Neurolinguistic & psycholinguistic investigations on evidentiality in Turkish
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Document Version
Publisher's PDF, also known as Version of record

Publication date:
2016

Link to publication in University of Groningen/UMCG research database

Citation for published version (APA):

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CHAPTER 3

3. A characterization of verb use in Turkish agrammatic narrative speech

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23 This study reported in this chapter is under review: Arslan, S., Bamyaci, E., and Bastiaanse, R. (Submitted) A characterization of verb use in Turkish agrammatic narrative speech. Clinical Linguistics and Phonetics.
Abstract: This study investigates the characteristics of narrative-speech production and the use of verbs in Turkish agrammatic speakers (n=10) compared to non-brain-damaged controls (n=10). To elicit narrative-speech samples, personal interviews and story-telling tasks were conducted. Turkish has a large and regular verb inflection paradigm where verbs are inflected for evidentiality (i.e. direct versus indirect evidence available to the speaker). Particularly, we explored the general characteristics of the speech samples (e.g. utterance length) and the uses of lexical verbs, finite and non-finite verbs, and direct and indirect evidentials. The results show that speech rate is slow, verbs per utterance are lower than normal, and the verb diversity is reduced in the agrammatic speakers. Verb inflection (including evidential forms) is relatively intact; however, a trade-off pattern between inflection for direct evidentials and verb diversity is found. The implications of the data are discussed in connection with narrative-speech production studies on other languages.

3.1. Introduction

Narrative speech of individuals with agrammatic aphasia is well-studied across languages. There is the invaluable source book from (Menn & Obler, 1990) but there are also many studies on individual languages (Anjarningsih, Haryadi-Soebadi, Gofir and Bastiaanse (2012) for Indonesian; Bastiaanse and Jonkers (1998) for Dutch; Miceli et al. (1989) for Italian; Saffran et al. (1989) for English) and a study on a group of bilingual (Swahili-English) agrammatic speakers (Abuom & Bastiaanse, 2012). All these studies show that apart from non-fluent speech, short utterance length and lack of grammatically complex and correct sentences, verbs and verb morphology seem to be particularly vulnerable in agrammatic speech.
3.1.1. Lexical verbs in narrative speech

Studies on agrammatic narrative speech employ quite different methodologies: some researchers prefer the retelling of a fairy tale (e.g., Thompson, Choy, Holland, & Cole, 2010) and analyze the whole sample, others use interviews (the studies of our group) and analyze a fixed number of words, whereas still others compare different elicitation methods (e.g., Olness, 2006). Also, the variables used to analyze the samples differ largely, but the conclusions are relatively in line: the production of lexical verbs in narrative speech is impaired, no matter whether measured by verb-to-noun ratios or by type-token ratios.

3.1.2. Verb inflection in agrammatic narrative speech

Agrammatic speakers often overuse non-finite verbs (e.g., infinitives, gerunds; Bastiaanse, Huguen, Koes, & van Zonneveld, 2002; Kolk & Heeschen, 1992; Thompson et al., 2010) or they produce incorrect verb inflections (Miceli, Mazzucchi, Menn, & Goodglass, 1983). There seems to be a language dependency here: in languages that allow bare stems, verb inflection is predominantly omitted, whereas in languages where no bare stems are allowed, inflections are substituted, as suggested by Grodzinsky (1991, 2000). Consistently, Abuom and Bastiaanse (2012) found this latter pattern in their group of Swahili-English agrammatic speakers: in Swahili, a language that does not allow bare verbs stems, verb inflections were substituted, whereas the same agrammatic speakers omitted the verb inflections when they spoke English. Another explanation for the different patterns that have been observed among languages with regard to verb inflection comes from Menn and Obler (1990). They suggest that most errors with verb inflections are made by agrammatic speakers of languages that have a diverse inflectional paradigm (Menn and Obler, 1990). English, for example, has four different ways to form past tense: three allomorphs – V+t (‘he fixed’); V+d: (‘he begged’); V+ed (‘he created’) – and irregular
forms (‘he stood’). This theory predicts that past tense in English will be more difficult than in Swahili, which has only one morpheme for past tense, that is always pronounced similarly. This is exactly what was found in the studies of Abuom and colleagues (Abuom & Bastiaanse, 2012, 2013; Abuom, Obler, & Bastiaanse, 2011). Another interesting prediction has been made by Goral (2011). She suggests that verb inflections are better preserved in speakers of languages with a highly regular inflectional system. Usually, extended inflectional paradigms are highly regular. This is an alternative explanation for observed discrepancy between verb inflections in the Swahili-English bilingual agrammatic speakers.

Another question is whether all verb inflections within one language are equally affected. Bastiaanse et al. (2002) suggest that it is not verb inflection per se that is impaired, but rather the production of finite verbs. That is, the verb forms that are inflected for Tense, Aspect, Mood and Agreement with the subject are most vulnerable. In English, for example, the progressive form V+ing does not seem to be difficult for agrammatic speakers, although it is an inflected lexical verb (Abuom & Bastiaanse, 2012; Faroqi-Shah & Thompson, 2004).

