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Verbs and time reference in Standard Indonesian agrammatic speech

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Background: It has been shown for a number of languages that verb retrieval and verb inflection are impaired in agrammatic speech. Several studies showed that, while some agrammatic speakers are relatively good in verb retrieval but poor in verb inflection, others show the inverse pattern (Dutch: Bastiaanse & Jonkers, 1998; Italian: Rossi & Bastiaanse, 2008, among others). However, not all languages use verb inflection to express sentence internal and external relationships, such as agreement, tense, and aspect; some use free-standing grammatical morphemes instead. Standard Indonesian (SI) is such a language.

Aims: The aim of the current study is to find out whether the production of free-standing grammatical morphemes—which specify time frame and are thus comparable to tense and aspect inflection in other languages—is impaired in SI agrammatic spontaneous speech, and whether there is a similar inverse relationship between verb retrieval and the use of these morphemes, as suggested by findings on verb inflection in other languages.

Methods & Procedures: A total of 21 adult speakers of SI (6 with Broca’s aphasia with mild to moderate agrammatic speech and 15 without history of neurological problems) participated in the study. From the speech of each participant 300 words were extracted, and the occurrence of verbal predicates, aspectual adverbs, and lexical adverbs of time was counted. Type-token ratios (TTR) were used to express the diversity of lexical verbs produced, and the proportion of aspectual and temporal lexical adverbs per verbal predicate was calculated for all participants.

Outcomes & Results: An inverse relationship was observed between the verb variability and the proportion of aspectual adverbs. The agrammatic participants who used a low proportion of aspectual adverbs did not compensate with over-production of lexical adverbs.

Conclusions: Based on the results of the current study we propose that the inverse relationship between lexical diversity of the verbs and the use of aspectual adverbs reflects the same underlying deficit as the inverse relationship between lexical diversity of verbs and verb inflection observed in Dutch and Italian. Apparently it is difficult for agrammatic...
speakers to simultaneously retrieve verbs (names of the events) and specify the time frame in which the events take place. This has some important clinical implications.

**Keywords:** Indonesian; Agrammatism; Spontaneous speech; Time reference; Bahasa Indonesia.

It has been shown for many languages that production of verbs and verb inflection is impaired in agrammatic spontaneous speech (Dutch: Bastiaanse, & Jonkers, 1998; English: Saffran, Berndt, & Schwartz, 1989; Italian: Miceli, Mazzucchi, Menn, & Goodglass, 1983; Rossi & Bastiaanse, 2008). Bastiaanse and Jonkers (1998) and Miceli et al. (1983) showed that verb retrieval and verb inflection can be independently reduced: some agrammatic speakers produce a normal number of lexical verbs with a normal diversity as measured by a type-token ratio but are poor in verb inflection, whereas others produce a normal proportion of finite verbs in combination with a low number or a low diversity of lexical verbs. It has been demonstrated that reduced verb retrieval in agrammatic spontaneous speech is not related to these patients’ poor performance on action naming (Bastiaanse & Jonkers, 1998; Crepaldi et al., 2011). Thus, assuming that agrammatism is primarily a deficit in grammatical encoding (rather than a word retrieval deficit), the spontaneous speech data suggest that production of lexical verbs in spontaneous speech is hampered by the need to inflect the verbs for tense and agreement. The feature “tense” seems to be particularly vulnerable. Tense is used to set the time frame in which the event took, is taking, or will take place. This means that a semantic notion (time) has to be expressed by grammatical morphology. It is this operation that makes tense difficult for agrammatic speakers (Bastiaanse, 2008; Bastiaanse et al., 2011; Burchert, Swoboda-Moll, & De Bleser, 2005; Clahsen & Ali, 2009; Faroqi-Shah & Dickey, 2009; Lee, Milman, & Thompson, 2008; Wenzlaff & Clahsen, 2004, 2005). However, data from Greek patients (Nanousi, Masterson, Druks, & Atkinson, 2006; Stavrakaki & Kouvava, 2003) suggest that it is not only tense that is impaired in agrammatic speech, but that aspect is affected as well. Aspect does not set the time frame (past, present, future) of the event, but rather specifies whether the event is finished (perfect) or still going on (imperfect). Agreement (e.g., person and number) seems to be less vulnerable than tense and aspect. Therefore it is plausible that the inverse relationship between verb diversity and verb inflection reported by Bastiaanse and Jonkers (1998) reflects an inability to perform the double task of retrieving the name of the event (the lexical verb) and expressing the time frame of the event: good retrieval is combined with poor verb inflection and vice versa.

