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Selective Impairment in Verb Inflection: Evidence from Persian Agrammatism

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ABSTRACT
Impaired morpho-syntactic production is the hallmark of agrammatic aphasia. It has been shown across several languages that verb inflection is difficult for agrammatic aphasic speakers. Many studies have indicated that this deficit is selective. Agreement is relatively preserved, while tense is severely impaired. The present work is based on the Interpretable Features' Impairment Hypothesis (Fyndanis, 2012) which believes that categories with uninterpretable features (e.g. Agr.) are better preserved than categories with interpretable features (e.g. Tense & Aspect). It is argued that the increased processing demands of Tense and Aspect, which carry interpretable features, render them more vulnerable compared to Agreement which bears an uninterpretable feature and is a local, strictly grammatical operation. A sentence completion task tapping subject-verb agreement and tense and a picture description task were administered to two native speakers of Persian with agrammatic aphasia. The patients were classified as Broca's aphasics according to the Persian aphasia test, their MRI reports, and CT scans. They were asked to participate in a battery of tests designed to assess their abilities in the production of inflectional morphology. Results showed that all the agrammatic speakers performed as hypothesized. Overall, the tense was significantly more impaired than agreement.

Keywords: Agrammatism; Agreement; Interpretable Features' Impairment Hypothesis; Tense

INTRODUCTION

Agrammatism is a type of language disorder that occurs mainly because of damage to Broca's area which is located in the left hemisphere. However, research on agrammatism has shown that the nature of language disorder is systematic and interpretable. Agrammatic production is commonly described as the omission or replacement of grammatical morphemes and the lack of complexity of sentence structure. According to Abu Saeedi et al. (2016), these patients produce short sentences, consisting of nouns, important and frequent verbs, and adjectives, which lack conjunctions, prepositions, and other grammatical words, and therefore this is referred to as agrammatic speech. As Friedman and Grodzinsky (1997) stated, in the past, agrammatism was thought of as a kind of language disorder involving all functional morphemes in the same way; however, this is not the case.

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In fact, inflectional elements which are a special kind of functional element, are not impaired to the same extent in this syndrome. This results from a selective disorder. According to Qorchi & Bouchara (2017), some syntactic elements such as Agreement inflection, remain relatively intact; however, other factors such as Tense inflection are not equally impaired in different languages and patients with the same lesion. In another study, Roberts (2017) stated that in languages with different morphological structures (such as Arabic, Hebrew, German, and Korean), the Tense marker is more vulnerable than the subject-verb Agreement. Compared to healthy individuals, as Gavarro (2002) states, finite clauses are much less common in agrammatic patients, which is due to the less variety of finite lexical verbs.

Faroqi-Shah and Friedmann (2015) believed that often in all languages, including English, Hebrew, and German, the problem of sentence production in agrammatism is described with the problem of producing specific kinds of morpho-syntactic structures like a tense marker, in comparison with other structures such as agreement marker and voice, however, this is not the case in Spanish, Dutch, and Greek. Interlanguage data show that the problem of tense production occurs even when the morphological complexity of the verb, such as affixation and other free grammatical morphemes, is considered constant.

Salehnejad (2017) writes: "the variations in agrammatism hold two aspects: first, a group of agrammatic patients who have disorders that show different structural descriptions; second, patients who differ in the extent of their errors". Friedman and Grodzinsky (1997) argue that the second aspect is neither associated with diagnostic issues nor with theoretical aspects; however, the first aspect is extremely significant for language-brain relation theories.