There is, however, quite some variation in the use of finite verbs: Miceli et al. (1989) showed that some of their agrammatic speakers are better in finite verb production than others. Thus, these authors assumed that agrammatism is not a unitary syndrome, but that different underlying disorders may result in different patterns of agrammatic speech. Bastiaanse (1995) argued that it is not necessarily a different underlying disorder that caused this variation, but rather different reactions to a similar underlying disorder. Bastiaanse and Jonkers (1998) elaborated this idea further in a group study to agrammatic spontaneous speech, which showed that some agrammatic speakers were relatively good in producing finite verbs, but had little variation in their use of lexical verbs (i.e., a low type-token ratio), whereas others had more variety in their lexical verbs but produced relatively few finite verbs. The authors argued that retrieving lexical verbs and inflecting them is difficult for speakers with a grammatical deficit. That raised the question whether it is agreement and / or tense that causes the problems with finite verbs in agrammatic speakers. Agreement manifests as an inflectional morpheme that reflects the relation between words or
constituents (in this case, between subject and the finite verb). Tense, however, is an inflectional morpheme that links the verb to a time frame, thus carrying more semantic and pragmatic content than agreement does.

Anjarningsih and Bastiaanse (2011) showed that it is not the combination of verb retrieval and verb finiteness that is the problem in agrammatic aphasia. They analyzed the narrative speech of agrammatic speakers of Standard Indonesian (henceforth SI). In SI, verbs are not inflected for tense or for agreement with the subject. Time reference is morphosyntactically expressed only when reference to a time frame is not clear from the context, in which case ‘aspectual’ adverbs are used. These are free-standing grammatical morphemes that express whether an event has finished, is going on or still has to commence. Interestingly, the trade-off between lexical diversity and finiteness that was observed for Dutch was also observed in SI between lexical diversity and the use of aspectual adverbs. Particularly, agrammatic SI speakers who produced lexical verbs (or ‘verbal predicates’ as they are usually called in SI) with a relatively normal variety, produced relatively few aspectual adverbs and vice versa. This suggests that neither agreement, nor tense as such is the source of the problem in agrammatism, but it is rather retrieving the name of an event and simultaneously expressing the time frame of the event through grammatical morphology.

This trade-off was not observed in the Swahili-English bilingual agrammatic speakers. However, it was observed that verb forms referring to the past were affected in both English and Swahili, whereas verb forms referring to present and future showed a normal distribution. What reference to the past through verb inflection and reference to a time frame by aspectual adverbs have in common is that they require ‘discourse linking’. According to Zagona (2003), past tense morphology requires discourse linking and according to Avrutin (2000, 2006), discourse linking is impaired in agrammatic aphasia. Bastiaanse et al. (2011) proposed that reference to the past, not only through Tense as suggested by Zagona (2003), but through grammatical morphology in general is difficult for agrammatic speakers, because it requires discourse linking. Bastiaanse (2013) refined this idea on the basis of the data from SI (Anjarningsih & Bastiaanse, 2011; Anjarningsih et al., 2012). For agrammatic SI speakers, aspectual adverbs
referring to past, present and future were equally difficult to produce (i.e., they produce fewer aspectual adverbs than normally would be expected). Since these aspectual adverbs are used to disambiguate time reference when context is not conclusive, they are used for linking the event to discourse. Hence, these aspectual adverbs are difficult for agrammatic SI speakers.

So far, the features of agrammatic narrative speech in Turkish have not been described. This is a caveat, since Turkish is an interesting language for studying agrammatic speech: it is an agglutinative language. Most interestingly, it has a kind of inflection on the finite verb that does not exist in the languages that have been analyzed so far. In the next section, the specific features of Turkish that are of interest for the current study will be presented.

3.1.3. Linguistic background

Turkish is an agglutinative language with a rich and regular inflectional paradigm. Verbs are inflected for Tense / Aspect, Mood, Evidentiality and Agreement. Tense is used to refer to the time of the event in relation to speech time (Reichenbach, 1947). Turkish verbs require inflection for Tense, which marks past, present or future. Furthermore, Turkish verbs are inflected for another semantic feature: evidentiality. Evidentials require the speaker to monitor different types of information sources (e.g., Papafragou et al., 2007). That means that the inflection on the finite verb should denote whether the event was (1) witnessed personally or (2) either heard from another source or inferred (Aksu-Koç and Slobin, 1986; Slobin and Aksu, 1982). Evidentiality marking is obligatory within the past time reference (see 1-2).\textsuperscript{24}

\textsuperscript{24} Evidentiality is assumed to constitute an independent grammatical category, not a sub-category of tense or modality (see Aikhenvald, 2004 for an overview). Although evidentiality marking in Turkish is more common and obligatory for past events, future events can also be reported by using the indirect evidential form (see Aksu-Koç, 1988; Johanson, 2000). For the purposes of this study, we only discuss evidential forms used in past time reference.
Vowel harmony applies to all verb affixes in Turkish, resulting in a large number of allomorphs. For example, the direct evidential form in (1) can be realized in the (orthographical) forms –dI, -tI, -di, -ti, -du, -tu, -dü, and –tü, depending on the vocalic properties of the verb stems.

(1) Direct evidential (witnessed past)

Kedi sütü içti
Cat milk_{ACC} drink_{DIRECT EVIDENTIAL 3.SG}
“The cat drank the milk”

(2) Indirect evidential (reported or inferred past)

Kedi sütü içmiş
Cat milk_{ACC} drink_{INDIRECT EVIDENTIAL 3.SG}
“The cat drank the milk”

The direct evidential –DI in (1) marks that the speaker has directly witnessed or personally participated in the past event s/he is talking about. The indirect evidential -mIş in (2) reflects that the speaker knows about a past event through indirect or second-hand information sources: inference or report of another speaker (see Aksu-Koç, 1988; Aksu-Koç and Slobin, 1986; Slobin and Aksu-Koç, 1982). The present progressive –Iyor in (3) marks imperfect aspect and refers to the present. Although it does not formally mark an evidential term, Aksu-Koç (2000) argues that the present progressive often specifies an evidential value akin to direct evidence.