In the languages that have been studied so far the time in which the event takes place is grammatically expressed either directly on the verb (e.g., “writes”, “wrote”) or by a periphrastic verb form (e.g., “has written”, “is writing”, “will write”). The current study investigates whether the production of lexical verbs in spontaneous speech is indeed hampered solely by the requirements of verbal inflection, with no relationship to time reference, or hampered by the requirements of expressing time reference through verbal inflection. To do this we turned to Standard Indonesian (SI), in which verbs are not inflected for tense and agreement, but where verbal predicates can be modified by aspectual adverbs to specify whether events are complete, ongoing, beginning to happen, or will happen in the future. The aspectual adverbs are free-standing function words, which cannot be produced on their own and must appear with the verbs they modify. In the next section some relevant features with regard to verbs and time reference in SI will be given.
SI is a language that has no verb inflection for tense, aspect, or agreement. Aspectual adverbs are free-standing grammatical morphemes that are used to express the time frame of the event grammatically. SI, just like Indo-European languages, also uses temporal lexical adverbs to specify the time frame. Below we present in more detail the features of SI that are investigated in the current study.

Lack of verb inflection for tense, aspect, and subject–verb agreement

Grammatical clauses in SI are composed of at least a subject and a predicate, the latter being a verb-, noun-, adjective-, numeral-, or prepositional-phrase. There are no inflectional morphemes attached to predicates to mark tense, aspect, or subject–verb agreement. Therefore verbal predicates such as the ones below form grammatical clauses in SI and look very different from analogous clauses in English, Dutch, or German, which require verbs with tense, aspect, and agreement affixes (i.e., eats, eat, and ate).

1) Azka makan nasi setiap pagi
   “Azka eats rice every morning”
2) Azka dan Diana makan nasi setiap pagi
   “Azka and Diana eat rice every morning”
3) Azka makan nasi kemarin sore
   “Azka ate rice yesterday afternoon”

The use of adverbs to mark aspectual information

When speakers of SI want to express the internal organisation of verbal, adjectival, and numeral predicates, aspectual adverbs are used. These aspectual adverbs always come before the predicates that they modify. Following the terminology of Kridalaksana (2007), these are duratif1 (sedang, lagi: “is V–ing”), imperfektif (masih: “still”), perfektif (pernah, sudah, telah: “already”), and inkoatif (mulai: “beginning to”). These aspectual adverbs are non-deictic and do not anchor an event in time (Grangé, 2003), which means that aspectual adverbs do not mention when events or situations happen. For example, the use of the perfektif aspectual adverb sudah does not guarantee that the event described happened in the past; sudah can also be used to describe events that happen in the future.

4) Besok [pukul empat] Azka sudah makan roti buaya
   “Tomorrow at four o’clock Azka will have eaten the crocodile-shaped bread”

Regarding future events, the modal adverbs mau or akan are used, which translate into “will” in English. However, syntactically they behave similarly to the aspectual

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1 We use the terms used by Kridalaksana (2007) and follow his definitions of the terms. This is for theoretical as well as practical reasons; in the literature of aspect different terms have been proposed by different authors studying different languages, and a full comparison of the terms is beyond the scope of this paper.
adverbs, and in the current study the modals meaning “will” are labelled as future-aspectual adverbs and are treated on par with the duratif, imperfektif, perfektif, and inkoatif aspectual adverbs. The use of the aspectual adverbs is illustrated in (5–9).

5) Azka sedang makan
Azka duratif eat
“Azka is eating or Azka was eating (at some time in the past)”

This sentence can be taken as meaning “now Azka is eating” or “at some time in the past Azka was eating” depending on the context of the utterance. This dependence on context for the English translations can also be seen for the following sentences.

6) Azka masih makan
Azka imperfektif eat
“Azka is still eating” or “Azka was still eating”

7) Azka sudah makan
Azka perfektif eat
“Azka has eaten” or “Azka ate” (at some time in the past) or “Azka had eaten”

8) Azka mulai makan
Azka inkoatif eat
“Azka begins to eat” or “Azka has begun to eat” or “Azka began to eat” or “Azka had begun to eat”

9) Azka akan makan
Azka future eat
“Azka will eat” or “Azka would eat”

The use of temporal lexical adverbs to mark time reference

If a speaker wants to emphasise the time frame of an event, temporal lexical adverbs are used (e.g., “yesterday”, “now”, “later”). This explicit use of lexical temporal adverbs also occurs when a speaker or writer mentions an action, event, or state for the first time so that conversational partners or readers know where to anchor the action, event, or state in time. The usage is very similar to that of English. Lexical temporal adverbs can occur in three positions in a clause, all of which are outside the scope of VP, as shown in (10–12).