As Fyndanis et al. (2012) state, several hypotheses have been proposed to account for the operational patterns observed in agrammatic patients, all of which were based on structural descriptions of patients with agrammatic speech; for example, Friedman and Grodzinsky (1997) proposed the Tree Pruning Hypothesis (TPH) within the framework of Chomsky's Generative Grammar (1981, 1995, 2000, 2001) and Government and Binding Theory (1981), adapted from Pollock (1989)'s split inflection (SI) hypothesis. They believe that Inflection (I) is not a separate and independent node; it is divided into separate structures, namely "TP" and "AgrP". The TPH is based on Pollack (1989)'s claim that in all languages, the TP is located higher than AgrP and agrammatism is the result of the pruning of the syntactic tree in node T, which makes all top nodes, such as complementizer (C), inaccessible; however, all projections below T, such as Agr, remain intact. Furthermore, as Faroqi-shah (2015) states, most interlanguage evidence shows that functional categories disorders do not always follow the morphosyntactic hierarchy patterns. Some recent studies which are based on the latest generative grammar versions such as Chomsky's Minimalist Program (1995, 2000, 2001) show that theoretical accounts based on the hierarchical nature of functional categories such as TPH cannot account for the data observed in all agrammatic patients; e.g., Nanousi et al. (2006) and Varlokosta et al. (2006) have shown that Asp, which is located lower than T and Agr in the Greek tree diagram, is more impaired in Greek agrammatism

According to TPH, the agrammatic severity is a function of the impaired or shortened position in the tree diagram; whenever a node is impaired, its upper nodes are affected, and its lower nodes remain intact. However, Stemmer & Whitaker (2008) argue that TPH is problematic because the theoretical linguists do not agree upon the exact order of inflectional nodes. In the same tense, this hypothesis requires a special order of nodes for a proper data agreement. Additionally, Stemmer & Whitaker claim that neuropsychological data show that the Tense node is more vulnerable in many languages than the Agreement node, regardless of the order in which the nodes are arranged. For example, in German, the Agreement node is located higher than the Tense node in the tree; but in a study of German agrammatism by Wenzlaff & Clahsen (2004), the Tense was more impaired than the

subject-verb Agreement in the sentence completion test and grammaticality judgment as well.

This paper aims to study the selective impairment of verb inflection (Tense and tense) in Persian agrammatic patients; given the degree of vulnerability of these features, within the framework of the interpretable features' impairment hypothesis proposed by Fynandis et al. In this descriptive-analytical study, we seek to answer the question of whether in Persian agrammatic patients all the functional elements are equally impaired or whether their vulnerability is different from each other; and what is the difference between the uninterpretable features of the verb such as person and number (tense) and the interpretable features such as tense and voice? The hypothesis is that the tense element is more vulnerable than other functional elements and the more requirement to process the tense as an interpretable feature makes it more vulnerable than tense as an uninterpretable feature. For this purpose, two Persian-speaking agrammatic patients with non-fluent aphasia and brain damage were studied. Based on the above hypothesis, the linguistic corpus, i.e. their speech samples, are evaluated in two tests, sentence completion and picture description tasks. Moreover, the paper benefits from descriptive and analytical measurement as a statistical method.

Research Background

For many years, the impaired production of functional elements in agrammatic patients has been proven. For example, in a study of agrammatic patients, Badecker & Caramazza (1986) concluded that they exhibit different characteristics. However, they found that the disordered pattern was not similar in Italian and English-speaking agrammatic patients. Upon further investigation, the researchers concluded that these variations could be divided into three categories:

I. Interlanguage diversity is related to the structural differences in different languages.

II. The reason for some other variations is the difference in the range of complexity of the different affixes and functional words within a language.

III. The disease severity is likely to be a cause of diversity (Caplan, 1995, p. 285).

The research on agrammatism is divided into two categories: domestic and foreign papers. Hagiwara (1995) studied spontaneous speech and acceptability judgment of sentences in Japanese agrammatic patients and noticed a selective inflectional disorder that only affects the production of a subset of inflectional categories. He claims that the projections inside the IP are preserved, while the projections outside it, such as CP, are easily impaired (Hagiwara, 1995, p. 94).

Relying on the inflectional morphology of the verb, Friedmann and Grodzinsky (1997) described the speech production of an agrammatic patient. In their study, agrammatism in Hebrew was examined by studying a patient who showed a very selective impairment. In his speech, the agreement inflection remained completely intact; however, the tense inflection, copula, and embedded structures were severely impaired.