(3) Present progressive

Kedi sütü içiyor
Cat milk_{ACC} drink_{PRESENT PROGRESSIVE 3.SG}
“The cat is drinking the milk”

Selection of one evidential over the other is determined by genre and discourse types: while direct evidentials usually occur in stories about
personal experiences and in first person narration, indirect evidentials are used for conventional accounts of storytelling (Aikhenvald, 2004, 2014; Aksu-Koç, 1988; de Villiers & Garfield, 2009). Aikhenvald (2014) argues that when a speaker is asked about his personal experience, direct evidentials will be used. Arslan and Bastiaanse (2014b) showed that Turkish speakers use a higher number of direct evidentials than other inflections when they talk about their personal experiences. Some story-telling genres, however, require the use of indirect evidentials in Turkish. According to Aksu-Koç (1988, p. 25) ‘accounts of myths, fairytales, folktales, or pure fantasy which has no basis in reality and are far distant from normal experience’ are often narrated with the use of indirect evidentials. Based on the theoretical framework on time reference in relation to Tense, Aspect and Evidentiality (Enç, 2004; Johanson, 2000; 2006; Erguvanlı-Taylan, 2001), Arslan, Aksu-Koç, Mavis and Bastiaanse (2014) adopted the view that direct evidentials are discourse linked, whereas indirect evidentials are not.

There is another feature of Turkish verbs that is interesting for narrative speech analysis; both finite and non-finite verbs are used in embedded clauses, as shown in (4-5), but non-finite verbs are more frequently used (Erguvanlı-Taylan, 1994; Hankamer & Knecht, 1976).

(4) **Embedding with a finite verb**
Adam müzik dinledim dedi
Man music listenD 3.SG sayD
EVID 3.SG
“The man said (that) he listened to music”

(5) **Embedding with a non-finite verb**
Adamın dinlediği müzik gürültülüydu
[Man listenOBJ,PARTICIPLE 3.SG music] noisyD EVID 3.SG
“The music that the man listened to was noisy”
Turkish has an extensive inflectional paradigm for non-finite verbs. These non-finite verb forms have three main categories: infinitives, participles, and gerunds. Infinitives in Turkish can be used in embedded clauses (the so-called ‘action nominals’) as shown in (6) and are marked by the suffixes –mE and –mEK (Kural, 1994). Furthermore, no bare verb-stems are allowed.

(6) **Infinitive in an embedded clause**

Adam müzik dinlemeyi seviyor

[Music music listen\textsc{infinite.acc}] love\textsc{pres. prog. 3.sg}

“The man loves to listen to music”

Participles (or verbal adjectives) are used in different types of relative clauses. The subject participle –An is used in Subject Relatives (see 7), whereas the object participle –DIK is used in Object Relatives\(^\text{25}\) (see 8) and refers to non-future events. The other participle forms, inflected with –EcEk and –mIş, can be used in Object and Subject Relatives, and express future and past events respectively (Kornfilt, 1997a).

(7) **Subject participle**

Müzik dinleyen adam

[Music listen\textsc{subj.participle} man]

“The man that listens to music”

\(^{25}\) The object participle –DIK can also be used in adverbial clauses. The other uses of –DIK are however outside the scope of the current study.

sabah olduğunda

[morning become\textsc{-participle.loc}]

“when the morning comes”
(8) **Object participle**

<table>
<thead>
<tr>
<th>adamın</th>
<th>dinlediği</th>
<th>müzik</th>
</tr>
</thead>
<tbody>
<tr>
<td>Man&lt;sub&gt;GEN&lt;/sub&gt;</td>
<td>listen&lt;sub&gt;OBJ.PARTICIPLE 3.SG.&lt;/sub&gt;</td>
<td>music</td>
</tr>
</tbody>
</table>

“The music that the man listened to”

Finally, gerunds are often used to construct adverbial relative clauses. Depending on the function of the adverbial clause, different markers can be used: the suffix –Iken expresses temporal simultaneity, as demonstrated in (9), while the suffixes –Ip and –IncE can be used to express sequential events.

(9) **Yürüyüş yaparken müzik dinliyorum**

<table>
<thead>
<tr>
<th>Yürüyüş</th>
<th>yaparken</th>
<th>müzik</th>
<th>dinliyorum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk</td>
<td>do&lt;sub&gt;GERUND&lt;/sub&gt;</td>
<td>music</td>
<td>listen &lt;sub&gt;PRES.PROG. 1.SG&lt;/sub&gt;</td>
</tr>
</tbody>
</table>

“(I am) listening to music while taking a walk”

In sum, two features are particularly interesting to analyze in Turkish agrammatic narrative speech: (1) Verb inflection, because Turkish has a rich verb inflection paradigm and verb forms referring to past must be inflected for evidentiality, a phenomenon that has not previously been studied in agrammatic narrative speech. (2) Clauses without finite verbs, but with infinitives, participles or gerunds, are frequently used. The participles require derived word order and, interestingly, derived word is known to be

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26 Notice that in the Object Relative (8), the object participle must agree with the subject of the embedded clause, whereas in the Subject Relative (7) there is no such agreement. Furthermore, the subject of the Object Relatives is assigned genitive case. It should be noted that in Turkish SOV is the base word order. In the Subject Relative, the subject is moved to the end of the clause, resulting in OVS-order (7), whereas in the Object Relatives, the object is in clause final position, resulting in SVO (8).