10) Besok Azka pergi ke Jayapura
    Tomorrow Azka go to Jayapura
    “Tomorrow Azka will go to Jayapura”

11) Azka besok pergi ke Jayapura
    Azka tomorrow go to Jayapura
    “Azka will go to Jayapura tomorrow”

12) Azka pergi ke Jayapura besok
    Azka go to Jayapura tomorrow
    “Azka will go to Jayapura tomorrow”

It is important to notice that aspectual adverbs and temporal lexical adverbs can be used separately or in combination. SI sentences without either of these two adverbs are also very common. The verbal predicates lacking temporal and aspectual adverbs should be discourse-licensed; it must be clear from context when the events happen or what the internal organisations of the events are. This is different from, for example, English and Dutch, where the time frame must be explicitly expressed by the verb
An example of the sentences lacking temporal and aspectual adverbs is given below.

13) MARJOSO

All right Sir Kyai I offer chance

“All right, Sire. I have offered a chance”

Sersan! Has the shooting troop readied?

Sergeant! Perfectif ready troop shoot?

“Sergeant! Has the shooting troop readied?”

SERSAN

Ready, Sir!

“Ready, Sir”

[Drama Fajar Siddiq, by Emil Sanossa, lines 115–116]

In the answer of the sergeant he does not repeat the perfectif aspectual marker sudah spoken by his superior (Marjoso) because presumably the shooting troop can already be seen in the field where the execution will take place and they have their rifles ready.

Verbs and predicates

In SI several kinds of predicates are distinguished: verbal, nominal, adjectival, numeral, and prepositional phrases. It is important to note that only the nominal predicates cannot be modified by aspectual adverbs, whereas all predicates can be modified by lexical adverbs of time. For a more extensive analysis regarding predicates in Indonesian, see Anjarningsih, Haryadi-Soebadi, Gofir, & Bastiaanse, 2011.

For the present study, only verbal predicates, and time reference adverbs (aspectual and lexical) modifying them were tallied.

RESEARCH QUESTIONS

According to Bastiaanse and Jonkers (1998), the inverse relationship between verb diversity and verb inflection observed in their study reflects the inability of the (Dutch) agrammatic speakers to simultaneously retrieve a verb and inflect it for tense and agreement. They termed this a “trade-off effect”, which we interpret as an integration deficit: relatively good verb retrieval pairs with a reduced proportion of finite verbs and the other way around. The first question for the present study is whether this inverse relationship is due to the fact that the use of a verb in Dutch requires that a lexical item is retrieved and inflected for tense and aspect, a kind of double task on the same word, or to the fact that the name of an event must be retrieved and the time frame in which the event takes place must be specified. If it is a matter of a double task on the verb, then a similar trade-off effect should not be found in SI agrammatic speech, since the aspectual adverb is a free-standing morpheme. However, if the combination of verb retrieval and time frame specification is the problem, then there should be an inverse relationship in SI agrammatic speech as well: good verb retrieval would then be accompanied by poor use of aspectual adverbs, and vice versa.

Kyai roughly means a scholar in Islamic sciences and teachings.
Since aspectual adverbs are grammatical morphemes that also contain semantic information (i.e., reference to perfectivity and imperfectivity) and since such grammatical morphemes are hard to produce for agrammatic speakers, it is expected that SI-speaking agrammatic speakers will produce proportionally fewer aspectual adverbs than non-brain-damaged speakers (NBDs). The second question of the current study is whether the lack of aspectual adverbs will be compensated or accompanied with an overuse of temporal lexical adverbs. This is not inconceivable: temporal lexical adverbs are content words that are usually not seriously affected in agrammatic aphasia. However, if specifying the time frame of an event is the problem, then such compensation is not to be expected, because temporal lexical adverbs also specify the time frame in which the event takes place.

**METHOD**

**Participants**

We recruited six speakers with Broca’s aphasia, as determined by the *Tes Afasia untuk Diagnosis, Informasi, dan Rehabilitasi* (TADIR; Dharmaperwira-Prins, 1996). The characteristics of SI agrammatic speech were reported in a separate study (Anjarningsih et al., 2011). The aphasia in five of these participants resulted from a stroke and they were more than 3 months post-onset at the time they were interviewed. One aphasic participant (P4) suffered from a second stroke a month before being interviewed for the current study. Due to limited access to CT scanners and/or a great distance between the participants’ houses and hospitals that have CT scanners, no information is available on the locus of the lesion. Demographic details of the participants are presented in Table 1.

In Table 2 we give the scores of the relevant tests from the TADIR for the six aphasic participants. The TADIR is a simple standardised test for the classification of aphasia with cut-off scores for aphasic data. It is the only formal test available for Indonesian. It provides a method for classifying aphasia in one of the classical aphasia types (including “mixed” aphasia). All six aphasic participants were classified as suffering from Broca’s aphasia. They spoke non-fluently; their speech rate and mean utterance length were reduced. Their speech was qualified as agrammatic (Anjarningsih et al., 2011).