In another study, Friedmann & Grodzinsky (2000) studied the speech production ability of a Hebrew-speaking agrammatic patient and designed specific tests to test the split inflection hypothesis while simultaneously examining the exact nature of this disorder. Empirical evidence corroborates their claim in neuropsychological and interlanguage data and proves that the tense and agreement are distinct: Tense is impaired; however, the agreement remains relatively intact (Friedmann & Grodzinsky, 2000b, p. 85).

Wenzlaff & Clahsen (2004) studied seven agrammatic patients and seven control subjects in sentence completion and grammaticality judgment tests. Their findings indicate the impairment of tense and no impairment in the agreement features. The subject-verb agreement remains relatively intact; however, the results related to tense are far worse in comparison to control subjects (Wenzlaff & Clahsen, 2004, p. 59).

Berchert et al. (2005) reported a bilateral deficit for agrammatic disorder in which tense and agreement features were influenced independently. This predicts a dual split between tense and agreement; particularly in the sense

that patients are found to have a tense feature deficit, while their agreement use is intact; however, some patients have an impaired agreement with the tense remained intact. In their study, nine patients were studied. However, seven showed no significant practical difference between tense and agreement use. One patient performed worse in tense than the agreement, and one patient performed worse concerning tense; therefore, in the samples studied by these researchers, the performance is equal and correspondent to the performance in agreement.

Applying the grammatical judgment test, Nanousi et al. (2006) examined the TPH in six Greek-speaking agrammatic patients. They studied the patients' ability to produce tense, agreement, and aspect in separate words and sentences. The patients were equally impaired in separate word tests in all inflectional markers; however, in sentence-related tasks, both in production and grammatical judgment, tense and aspect were more impaired than agreement. The findings are consistent with Friedman and Gradzinski (1997); however, in the tree diagram of the Greek, the agreement is located higher than tense and aspect, and the aspect is located lower than tense. Therefore, the TPH in Greek is not confirmed because of the lower position of tense and aspect and their greater vulnerability than the tense node; instead, the results were interpreted by applying the minimalist theory that distinguishes interpretable features (such as tense and aspect) from uninterpretable ones (such as tense) (Nanousi et al., 2006, p. 209).

Mehri et al. (2010) studied the tense use in Persian agrammatic patients and examined eight patients by the written sentence completion task and the picture sentence completion task. The results did not show any significant differences between the different forms of the past tenses of the verbs; however, comparisons show that these individuals scored better in the simple past tense, continuous past tense, present perfect tense, and past perfect past tense, respectively. They found that the tense node is disturbed in Persian-speaking agrammatic patients with Broca's aphasia (Mehri et al., 2010, p. 78).

Salimi Khorshidi and Raqibdoost (2013) studied the performance of three Persian-speaking agrammatic patients in four tasks of spontaneous speech, sentence completion, repetition, and grammatically judgment; and found that speech production in these patients was selectively impaired and that only a subset of the functional syntactic categories in the syndrome was impaired. The consequence of the disorder is the TPH in agrammatic patients, which results in worse performance in impaired nodes and higher nodes (Salimi Khorshidi and Raqibdoost, 2013, p. 102).

Theoretical Framework

According to the interpretable features' impairment hypothesis, elements that hold both verbal and grammatical expressions are interpretable. Still, elements that have only grammatical expressions and no verbal expressions are uninterpretable (Harun, 2020, p. 64). According to this theory, the uninterpretable features of the verb, such as person and number (agreement), and the interpretable features such as tense and voice are different; that is, functional categories with interpretable features may cause more problems and impairment in non-fluent aphasic patients, and the morphological representation of interpretable features in these individuals is not possible. Conversely, an agreement that requires a review of uninterpretable features remains intact, and as a result, agreement features are more preserved than tense in agrammatic patients and are more commonly applied (Salimi Khorshidi, 2013, p. 46).