27 We only include –Iken, -Ip, -IncE gerundal suffixes for this study. However, gerunds in adverbial clauses are not only limited to these, see Taylan (1984) for further examples.
difficult for agrammatic speakers (Bastiaanse & van Zonneveld, 2005, 2006).

### 3.1.4. Agrammatic aphasia in Turkish individuals

There are not many studies on Turkish aphasia and, so far, none on agrammatic narrative speech. Experimental studies revealed that grammatically complex sentences are particularly difficult in agrammatic speakers’ sentence production (Yarbay-Duman, Aygen, Özgirgin, & Bastiaanse, 2007). Turkish agrammatic speakers are also poor on comprehending and producing subject and object relatives (Aydin, 2007; Yarbay-Duman, Aygen, & Bastiaanse, 2008), even though the verbs are used in non-finite form (i.e., participles).

Finite verbs are difficult for Turkish agrammatic speakers: it has been shown in several experimental studies that finite verb forms that refer to the past are most vulnerable (Bastiaanse et al., 2011; Yarbay-Duman & Bastiaanse, 2009), just like in many other languages (for an overview, see Bastiaanse, 2013). However, not all finite verb forms that refer to the past are equally affected. Arslan et al. (2014) conducted a production task with sentences requiring either direct or indirect evidential verb forms. Visual and verbal materials were used to elicit evidential forms appropriate for directly witnessed, inferred or reported events. The direct evidential forms were found to be more difficult for Turkish agrammatic speakers to produce than the indirect evidentials were.

### 3.1.5. The current study

As summarized above, several experimental studies showed that verb inflection in Turkish is impaired and that derived word order is difficult. The question is how these problems emerge in narrative speech. We, therefore, analyzed the narrative speech of a group of agrammatic speakers.
and compared the results with those of a group of non-brain-damaged speakers, with particular emphasis on verb production. It has been shown that different genres elicit different verb forms (Armstrong, 2000; Olness, 2006). Hence, we elicited narrative speech through an interview about the personal life of the participants.

There were 4 main research questions:

(1) Is narrative speech of Turkish agrammatic speakers disturbed along similar lines as in other languages?
The aphasic participants were diagnosed as suffering from Broca’s aphasia. It was expected that their speech rate and utterance length were decreased and that they would produce fewer grammatical sentences than NBDs, with fewer embedded clauses.

(2) Is production of verbs in Turkish agrammatic speech impaired?
In other languages, it was found that it is not the number of lexical verbs that is reduced, but rather there is little variety in the produced verbs. We expect to find a similar pattern in Turkish.

(3) Is production of finite verbs and participles impaired in Turkish agrammatic speech?
Verb inflection of agrammatic speakers of languages with a regular inflectional verb paradigm may be relatively spared (Goral, 2011). Hence, it is expected that Turkish agrammatic speakers will not encounter many problems. According to Menn and Obler (1990), however, verb inflection in Turkish agrammatism may be affected, because of the large number of allomorphs. Participles in Turkish are used (highly frequent) in object and subject relativization. Since sentences with embedding and derived word order are difficult for agrammatic speakers (Abuom and Bastiaanse, 2012; 2013; Saffran et al., 1989; Thompson et al., 2010; Yarbay Duman et al., 2007; 2008), we expect that the use of participles is limited.

(4) Is the production of direct and indirect evidentials affected?
In previous experimental studies, it was shown that reference to the past through verb inflection in Turkish agrammatic speakers is impaired (Yarbay
Duman and Bastiaanse, 2009; Bastiaanse et al., 2011) and that direct evidentials were particularly difficult (Arslan et al., 2014). We, therefore, expect problems with the production of the direct evidentials.

3.2. Methods

3.2.1. Participants

Ten agrammatic speakers participated in this study. They were recruited from the Hacettepe University Department of Audiology; Ankara University, Department of Speech Therapy; Ankara University Department of Neurology; and Ankara Hospital for Physical Medicine. They were diagnosed by their SLTs as having Broca’s aphasia. There were 6 men and 4 women and their age ranged from 43-74 years (mean 58.6 years). All agrammatic speakers were right-handed and suffered from a stroke in the left hemisphere. The time post-onset varied from 1-22 months (mean 7.9 months). They all had a right-sided hemiparesis. All agrammatic speakers completed at least primary education and were literate individuals who had regular reading habits prior to their aphasia, as reported by their proxies. Further individual data are given in Appendix B1.

A control group was composed of non-brain-damaged speakers in the age range of 37-67 years (mean 51.7 years), who came from the same regions as the agrammatic speakers. All participants signed an informed consent and allowed us to use their data for research.

3.2.2. Narrative speech elicitation

The methods to elicit narrative speech were similar to that of Abuom and Bastiaanse (2012). First, an interview was conducted by means of open-ended questions, as shown in (8) below. Afterwards, the participants were asked to tell a story about two pictures. To elicit those stories, the questions
mentioned in (9) were asked, based on Olness (2006). The pictorial materials used were the ‘cookie theft’ picture (Goodglass & Kaplan, 1972) and the ‘flood rescue’ picture, a Pulitzer Prize winning photo of Annie Wells.