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>Handed-ness</th>
<th>Years of education</th>
<th>Professional background</th>
<th>Time post-onset</th>
<th>Dialect of Indonesian spoken</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>55</td>
<td>m</td>
<td>Left</td>
<td>Security guard at various factories</td>
<td>&gt; 3 months</td>
<td>Flores</td>
</tr>
<tr>
<td>P2</td>
<td>65</td>
<td>m</td>
<td>Right</td>
<td>Owner of a small grocery stall</td>
<td>&gt; 2 years</td>
<td>Jakarta</td>
</tr>
<tr>
<td>P3</td>
<td>65</td>
<td>m</td>
<td>Right</td>
<td>Worker at glass factory and taxi driver</td>
<td>&gt; 4 years</td>
<td>Jakarta</td>
</tr>
<tr>
<td>P4</td>
<td>59</td>
<td>m</td>
<td>Right</td>
<td>Administration staff at private company</td>
<td>&gt; 1 month</td>
<td>Central Java</td>
</tr>
<tr>
<td>P5</td>
<td>54</td>
<td>m</td>
<td>Right</td>
<td>University lecturer</td>
<td>&gt; 3 months</td>
<td>Central Java</td>
</tr>
<tr>
<td>P6</td>
<td>41</td>
<td>f</td>
<td>Right</td>
<td>Housewife</td>
<td>&gt; 1 year</td>
<td>East Java</td>
</tr>
</tbody>
</table>
### TABLE 2
Raw scores of relevant oral/auditory TADIR subtests

<table>
<thead>
<tr>
<th>No. animal names produced in 1 min</th>
<th>Word-level picture naming (max. 8)</th>
<th>Words per minute</th>
<th>Auditory word and sentence comprehension (max. 10; word = 4, sentence = 6)</th>
<th>Word and sentence repetition (max. 4; word = 2, sentence = 2)</th>
<th>Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>6</td>
<td>6</td>
<td>35</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>P2</td>
<td>8</td>
<td>7</td>
<td>55</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>P3</td>
<td>8</td>
<td>6</td>
<td>58</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>P4</td>
<td>3</td>
<td>3</td>
<td>45</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>P5</td>
<td>7</td>
<td>7</td>
<td>23.5</td>
<td>8.5</td>
<td>3</td>
</tr>
<tr>
<td>P6</td>
<td>9</td>
<td>7</td>
<td>19</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>NBDs</td>
<td>&gt; 10</td>
<td>8</td>
<td>80–119</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

Dharmaperwira-Prins, 1996. NBDs = Non-brain-damaged speakers. Only oral/auditory data are given because some participants with aphasia could not read or write.

2011). They had no apraxia or dysarthria that might have had an effect on speech intelligibility.

We also recruited 15 non-brain-damaged speakers (NBDs) without any history of neurological disease. These NBDs were matched as well as possible for gender, age, educational background, and professional background to the agrammatic participants (P1 matched to C1, C2, and C3; P2 and P3 matched to C4 and C5; P4 matched to C6, C7, C8, and C9; P5 matched to C10, C11, and C12; P6 matched to C13, C14, C15). Matching the education and professional background is essential for Indonesian because SI is taught and acquired at school age for most of Indonesians, and Indonesians with a higher socio-economic status tend to be exposed to, and to speak, a more standard form of the language than those from the lower socio-economic classes. Therefore this background matching is required to control the influences of length, level of education, and work environment on the participants’ language production. Demographic details of the NBDs are presented in Table 3.

#### Materials and procedure

A semi-standardised interview was audio-recorded and orthographically transcribed. Four questions were asked. The first two were directed at the past:

1. Can you tell me about your stroke?
2. Can you tell me about your work before the stroke?

Two other questions were asked to elicit reference to the present time:

1. Can you tell me about your family?
2. Can you tell me about your hobby?

For the NBDs, questions 3 and 4 were the same, but question 1 was changed to “Can you tell me about the worst health problem you have had?” and question 2 to “Can you tell me about your previous work?”
TABLE 3
Demographic details of the non-brain-damaged speakers (NBDs)