Nanusi et al. (2006) and Varlocosta et al. (2006) believe that categories with interpretable features such as T and Asp are more damaged than Agr. In the minimalist program, the Agr is not considered as an independent functional category but as a function through which the specific and uninterpretable features of T are reviewed against the specific and uninterpretable features of the subject. Nanousi et al. (2006) attempted to account for the observed pattern by suggesting that the part that is impaired in agrammatic patients is the syntactic-phonological process, which is responsible for determining the

phonological values of the interpretable features (as they say, it is probably a spelling sub-process) (Fyndanis et al., 2012, p. 1136).

Radford (2004) argues that these authors' suggestion that there are two distinct mechanisms for determining the phonological value of interpretable and uninterpretable categories (probably the sub-process of spelling and tense) is relatively controversial. Furthermore, in minimalist standard theories, categories with interpretable features enter the derivation while holding syntactic (abstract) values; however, categories with uninterpretable features receive such values during derivation through tense (i.e., copy/assignment). Assigning "concrete/non-abstract" phonological value to interpretable features and categories with uninterpretable features occurs in spelling (Radford, 2004, pp. 284-287).

Moreover, in TPH, the tense and agreement have comparable syntactic roles (for examining/evaluating tense and agreement); they show separate projections and are hierarchically related in the tree diagram. However, advances in linguistic theory have provided a means of conceptualizing the differences between tense and agreement affixes which is unrelated to their hierarchical position. According to Drucks (2017), quoted by Chomsky and by Redford (2004), it is likely to be assumed that there is no agreement (p. 363). By this, Chomsky means that the agreement is no longer embodied as a functional head having a structural place in the phrase structure; rather, agreement is a performance that matches the following two: (a) Uninterpretable (or unvalued) characteristics of verbs agreement (or adjectives and prepositions in the languages in which they correspond) and Interpretable (or valued) features tense in subject noun groups (person, number and gender) and (b) uninterpretable state (structural) characteristics of nominal groups (subject, object) with current interpretable characteristics (Tense, aspect, and aspect). When a feature is valued (that is, it has agreement), the uninterpretable feature that lacks semantic significance is removed due to the relationship between the narrow syntax and the logical form; agreement is, therefore, the syntactic and detailed function of valuation and omission (unexplained characteristics) (Druks, 2017, pp. 79-80).

As Bastiaanse, et al. state, the differences in tense and agreement production in agrammatic patients are likely to be rooted in several features unrelated to the structural position. The most important difference concerns the grammatical function: tense is referential and shows the tense interval through referential dependencies, but the agreement is a local syntactic function that bears no meaning outside the grammatical system. This view is explored by Avrutin (2000), who suggested that referential elements (related to discourse such as tense and pronominal elements) are impaired in agrammatic patients. This is also predictable in interpreting the interpretable feature; however, it is particularly interesting in terms of the damage to the relationship between syntax and discourse (Bastiaanse & et al., 2012, p. 84).

According to Kiss and Alexiado (2015), interpretable features can be interpreted at the logical form level, i.e., they are related to the semantic interpretation of a phrase; however, the uninterpretable features at this level are incomprehensible and must be reviewed before the logical level so that derivation at this level does not become problematic (Kiss & Alexiadou, 2015, p. 1851).

Generally, and based on Roberts (2017), in most of the justifications for deficiencies in complex grammatical structures in agrammatic patients, linguistic impairment indicates impaired processing limitations or syntactic manifestations in terms of some complex grammatical features and not due to impairment of core linguistic knowledge (Roberts, 2017, p. 502).

METHOD

Participants

In this study, two male Persian-speaking and right-handed agrammatic patients, 24 and 54 years old, were considered. They were non-fluent aphasic based on the items in the Persian language test, MRI report, and CT scan because the perceptual abilities of these patients were somewhat higher than their expressive abilities. Furthermore, their education was at least a

diploma, and their illness lasted from one to five years. Their speech consisted of short sentences, and they used content words (nouns and verbs) more than pronouns, prepositions, and articles; generally, they were able to communicate the verbal communication needed to perform the aphasia tasks related to this paper. However, according to medical records and personal reports, none showed a history of alcohol or drug addiction and no developmental or neurological disorders. Patient (a) was a 24-year-old man with a postgraduate degree who suffered an injury to the left temporal lobe due to an accident. He had paralysis of the right side of his body at the time of the test and had been undergoing speech therapy at rehabilitation centers for almost three years. 62% of his speech was inaccurate, and his perception was 14% impaired, but his perceptual skills were better than his production skills.

