for processing language is taking place. However, it cannot explain the exact nature of the underlying process of language (Siegler, 2004). Siegler et al., (1981) and Siegler (1983) argued that the first stages of accurate performance are based on a lack of knowledge, followed by consistent incorrect performances due to incomplete knowledge. Later, proper performances are traced based on advanced knowledge and experience. Bybee and Slobin (1982) argued that children's first stages of correct performances of the English irregular past tense are based on a lack of knowledge of the rules. It is then followed by a period of overgeneralization in performance because of their incomplete understanding of the rules to be reformed again in later stages. Research on U-shape development has proven to exist in cognitive psychology, such as motor skills development and language-related functions. For instance, Ervin and Miller (1963) suggested that a U-shaped development exists concerning comprehension skills, where the first stages are characterized by the reintegration of different skills and subsystems. It is then followed by a stage of disorganization before they can pick up the abilities again. Such

development can be traced in the present study, where beginners seemed to perceive and hold the head noun that should control the agreement while reading the other items. Then this performance became distorted and disorganized at the elementary level and was later reformed again among those at the intermediate level. It is still too early to suggest the existence of such development in agreement attraction errors, although such development was identified in the present study. Future research can investigate this further by analyzing the development of individual cases in a longitudinal framework to gain a better insight into the nature of the U-shaped development in agreement attraction errors.

Conclusion

This study analyzed the agreement attraction errors produced by Saudi non-native speakers of English. The researcher asked the participants to choose either singular or plural verbs for each presented complex noun phrase in a forced-choice task. Their agreement errors were analyzed regarding their quality, whether in prepositional phrases or relative clauses, and quantity. Additionally, the reaction time needed for the items with prepositional phrases was compared with relative clauses. The researcher likewise analyzed the proficiency level to see its effect on agreement attraction errors. While previous studies argued that agreement errors are higher in phrases than clauses, the present research indicated no such difference among the participants of Saudi non-native English speakers. Both types of errors possess the same level of difficulty. The current study did not aim for generalization. It aimed at providing an in-depth analysis of a phenomenon among Saudi non-native English speakers and addressing a literature gap because no such study has been done in the Saudi context. The fact that the present research ended with challenging findings to the ones found among native and non-native English speakers around the world further proves the lack of this specific topic in the literature done on Saudi non-native English speakers. Future research is needed to see whether the native Arabic could affect agreement attraction errors in English as a second language.

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