<table>
<thead>
<tr>
<th>Matched with</th>
<th>NBD</th>
<th>Gender</th>
<th>Age</th>
<th>Handedness</th>
<th>Years of education</th>
<th>Professional background</th>
<th>Dialect of Indonesian spoken</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>C1</td>
<td>m</td>
<td>50</td>
<td>Right</td>
<td>1</td>
<td>Second-hand shop keeper</td>
<td>Flores</td>
</tr>
<tr>
<td></td>
<td>C2</td>
<td>m</td>
<td>51</td>
<td>Right</td>
<td>3</td>
<td>Truck driver</td>
<td>Flores</td>
</tr>
<tr>
<td></td>
<td>C3</td>
<td>m</td>
<td>56</td>
<td>Right</td>
<td>5</td>
<td>Owner of a small grocery store at home</td>
<td>Flores</td>
</tr>
<tr>
<td>P2</td>
<td>C4</td>
<td>m</td>
<td>55</td>
<td>Right</td>
<td>10</td>
<td>Private driver of a manager</td>
<td>Jakarta</td>
</tr>
<tr>
<td>P3</td>
<td>C5</td>
<td>m</td>
<td>63</td>
<td>Right</td>
<td>12</td>
<td>Technician at a telecommunication company</td>
<td>Jakarta</td>
</tr>
<tr>
<td>P4</td>
<td>C6</td>
<td>m</td>
<td>56</td>
<td>Right</td>
<td>12</td>
<td>Administration staff at a government office</td>
<td>Central Java</td>
</tr>
<tr>
<td></td>
<td>C7</td>
<td>m</td>
<td>57</td>
<td>Right</td>
<td>12</td>
<td>Administration staff at a government office</td>
<td>Central Java</td>
</tr>
<tr>
<td></td>
<td>C8</td>
<td>m</td>
<td>66</td>
<td>Right</td>
<td>13</td>
<td>Researcher at a provincial research institute</td>
<td>Central Java</td>
</tr>
<tr>
<td></td>
<td>C9</td>
<td>m</td>
<td>63</td>
<td>Right</td>
<td>12</td>
<td>Assistant manager</td>
<td>Central Java</td>
</tr>
<tr>
<td>P5</td>
<td>C10</td>
<td>m</td>
<td>51</td>
<td>Right</td>
<td>20</td>
<td>Lecturer</td>
<td>Jakarta</td>
</tr>
<tr>
<td></td>
<td>C11</td>
<td>m</td>
<td>57</td>
<td>Right</td>
<td>20</td>
<td>Lecturer</td>
<td>Jakarta</td>
</tr>
<tr>
<td></td>
<td>C12</td>
<td>m</td>
<td>52</td>
<td>Right</td>
<td>20</td>
<td>Lecturer</td>
<td>Jakarta</td>
</tr>
<tr>
<td>P6</td>
<td>C13</td>
<td>f</td>
<td>40</td>
<td>Right</td>
<td>9</td>
<td>Housewife</td>
<td>East Java</td>
</tr>
<tr>
<td></td>
<td>C14</td>
<td>f</td>
<td>45</td>
<td>Right</td>
<td>9</td>
<td>Housewife</td>
<td>East Java</td>
</tr>
<tr>
<td></td>
<td>C15</td>
<td>f</td>
<td>40</td>
<td>Right</td>
<td>9</td>
<td>Housewife</td>
<td>East Java</td>
</tr>
</tbody>
</table>

Analysis

From each spontaneous sample, 300 words were orthographically transcribed. This number is sufficient for a reliable and valid analysis (Vermeulen, Bastiaanse & van Wageningen, 1989). The samples were composed in such a way that there was an equal number of words (around 75) for each of the four questions. This sample was analysed by a trained linguist (the first author) and, independently, by an assistant with a degree in Linguistics, specialising in Indonesian linguistics, who was not informed about the status of the participants (agrammatic or not). The few and minor disagreements were discussed and solved.

Each sample was segmented into sentences, and each sentence into clauses. The lexical verbs that formed the predicate of clauses (comparable to finite verbs in Indo-European languages) were counted and the number of different verbs was tallied. Type-token ratios (TTR) for the verbs were then calculated for each participant (number of different verbs divided by the total number of verbs).\(^3\)

\(^3\)Since the sample size was equal for each participant and only one word class (lexical verbs) was involved, the figures we used were reliable, especially since the number of verb tokens was more or less equal in all participants (Malvern & Richards, personal communication).
The following aspectual adverbs were counted: “pernah”, “sudah”, and “telah” (perfektif markers), “sedang” and “lagi” (duratif markers), “masih” (imperfektif marker), “mau” and “akan” (future markers), and “mulai” (inkoatif marker). First, all aspectual adverbs occurring with verbal, adjectival, and numeral predicates were counted. Since we concentrated on the production of the verbs and aspectual adverbs (which form a verb phrase) for comparison with the finite verbs of Indo-European languages, we then counted the number of aspectual adverbs occurring with verbal predicates. The number of aspectual adverbs was divided by the total number of verbal predicates in the 300-word corpus, yielding the percentage of aspectual adverbs per verbal predicate for each participant.

The same procedure was followed for temporal lexical adverbs to find out whether potential problems with the production of aspectual adverbs in combination with verbal predicates was also encountered in producing temporal lexical adverbs.

RESULTS

Number and variability of lexical verbs

The results are given in Table 4. Some actual sentences spoken by some of the participants with agrammatism are given below.