- Interview questions

  - Konuşma güçlükleriniz nasıl başladı? “How did your speech problems start?”
  - Daha önce ya da şuan yaptığınız islerden bahseder misiniz? “Could you tell me about your present or previous job?”
  - Ailenizden bahseder misiniz? “Could you tell me about your family?”
  - Hobilerinize bahseder misiniz? “Could you tell me about your hobbies?”

- Picture description

  - Bana bu resimde neler olduğunu anlatabilir misiniz? “Could you tell me what you see in this picture?”
  - Bu resimle ilgili başı, ortası ve sonu olan bir hikaye anlatabilir misiniz? “Could you make a story with a beginning, a middle and an end about this picture?”

3.2.3. Procedure

Sessions were administered with each participant individually in a quiet room. The order of questions was as mentioned above for each participant, who was encouraged to tell as much as possible. The sessions were audio recorded with a voice recorder.
3.2.4. Analysis

All samples were transcribed in orthographic speech. Two hundred words from each sample were extracted, following the methods of Vermeulen, Bastiaanse, and Van Wageningen (1989) that we used in all our previous analyses. This is comparable to 300 words in a non-agglutinative language and supposed be a reliable sample size for agglutinative languages (Abuom and Bastiaanse, 2012). For each speech sample, an equal proportion of words was extracted from open-end questions and picture descriptions.

Since we had no data from a diagnostic aphasia test, the first analysis was performed to evaluate whether the aphasic speakers were truly agrammatic. They were supposed to speak non-fluently, in simple and short, frequently ungrammatical utterances. Ungrammatical utterances were defined as utterances that did not contain a finite verb or in which other morphological, syntactic or lexical-semantic errors are made. Minor phonological and articulation errors were ignored. In order to determine the agrammatic nature of the aphasic samples the following variables were included:

1. Speech rate: words per minute
2. Mean Length of the Utterances (MLU)
3. Percentage correct sentences
4. Number of embedded clauses with finite and non-finite verbs

For the analysis of verb production, the following variables were calculated:

5. Number and diversity of lexical verbs (including non-finite verbs and the copular verb *ol* “to become”, but excluding nominal predicates). The number of lexical verbs was counted, as well as

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28 The verb *ol* ‘to become’ was counted as a lexical verb, although it may sometimes be used as a copula. However, it behaves similarly to all other lexical verbs. The existential copulas *var* ‘there is’, *yok* ‘there is not’ were counted as nominal predicates. Note that the evidential morphemes can be inflected on nominal predicates and existential copulas, while present tense and future tense cannot.
the number of lexical verbs per utterance. Diversity of the lexical verbs was measured by type-token ratios (number of different verbs divided by the total number of verbs; when the sample size and the total number of verbs are equal, this is a reliable measure of variability of verbs (see Richards & Malvern, 1997).

(6) Number and proportion of finite verbs and nominal predicates (that include a finite form of the copula var “there is” or yok “there is not”) and number of non-finite verbs. The non-finite verbs include the infinitives, participles, and gerunds.

(7) Tense inflection. Three types of finite verbs were distinguished:29 (i) direct evidential (witnessed past); (ii) indirect evidential (inferred/reported past); (iii) and present progressive. For each of these inflection types the frequency as well as the diversity was calculated.

T-tests were used to test the reliability of the differences between the agrammatic and NBD group.

3.3. Results

3.3.1. General agrammatic features

In Table 3.1, the scores on the four general features of agrammatic speech are given for both groups. Individual data are in Appendix B2.

29 Future and habitual tense were tallied as well, but they were hardly used in either group and they will further be ignored
Table 3.1. The means and standard deviations (sd) for the general measures for agrammatism (MLU = mean length of utterances)

<table>
<thead>
<tr>
<th></th>
<th>Speech rate</th>
<th>MLU</th>
<th>% correct sentences</th>
<th># embeddings with finite verbs</th>
<th># embeddings with non-finite verbs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agrammatic speakers</strong></td>
<td>mean</td>
<td>33.70</td>
<td>2.52</td>
<td>48.40</td>
<td>1.10</td>
</tr>
<tr>
<td></td>
<td>sd</td>
<td>11.63</td>
<td>0.50</td>
<td>20.37</td>
<td>1.44</td>
</tr>
<tr>
<td><strong>NBDs</strong></td>
<td>mean</td>
<td>82.80</td>
<td>5.06</td>
<td>92.60</td>
<td>1.80</td>
</tr>
<tr>
<td></td>
<td>sd</td>
<td>13.98</td>
<td>1.00</td>
<td>10.23</td>
<td>1.61</td>
</tr>
</tbody>
</table>

Speech rate of the agrammatic speakers is significantly lower than that of the NBDs ($t(18) = 8.539; p < .0001$) and their utterances are significantly shorter ($t(18) = 7.166; p < .001$). As expected, the percentages of correct sentences ($t(18) = 6.007; p < .0001$) are significantly reduced. The agrammatic speakers produce fewer embeddings with non-finite verbs than the NBDs do ($t(18) = -2.330; p = .032$), whereas no group difference is found in the number of embeddings with a finite verb ($t(18) = -1.019; p = .322$).