Patient (b) was a 54-year-old graduate man who suffered a brain injury due to an accident at the age of 53 due to an injury to the left frontal lobe. As the CT scan shows, asymmetry was observed in the size of the brain's lateral ventricles, so the left side of the lateral ventricle was larger than the right. Patient (b) was non-fluent for one year until the task was performed, made grammatical and phonological paraphrasing errors, and had an erratic verbal output consisting of very short phrases. An assessment of the patient's perceptual skills showed that his speech comprehension was normal. In general, his productive abilities were weaker than his perceptual abilities; he was treated at a speech center for about a year until the tasks.

Instruments (Tasks)

Picture Description Task

The most common test for obtaining speech in language tasks was picture description. In this method, the examiner shows the patient a drawing. In this painting, several characters are depicted, and each is engaged in activities that most adults are familiar with and asks the patient to describe the picture (Brookshire, 2003, p. 226). For this purpose, by adapting the Persian language test of Nilipour (1993), samples of these pictures (such as the picture of a bird's nest) were shown to the patients, and they were asked to describe the pictures.

Sentence Completion Task

In this study, two types of sentence completion tasks were utilized:

Sentence completion task (filling the blank)

In this test, the patients had to fill in the blanks orally with the appropriate verb; sentences whose verbs were omitted were written on cards and placed in front of patients, and the examiner read the sentences randomly and aloud. Moreover, some of these sentences required completion of the sentence in terms of tense, and others required completion of the sentence in terms of agreement. For the sentence completion test, 30 sentences were considered in terms of Tense: five simple past sentences, five continuous past sentences, five past perfect sentences, five past perfect sentences, five present sentences, and five future sentences. Furthermore, adverbs of time were applied to deduce the present, past, and future. The purpose of compiling the sentence completion test in terms of tense was to see if the patient has the appropriate grammatical information and the ability to use this information by observing / not observing the subject-verb agreement. In the sentence completion test, 18 sentences were used in terms of tense: three of them were related to the first person singular, three cases to the second person singular, three cases to the third person singular, three cases to the first-person plural, three to the second person plural and three to the third person plural.

Sentence completion task (multiple choices)

In this test, we showed patients simple sentences and asked them to choose the correct tense of the verb from the three given options for the target sentence. The difference between this subtest and the sentence completion subtest (filling) is that in this test the patient is likely to choose the answer more easily due to having several options. We predict that if the patient is able to process tense and agreement information, he/she may find the correct answer from several options, even if he/she has

not completed the sentence. For this test, 18 sentences were considered, six related to the past tense, six to the present tense, and six to the future tense.

It should be noted that before the task, content validity and reliability of the test were obtained; that is, after determining the objectives of the test and conducting the necessary studies in the literature related to the test and using similar tasks, and consulting experts and professors, the test questions were written one and a half times the required number. However, the test questions whose CVR value was less than 0.79 according to the Leuche index were omitted. Because they did not have acceptable content validity according to the content validity index. Subsequently, the questions were tested on a sample group of people in the plant, and at the end of the design, tasks were performed on the target group.

Data Collection Procedure

Upon selecting the patients from the patients referred to the neurology ward of Golestan Hospital in Ahvaz and using the advice of a neurologist and identifying the participants by the speech therapists as non-fluent aphasic, each patient's speech sample was recorded in a quiet room separately, and the relevant sentences were read to them randomly. However, the tasks were performed in two sessions as follows: picture description task and sentence completion task. In this paper, the statistical methodology is descriptive and analytical measurement.

Since verb inflection in Persian has a special morpheme for each combination of tense and agreement, it is easy to identify the type of errors. These errors are analyzed as follows: each of the misspellings errors is considered a tense error or an agreement error (or both). The tense error is the inconsistency of the adverb of time and verb inflection. An agreement error is the lack of coordination between the grammatical subject of the sentence and the verb agreement features; for example, for sentence 1, sentence 2 is considered a tense error, and sentence 3 is considered an agreement error.