13) Perlu sama bos
   Need with boss
   “(I) need the boss”

14) Kalau apel, masih diblender
   If apple, still passive-blend (by a blender machine)
   “For apple, is still blended (by a blender machine)”

<table>
<thead>
<tr>
<th>Verb types</th>
<th>Verb tokens</th>
<th>Type-token ratio</th>
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<td>68</td>
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<td>33</td>
</tr>
<tr>
<td>C2</td>
<td>15</td>
<td>29</td>
</tr>
<tr>
<td>C3</td>
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<td>32</td>
</tr>
<tr>
<td>P2</td>
<td>23</td>
<td>40</td>
</tr>
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<td>P3</td>
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<td>44</td>
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</tr>
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<td>C9</td>
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</tr>
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<td>C14</td>
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<td>31</td>
</tr>
<tr>
<td>C15</td>
<td>30</td>
<td>44</td>
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</table>
15) Terus saya jatuh di situ
Then I fall at there
“Then I fell there”

Following Bastiaanse and Jonkers (1998), number and TTR of the lexical verbs were calculated for all participants. P1, P3, and P6 produced more lexical verb types per 300 words than their NBDs, and P2, P4, and P5 scored just within the normal range. Also the diversity of verbs (tokens) for P1, P3, and P6 is higher than normal; P2 and P4 scored just within the normal range. P5 produced more tokens than his NDBs.

When the TTR of the verbs is considered we see that P1 and P6 scored within the normal range, and P2, P3, P4, and P5 scored below the normal range. All in all, P1 and P6 do not seem to be impaired in the use of their lexical verbs in the 300-word samples. P2, P3, P4, and P5, however, seem to have problems using a normal variety of lexical verbs.

Aspectual and lexical adverbs

The production of aspectual and temporal adverbs of both groups is given in Table 5. Both P3 and P6 produced fewer aspectual adverbs per 300 words than their NBDs; moreover, the number of aspectual adverbs occurring with verbal predicates is outside the range of their control participants. P1’s and P4’s raw number of aspectual

<table>
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<td>2</td>
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<tr>
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<td>16</td>
<td>11</td>
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<td>P2</td>
<td>9</td>
<td>6</td>
<td>5</td>
<td>–</td>
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<tr>
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<td>2</td>
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<tr>
<td>C15</td>
<td>10</td>
<td>8</td>
<td>7</td>
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</tbody>
</table>

wvp = adverbs occurring with verbal predicates; Perf. = perfektif; Dur. = durative; Imperf. = imperfektif; Fut. = future; Incho. = inchoative. For the lexical adverbs it is indicated whether they refer to past, present, or future.
adverbs is quite normal: the number of aspectual adverbs they produced is within the normal range and the number of aspectual adverbs occurring with verbal predicates is virtually normal. P2 and P5 produced more aspectual adverbs in general.

All agrammatic and all NBD speakers produce _perfektif_ markers. Remarkably, four of the six agrammatic speakers do not produce any _imperfektif_ markers, whereas all but one of the control speakers do. The use of other aspectual adverbs is more or less similar in agrammatic speakers and NBDs. It is important to realise, however, that the number of utterances of the agrammatic speakers is much higher than in the NBDs because the agrammatic utterances are considerably shorter and a fixed number of words (300) was analysed. To get a realistic picture of the use of aspectual adverbs, we calculated the number of aspectual adverbs per verbal predicate. Hence it was calculated how frequently an aspectual adverb was used when a verbal predicate was produced. The results are given in Table 6.

P1, P3, and P6 produced proportionately fewer aspectual adverbs per verbal predicate than their matched NBDs, whereas P2, P4, and P5 produced the aspectual adverbs in normal/above normal frequency.

The first question was whether the inverse relationship reported by Bastiaanse and Jonkers (1998) between the diversity of lexical verbs and verb inflection is also observed in Indonesian agrammatic speech. Instead of verb inflection, we compared the number of aspectual adverbs that express event time, similar to Tense in Dutch, per verb predicate with the type token ratio of the verbal predicates. In Figure 1 we first show the patterns found in the NBDs.

On the X-axis the individual NBDs are given (C1–C15). On the Y-axis the ranks for TTR (black bars) and for the proportion of verbal predicates with an aspectual adverb (white bars) are plotted. The X and Y-axis cut at the median rank (8). As can be seen,
there are four different patterns: relatively low ranks for both variables (C1, C2, C7, C12) relatively low rank for TTR but high rank for proportion of verbal predicates with an aspectual adverb (C3, C6, C14, C15), relatively low rank for proportion of verbal predicates with an aspectual adverb but high rank for TTR (C5, C10, C11, C13), and high ranks for both TTR and proportion of verbal predicates with an aspectual adverb (C4, C8, C9).