These data show that agrammatism in Turkish resembles agrammatism in other languages: speech is severely delayed and the sentences are shorter and less complex. Also, a large proportion of sentences is incorrect and embedded clauses with non-finite verbs are scarce.
3.3.2. Production of lexical verbs

In Table 3.2, the group data of the production of lexical verbs are given. The individual data are in Appendix B3.

<table>
<thead>
<tr>
<th></th>
<th>verb tokens</th>
<th>TTR verbs</th>
<th>verbs per utterance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agrammatic speakers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean</td>
<td>46.90</td>
<td>0.49</td>
<td>0.61</td>
</tr>
<tr>
<td>sd</td>
<td>12.46</td>
<td>0.15</td>
<td>0.23</td>
</tr>
<tr>
<td><strong>NBDs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean</td>
<td>46.30</td>
<td>0.62</td>
<td>1.16</td>
</tr>
<tr>
<td>sd</td>
<td>5.96</td>
<td>0.06</td>
<td>0.27</td>
</tr>
</tbody>
</table>

The use of lexical verbs is normal when it comes to verb tokens ($t(18) = -0.1373$, $p = .8923$). Lemma frequencies of the produced tokens from the agrammatic group, as verified from a web-based Turkish corpus, are similar to those of the NBDs; a group comparison yielded no significant difference $^{30}$ ($t(199) = .123; p = .902$). However, like in the other studies, the diversity of the produced verbs is significantly reduced compared to NBDs ($t(18)=2.604; p = .018$). As expected, the number of verbs per utterance of the agrammatic speakers is reduced ($t(18) = 5.02; p = .0001$).

$^{30}$ The lemma frequencies were taken from the TS corpus (Sezer and Sezer, 2013). The comparison was done on LOG-transformed frequency scores. Mean verb lemma frequencies: agrammatic speakers=5.64, and NBDs=5.60.
3.3.3. Production of finite and non-finite verbs

Table 3.3 presents the data for the finite verbs and participles. The individual data are in Appendix B4. As expected, the Turkish agrammatic speakers have no problems with finite verbs: the number is similar as in NBD speech ($t(10) = -0.4708; p = .643$). The proportion of finite verbs (number of finite verbs divided by the number of finite+non-finite verbs) is also similar in both groups ($t(18) = 1.579; p = .132$).

In Turkish, non-finite verbs are described in three categories: infinitives, participles (in Object and Subject Relatives) and gerunds (in adverbial clauses). The agrammatic speakers’ use of infinitives and gerunds is normal as compared to the NBDs (infinitives: $t(18) = -0.211; p = .835$; gerunds $t(18) = -0.274; p = .787$). Since agrammatic speakers have problems with derived word order, a characteristic of Object / Subject Relatives in Turkish, it is expected that they will produce fewer participles than the NBDs. This is confirmed by our data ($t(18) = -2.717; p = .014$). Post-hoc comparisons showed that the agrammatic speakers produced fewer object participles than the NBDs did (1.00 vs. 3.30; $t(18) = -2.203; p = .040$). No group differences were found for the production of subject participles (1.00 vs. 0.40; $t(18) = -1.567; p = .135$), or any of the other participle forms (–mIş and –EcEk: both $p$s > .11).

31 The infinitives produced by all participants were in embedded clauses. However, agrammatic participant A10 (see Appendix B4) produced most of the infinitives in isolation and only few in embeddings.

32 Not to be confused with the indirect evidential –mIş. The participle –mIş is used in relative clauses and is not a finite verb nor does it make reference to indirect information. The indirect evidential and the participle –mIş were analyzed seperately.
Table 3.3. The means and standard deviations for the measures of verb inflection

<table>
<thead>
<tr>
<th></th>
<th># finite verbs</th>
<th>prop. finite verbs</th>
<th># non-finite verbs</th>
<th>Infinitives</th>
<th>Particiles</th>
<th>Gerunds</th>
</tr>
</thead>
<tbody>
<tr>
<td>agrammatic speakers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean</td>
<td>42.8</td>
<td>0.87</td>
<td>3.90</td>
<td>1.10</td>
<td>1.90</td>
<td></td>
</tr>
<tr>
<td>sd</td>
<td>9.78</td>
<td>0.10</td>
<td>4.88</td>
<td>1.44</td>
<td>1.85</td>
<td></td>
</tr>
<tr>
<td>NBDs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean</td>
<td>41.2</td>
<td>0.78</td>
<td>4.30</td>
<td>4.60</td>
<td>2.10</td>
<td></td>
</tr>
<tr>
<td>sd</td>
<td>9.53</td>
<td>0.14</td>
<td>3.46</td>
<td>3.80</td>
<td>1.37</td>
<td></td>
</tr>
</tbody>
</table>

3.3.4. Verb tense and evidentiality

In Table 3.4, the use of inflectional morphology for tense/aspect and evidentiality for both groups is given. The individual data are in Appendix B5.