1) He went yesterday.
2) He goes/ will go yesterday.
3) He went yesterday (referred to third person plural and 1st person singular)

Scoring

The obtained data were quantitatively analyzed. Scoring was based on the first response, but in cases where patients corrected their mistakes, scoring was based on the corrected response. In the sentence completion test, scoring was done according to the correct or incorrect answer of the patient. Two types of errors were considered for the sentence completion test (filling): tense error and tense error. Replacing the verb with the present tense with a different tense is considered a tense error. Furthermore, correct responses and phonetic errors were recorded on the sheet; only the auxiliary verb and the main verb of the target were considered for scoring, and errors related to the production of the remaining components of the sentence were ignored.

RESULTS AND DISCUSSION

Tense and agreement in the picture description task

As Nilipour (2002) has stated, in this test some patients constantly change the inflectional endings of the verb in sentences and, for example, change the inflectional marker of the present to the past. However, we should note that the past tense of the verb is structurally simpler than the present tense and is closer to the bare form of the verb (i.e. Masdar) (Nilipour, 2002, p. 118). For example, in the following speech sample obtained from the patient (a), the past tense verb "oft-ad" replaces the present tense verb "mi-oft-e".

1. /bæʔd ʔofta –d …/
Adv fall-PAST-3S

Table 1
The patients' performance in the picture description task

	TENSE		AGREEMENT	
	patient (a)	patient (b)	patient (a)	patient (b)
The number of correct answers	28	48	38	48
The number of incorrect answers	12 (30%)	8 (16.7%)	2 (%5)	0

As Table 1 shows, in this test, patient (a) holds two (five percent) agreement errors and 12 (30 percent) tense errors; however, patient (b) shows no agreement error and holds eight cases (16.7%) tense errors.

Tense and agreement in sentence completion tasks

In some of these tasks, patients substituted tense but rarely made agreement errors.

Patients' performance in sentence completion task (filling task)

Table 2
The patients' performance in sentence completion task (filling)

	TENSE		AGREEMENT	
	patient (a)	patient (b)	patient (a)	patient (b)
The number of correct answers	9	13	18	17
The number of incorrect answers	21 (70%)	17 (56.6%)	0	1 (5.5%)

According to Table 2 in this test, patient (a) shows 21 (70%) tense errors but no agreement errors; therefore, the tense errors were more than the agreement errors. The data in this table also show that patient (b) committed one case (five and a half percent) agreement error and 17 cases (56.6%) tense error; therefore, this patient, like patient (a), performed better in producing the agreement than in producing the tense.

Patients' performance in sentence completion task (multiple choice)

Table 3
The patients' performance in sentence completion task (multiple choice)

	TENSE		AGREEMENT	
	patient (a)	patient (b)	patient (a)	patient (b)
The number of correct answers	11	14	17	18
The number of incorrect answers	7 (38.8%)	4 (22.2%)	1 (5.5%)	0

As Table 3 shows, in this test, patient (a) committed one case (five and a half percent) agreement error and seven cases (38.8%) tense error; however, patient (b) did not make any agreement error but showed four tense-errors (22.2%). Based on these results, it may be predicted that the discontinuity of tense and agreement in the agrammatic patients' performance is confirmed. Considering the performance of these patients in different tasks, however, one may argue that choosing the appropriate verb in multiple-choice tasks is easier than producing the appropriate verb in the filling test in which patients have no choice.According to Friedman and Grodzinsky (1997), the performance of many agrammatic patients is similar to that of puzzle players. When they are asked to fill a vacancy without having a specific set of options (or with a large number of possible options), they become confused and confused, and may not choose the desired option correctly; however, when they are given options to choose from, they are likely to choose the right option successfully (Friedman & Grodzinsky, 1997, p. 408).