The results for the agrammatic participants are shown in Figure 2. On the X-axis the individual agrammatic speakers are given (P1–P6). On the Y-axis the ranks for TTR (black bars) and for the proportion of verbal predicates with an aspectual adverb (white bars) are plotted. The X and Y-axis cut at the median rank (3.5). The results of this comparison show one single pattern that is remarkably similar to that of Bastiaanse and Jonkers (1998) for their Dutch group of agrammatic speakers: there is an inverse relationship between the ability to retrieve a variety of verbal predicates and to express the time frame of the event grammatically. P1, P3, and P6 are relatively good at producing verbal predicates with a roughly normal diversity, but their production of aspectual adverbs accompanying these verbal predicates is relatively poor. P2, P4, and P5 are relatively good at expressing the time frame of the predicates, but this comes at the cost of verb retrieval: there is relatively little diversity in the verbs they use. Notice, however, that the absolute difference between the TTRs of P3 and P5 is quite small (P3: 0.614; P5: 0.611).

The second question was whether agrammatic speakers would compensate for their poor use of aspectual adverbs with an over-production of lexical/temporal adverbs. The relevant data are given in Table 6. On the one hand, between the two participants with aphasia whose production of aspectual adverbs was below the normal range.
Figure 2. Relation between type-token ratio of verbal predicates (TTR) and percentage of aspectual adverbs used with verbal predicates (P1–P6 are the individual agrammatic speakers; the values on the Y-axis are ranks (median of ranks = 3.5)).

(P3 and P6), only P6 seemed to compensate for her poor use of aspectual adverbs by producing more lexical adverbs, but this was only apparent in the number of lexical adverbs produced with verbal predicates and not in the percentage of the lexical adverbs used with the verbal predicates. P3 was not only poor in the production of aspectual adverbs, but his use of temporal lexical adverbs fell below the normal range as well. On the other hand, P1 and P5 show a different pattern that does not support the idea of compensation. P1’s production of aspectual adverbs was normal, but his production of lexical adverbs is below the normal range. For P5, his number of lexical adverbs produced was normal but the proportion of those lexical adverbs was below normal. P2 and P4 show normal or above normal performance on both aspectual and lexical adverbs.

DISCUSSION

This study focused on the relation between verb retrieval and the use of grammatical morphology for time reference. The data show that agrammatic speakers produce a normal number of lexical verbs, but that the verb diversity is reduced in several agrammatic speakers. These are those participants who produce a relatively large number of aspectual adverbs. This means that they do not give much information with their verbs, but they put the events that they refer to in a time frame. The other agrammatic speakers demonstrate the opposite pattern: they produce a normal number of lexical adverbs with a high diversity compared to the entire group. However, the number of aspectual adverbs per verb is relatively low. This implies that these agrammatic speakers use a more informative range of verbs, but information regarding the time frame of the event is relatively sparse. There is only very little evidence for compensatory overuse of temporal lexical adverbs.

A similar pattern has been reported for Dutch agrammatic speakers: retrieving the name of an event (i.e., a lexical verb) and simultaneously inflecting this verb for the
appropriate time frame with tense and aspect morphology is difficult for them. They produce either a normal diversity of verbs with a decreased number of inflected verbs or a lower diversity of verbs with a normal proportion of finite verbs.

It has been suggested, for example by Tissot, Mounin, and Lhermitte (1973) and Miceli et al. (1983), that the discrepancy between the use of lexical verbs and the problems of verb inflection is due to different underlying disorders. However, Bastiaanse (1995) shows that both phenomena may result from the same disorder. Therefore, rather than a double dissociation, Bastiaanse (1995) suggests that there is a trade-off effect in agrammatic speakers. This was further elaborated by Bastiaanse and Jonkers (1998). Bastiaanse and Jonkers (1998) suggested that the observed inverse relationship between verb retrieval and verb inflection was due to the inability of the agrammatic speakers to retrieve the verb and inflect it. This implies two operations on the same word. Bastiaanse and Jonkers (1998) assumed that this problem was caused by a syntactic deficit; that is, that the agrammatic speakers had problems with verb inflection. They suggested that if the agrammatic speaker focused on verb inflection, this was at the cost of verb retrieval. Those agrammatic speakers who focused on the content used verbs with a greater diversity, but they could only do so by neglecting verb inflection. On the basis of the data of agrammatic speech in SI, this interpretation of the Dutch data seems too narrow: in SI the same inverse relation is seen, but the verbs are not inflected. We therefore suggest an alternative theory: it is difficult for agrammatic speakers to retrieve the name of the event and simultaneously express the time frame of the event, whether the latter is done through verb inflection or through aspectual adverbs. Some agrammatic speakers use the names of events to a normal extent, but fail to produce the time frame. Notice that this does not hold only for time frames that are expressed grammatically (via aspectual adverbs) but also for those that are expressed lexically (via temporal adverbs). Other agrammatic speakers show the opposite pattern: their speech is poor in the production of lexical verbs, but those verbs that are expressed refer to time frame to a normal extent.