Table 3.4. Means and standard deviations (sd) of the numbers and type token ratios (TTR) for the 3 most frequently used verb forms

<table>
<thead>
<tr>
<th></th>
<th>direct evidentials</th>
<th>indirect evidentials</th>
<th>present progressive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>number TTR</td>
<td>number TTR</td>
<td>number TTR</td>
</tr>
<tr>
<td>agrammatic speakres</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean</td>
<td>20.5 0.72</td>
<td>4.0 0.68</td>
<td>11.6 0.71</td>
</tr>
<tr>
<td>sd</td>
<td>11.3 0.14</td>
<td>3.06 0.32</td>
<td>5.82 0.19</td>
</tr>
<tr>
<td>NBDs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean</td>
<td>12.8 0.86</td>
<td>3.4 0.86</td>
<td>15.0 0.83</td>
</tr>
<tr>
<td>sd</td>
<td>8.0 0.13</td>
<td>2.59 0.31</td>
<td>7.51 0.16</td>
</tr>
</tbody>
</table>

There is no difference between the use of each type of inflection between the groups, although there is a trend for agrammatic speakers to produce more direct evidentials than the NBDs (direct evidentials: $t(18) = -$
Since the number of direct evidentials of the agrammatic speakers was surprisingly high, we inspected the raw data and looked at the diversity of the verbs that were used within each inflectional category.

The individual performances of the agrammatic speakers reveal a pattern similar to that of Bastiaanse and Jonkers (1998) and Anjarningsih and Bastiaanse (2011) with regard to the production of time reference. In particular, the Turkish agrammatic speakers who produce relatively many direct evidentials (a verb inflection that is difficult to them; Arslan et al., 2014), show little diversity of the lexical verbs used in direct-evidential forms and vice versa: agrammatic speakers who produce direct evidentials with a relatively high diversity produce relatively few of them. This is graphically represented in Figure 3.1. For the other tenses and for the healthy speakers this pattern is not found.

**3.3.5. Summary of results**

Turkish agrammatic speakers had a slow speech-rate and used short utterances, which were simple and often incorrect. They produced a normal number of lexical verbs on 200 words of narrative speech, but they used fewer verbs per utterance. The diversity of the verbs was reduced. However, verb inflection was retained as they produced as many finite verbs as the NBDs. The produced finite verbs were equally distributed over the main verb tenses: direct evidentials, indirect evidentials and present progressive, although the agrammatic speakers produced marginally more direct evidentials than the NBDs. Within these direct evidentials, there was a trade-off pattern between verb inflection and verb diversity in the agrammatic group. A similar pattern was not observed for the NBDs or for the other tenses. The agrammatic speakers produced fewer embeddings with non-finite verbs than the NBDs did yet, not all non-finite verbs were equally affected. The agrammatic speakers performed as normal in producing infinitives and gerunds, whereas they produced fewer participles than the
NBDs did. However, this was due to a reduced number of object participles; the number of other participles is normal.

Figure 3.1. Graphical representation of the number of direct evidentials (tokens) and the type token ratios (TTR). On the Y-axis are the ranks (median is 5). Each black and white pair represents one agrammatic speaker.

3.4. Discussion

3.4.1. General characteristics of agrammatic aphasia

Since not much is known about agrammatic narrative speech in agglutinative languages, we first analyzed whether the general characteristics were reflected in Turkish. The general characteristics are: slow, non-fluent speech, with reduced sentence complexity. The speech of the Turkish agrammatic speakers was indeed slow: the speech rate was reduced compared to that of NBDs. Grammatical abilities were also
compromised: the utterances of the agrammatic speakers were shorter and more often incorrect, and the number of embeddings with non-finite verbs was lower than normal. The question was whether narrative speech of Turkish agrammatic speakers disturbed along similar lines as in other languages and the data show that this is indeed the case.

3.4.2. Production of lexical verbs

The second question was whether production of verbs in Turkish agrammatic speech is impaired. As expected, the number of lexical verbs on the 200 words sample was similar for both groups, like it was in other languages in which the analysis was done over a fixed number of words (Abuom and Bastiaanse, 2012; Anjarningsih et al., 2012; Anjarningsih and Bastiaanse, 2011; Bastiaanse and Jonkers, 1998). However, since the agrammatic speakers have a reduced utterance length, they produce more utterances. When this is taken into account and the numbers of verbs per utterance are compared between agrammatic and NBDs, the differences between the groups emerge: the agrammatic speakers produce fewer verbs per utterance. This is in line with the results of authors who analyzed samples of certain duration (Saffran et al., 1989) or retold fairy tales (e.g., Thompson et al., 2010)

Although the agrammatic speakers produce the same number of verbs, the information they provide with these verbs is limited: the diversity, as measured with a type-token ratio is lower than normal. This lack of variation in verb use has been reported before for Dutch (Bastiaanse and Jonkers, 1998), Indonesian (Anjarningsih et al., 2012) and Italian (Crepaldi, Ingignoli, Verga, Contardi, Semenza and Luzzatti, 2011) agrammatic speakers.
3.4.3. Verb finiteness

The third question was whether the use of finite verbs and non-finite verbs (i.e., infinitives, participles, and gerunds) was affected in Turkish agrammatic speech. Since Turkish is an agglutinative language in which bare verb stems are not allowed, we did not expect omission of verb inflections, but not all verb inflections are equally affected. In non-agglutinative languages, such as Dutch and English, verbs that are inflected for tense and agreement with the subject (i.e., finite verbs) are impaired. However, this has not been shown in agrammatic narrative speech in another agglutinative language: Swahili. The bilingual agrammatic speakers of Abuom and Bastiaanse (2012) had problems with finite verbs in English, but not in Swahili. The authors argued that this was the case because in Swahili, Tense and Agreement morphemes cannot be omitted. However, contrary to what Grodzinsky (1991; 1999) suggested and what Miceli et al. (1989) reported for part of their agrammatic speakers, the bilingual agrammatic speakers did not make substitution errors in Swahili. Most of their finite verbs in Swahili were correct. The same holds for the Turkish agrammatic speakers in the current study: they produce a normal proportion of finite verbs and these are predominantly used correctly. This is in line with the predictions of Goral (2011) who suggests that regular verb inflection paradigms are relatively spared, but not with Menn and Obler (1990) who argue that the number of allomorphs is the critical factor.