Comparison of Agrammatic Patients' Performance in the Two Tasks

The analysis of the data showed that the ability of these patients in agreement production was almost normal and significantly better than their performance in tense production. Furthermore, Patients' performance in both tasks indicates a similar pattern in terms of tense

and agreement production; the number of patients' errors in the picture description test was generally higher than in the sentence completion test and in the sentence completion test (filling) was higher than the sentence completion test (multiple choice); this confirms the complexity of the nature of the picture description test compared to other tasks. On the other hand, patient (b) also had less agreement error and according to the interpretable features' impairment hypothesis, we can argue that the agreement which requires a review of the uninterpretable features, is less damaged and, as a result, the agreement features are more preserved over tense in agrammatic patients and is more correctly used. Therefore, functional categories with interpretable features may cause more problems and injuries in TBI patients and it is not possible to represent the morphological representation of interpretable features in these individuals. However, the agreement which requires a review of the uninterpretable features remains intact and as a result, the agreement features are more preserved over tense in these patients and have a higher application. As the findings show, the participants studied in this study have selective deficits and their vulnerability is not the same in inflectional morphemes (Tense and agreement); that is, their agreement production was relatively good, but they were impaired in tense production. Similar studies, such as Grodzinsky (2000 and 1997), Wenzlaff & Clahsen (2004), Berchert et al. (2005), Nanousi et al. (2006), and Salimi Khorshidi and Raqibdoost (2013), indicate the existence of selective impairment in speech production in patients with agrammatic symptoms. Accordingly, some subclasses of syntactic categories are severely impaired; the difference is that these researchers have cited the TPH in their study, based on which there is a direct relationship between the position of each element in the tree diagram and the number of errors, and the higher the element is located in the node, the more vulnerable it will be to impairment. However, the present paper, based on the interpretable features' impairment hypothesis studied this issue in Persian with an innovative perspective, while none of the Persian-speaking authors has addressed this hypothesis to this point.

According to the researchers mentioned above, the following generalizations are made: first, this attitude of aphasia should be discarded as a detriment to all grammatical morphemes. Second, the interpretable features' impairment hypothesis by Fyndanis et al. (2012) which is based on the distinction between uninterpretable features of the verb such as person and number (agreement) and interpretable features such as tense and voice is verified; this means that functional categories with interpretable features may cause more problems and injuries in patients with non-fluent aphasia, and it is not possible to represent the morphological representation of the interpretable features in these individuals. Conversely, the agreement which requires a review of the uninterpretable features remains intact and, as a result, the agreement features are more preserved over tense in agrammatic patients and are more widely applied.

CONCLUSION

In line with Faroqi-shah and Thomson (2007), the data from this study show that the ability of agrammatic patients to select appropriate verb forms remains relatively intact in finite morpho-syntactic context, and the extent of this ability is no different from their ability to select similar nonverbal structures.

If these individuals did not have access to the well-formedness syntactic constraints, then they would make more mistakes in choosing the correct form of the verb in a particular syntactic context. However, the high degree of accuracy of verb inflection in finite contexts is consistent with the multilingual research on access to the well-formedness constraints of verb inflection already conducted in the research literature (Faroqi-shah & Tompson, 2007, pp. 136-137).

The findings indicate a split in the production of tense and agreement. As the findings show, the patients in both tasks showed a small amount of agreement error, which indicates that in the speech of TBI patients with agrammatic symptoms, tense and agreement may be affected separately.

However, based on the results, one may argue that the need to process the tense as an interpretable feature makes it more vulnerable than agreement as an uninterpretable feature;

therefore, the research hypothesis is confirmed. According to Fyndanis et al. (2015), no hypothesis may account for the speech patterns of agrammatic patients worldwide. The results show that we may find all possible patterns in the speech of agrammatic patients, however, we cannot provide a single justification for all the relevant patterns.

The scientists believe that the patient's specific characteristics (such as the type, location, and extent of brain damage, and the type and severity of language disorder, age, and education) and the specific characteristics of functional categories in each language (e.g. syntactic hierarchy, frequency, interpretability, or complexity of integration processes) is likely to be effective in finding the manifestation of agrammatic disorders in patients with agrammatism in different languages.

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