This means that the underlying deficit is not purely syntactic in nature. The combination of an (uninflected) lexical verb and an optional free-standing aspectual adverb is not a syntactic relation, but requires integration of the name of an event (the verb) and the specification of the time frame in which the event takes place. So, rather than calling this a syntactic deficit, we opt to refer to it as an integration deficit. In Dutch this results in a trade-off effect between lexical diversity of the verbs and verb inflection for tense and agreement, in SI this results in an inverse relationship between verb diversity and the production of aspectual adverbs.

In an intact language system this integration of several layers of information is fully automatised (e.g., Green, 1986). In agrammatic aphasia this automated processing is hampered, and therefore the agrammatic speaker is unable to integrate the information of the different layers. In the case of verbs and time reference, simultaneously attending to the lexical information (the verb) and the semantico-syntactic information (the aspectual adverb) overloads the limited available resources of the agrammatic speaker, resulting in the observed pattern. It seems as if the same concepts are vulnerable in typologically very different languages. The between-participant variability data are in line with several theories that assume that individual agrammatic patients may react differently to the same underlying disorder; for example, Kolk’s adaptation theory (Kolk & van Grunsven, 1985); Caplan’s (2006) theory of reduction of resources for syntactic processing; Yarbay Duman, Altınok, Özgirgin, and Bastiaanse’s (2011) integration problem hypothesis. For the participants with aphasia,
simultaneously retrieving the name of the event and expressing the time frame seems to create a bottleneck in the production.

The similarities between Dutch, Standard Indonesian, and other languages such as Italian (Miceli et al., 1985; Rossi & Bastiaanse, 2008) and Swahili (Abuom & Bastiaanse, 2011) with respect to the production of verbs and time reference, combined with the recently observed selective problems with reference to the past in agrammatic aphasia (Bastiaanse et al., 2011) and the parallel disorder in aspectual and temporal lexical adverbs in the present study, suggest that time reference is a weak point in agrammatism. This has a serious impact on the use of verbs and, therefore, on communication in daily life. Verbs are used to express relations between entities and to name events, actions, states, etc. Poor use of verbs will result in a lack of information, and thus in poor communication. More cross-linguistic studies are needed to deepen our understanding of the source of the problems in agrammatic aphasia.

Clinical implications

The main conclusion of the current study is that agrammatic speakers who focus on lexical information (the verb) do so at the cost of information about the time frame in which the event takes place, and vice versa. We do not suggest that this focus is a conscious choice, or that the focus of agrammatic speakers is static. Bastiaanse (1995), for example, described a woman with agrammatic Broca’s aphasia who was interviewed about her speech problems and produced a normal proportion of finite verbs, but the lexical verbs had a low diversity. When the interview topic switched to the description of her house, she switched to typical agrammatic speech: the verb diversity increased but the verbs were no longer inflected as regularly. When she was asked whether she was aware of this switch, she said she was not. It was obvious that the change of register was unconscious. From a clinical point of view this is an interesting phenomenon: when the patient focused on the use of lexical verbs she was much more comprehensible and she provided much more information. Such variability within aphasic speakers has been observed more often (Cameron, Wambaugh, & Shannon, 2010). This implies that focus on the appropriate use of verbs is better than focus on verb inflection from a communicative point of view. The current study suggests that it is the expression of the time of the event in combination with the verb is the core of the problem, rather than verb inflection.

In aphasia therapy, especially in treatment of agrammatic aphasia, the focus is often on the production of correct and complete sentences. However, considering the relationship between verb retrieval and specifying the time frame by verb inflection or aspectual adverbs, speech-language therapists should be very careful that successful training of correct and complete sentences does not come at the cost of verb diversity (see Bastiaanse, Hurkmans, & Links, 2006; Links, Hurkmans, & Bastiaanse, 2010). Rather, speech therapy should focus on the use of lexical verbs, specifically on the use of a variety of lexical verbs. These are very important for communication in daily life.

A successful therapy in this respect can be decided after a certain baseline performance is obtained and is sustained in a certain period of time. Afterwards, further therapy is conducted which focuses on the production of aspectual adverbs. An important example of such a therapy is provided by Wieczorek, Huber, and Darkow (2011) who use a computer program to train the production of aspectual information. Finally, we think it is appropriate to inform to the agrammatic speakers about
their deficit and to train them to cope with it in an optimal way. Therefore it should be explicitly mentioned to the agrammatic speakers that they should focus on verbs and not on grammatical sentences, and therapy should be adapted to this (see Ruiter, Kolk, & Rietveld, 2010; Springer, Huber, Schlenck, & Schlenck, 2000).

Supplementary material

An appendix containing a speech sample (10 first utterances of all participants) is available via the “Supplementary” tab on the article’s online page (http://dx.doi.org/10.1080/02687038.2011.626844).

REFERENCES