If agrammatic speakers only have problems with finite verbs, it is expected that the use of non-finite verbs will be normal. This is, however, not the case: they produce fewer participles (but not infinitives or gerunds) than the NBDs. Adding onto the findings of Aydın (2007) and Yarbay Duman et al. (2008), only object participles are found to be reduced (despite the very scarce use of the subject participle in both groups). This may be due to several reasons. One is that the object participles in relative clauses are morphologically marked for agreement and time reference: the object participle expresses non-future (i.e., present and/or past) events. Subject participles, by contrast, do not require agreement marking and they do not make time reference. Both the object and subject participles require derived word order whereas other non-finite forms (infinitives or gerunds) do not.
Another reason why fewer object participles are produced in the agrammatic speech may be the complexity of the construction in which they appear. Kornfilt (1997) argues, for instance, that the Object Relatives have rather complex syntactic representations: the Object Relatives require subject agreement whereby the subject is assigned genitive case. The Subject Relatives, by contrast, do not require subject agreement and genitive case assignment. According to Yarbay-Duman, Altinok, Özgirgin and Bastiaanse’s (2011) Integration Problem Hypothesis, integrating information provided by derived word order and non-base case adds to the problems of agrammatic speakers. On the basis of the current data it is impossible to decide whether the lack of object participles is due to a problem with inflection or because these participles are associated with object relativization. It is worthwhile to develop an experiment to find out what underlies the spare use of participles in Turkish narrative speech.

### 3.4.4. Evidentials

The final research question was whether the use of direct and indirect evidentials is affected in Turkish agrammatic speech. Evidentiality is obligatorily marked on finite verbs that refer to the past. In earlier experimental studies, it was shown that Turkish agrammatic speakers have problems using verbs referring to the past (Yarbay-Duman and Bastiaanse, 2009; Bastiaanse et al., 2011) and that, within this category, direct evidentials are most impaired (Arslan et al., 2014). At the first sight, this is not reflected in the narrative speech data. The agrammatic speakers do not have more problems to refer to the past than to the present in their narrative speech and the frequency of marking for evidentiality is normal. This is comparable to the findings of Anjarningsih and Bastiaanse (2011): the SI-speaking agrammatic speakers used relatively fewer aspectual adverbs, but the distribution of reference to past, present and future was the same for the agrammatic and NBD speakers.

Although the frequency of morphemes referring to the past is normal for both direct and indirect evidentials, a post-hoc analysis revealed that
there is a trade-off pattern. Such a trade off pattern was observed earlier between time reference markers in Dutch and SI and diversity of the produced verbs. This is also visible in Turkish, but only for direct evidentials. Direct evidentials refer to an event in the past that is witnessed by the speaker. It was shown by Arslan et al. (2014) that these verb forms are more difficult for agrammatic speakers than indirect evidentials (that refer to an event that was heard of or inferred) and than verbs with present and future tense (Bastiaanse et al., 2011; Yarbay Duman and Bastiaanse, 2009). Recall that the direct evidential is used in personal narratives while the indirect evidential is the typical form for story-telling. The trade-off pattern cannot be attributed to the use of evidentials as narrative markers, as both groups have an equal number of instances of both personal narration and story-telling which were analysed. Alternatively, Bastiaanse (2013) suggests that what makes finite verbs in narrative speech difficult for agrammatic speakers is the fact that the name of the event should be retrieved and inflected for the time frame in which the event takes place. This requires a high processing load. The current data suggest that this is most difficult for verb forms that need to be linked to events that one witnessed.

Although the number of evidential verb forms is similar in agrammatic speakers and NBDs, in analogy to the findings in Swahili (Abuom and Bastiaanse, 2012), the agrammatic group provides less information with these verbs. However, there are important individual differences here: those agrammatic speakers who produce relatively many direct evidential markers, do not provide much information with them (as shown by the relatively low diversity); whereas those agrammatic speakers who provide relatively much information with direct evidentials (high diversity) use them relatively less frequently. These problems with grammatical morphemes that relate the event to the time frame in which it happened have been observed before for verb inflections in Dutch and aspectual adverbs in SI. In SI, such a pattern was observed for all time frames (for Dutch no analysis per time frame was done). In Turkish, this only holds for direct evidentials. This trade-off was not observed in Swahili, but in this language, reference to the past in narrative speech was impaired. What seems to be the common denominator here is that the verb forms for which discourse linking is required are difficult: direct evidentials in
Turkish, past tense in Swahili and all aspectual adverbs in SI require discourse linking, as suggested by Zagona (2003). This morphological information needs to be parsed by discourse syntax, which is hard for agrammatic speakers (Avrutin, 2000; 2006; Bastiaanse et al., 2011; Bos and Bastiaanse, 2013).
Psycholinguistic aspects of evidentiality: *studies on heritage bilingualism*