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Sentence comprehension in Malay-speaking adults with aphasia: the role of affix integration

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ABSTRACT

Background: One of the impairments in comprehension mostly reported for aphasia is that in reversible passive sentences, where a systematic asymmetry with reversible active sentences has been attested across languages. In several accounts, this selective impairment has been proposed to be the result of the specific syntax of passive sentences. However, some results particularly from flexible word order languages suggest that a pattern where both active and passive sentences are impaired also exists.

Aims: In this study, we examined the actives and passives in the comprehension of a flexible word order language, namely standard Malay, in people with aphasia (PWA), aiming to confirm that the predominant pattern in this language is one of generalised impairment across reversible sentences (active and passive), and not an asymmetrical one. The role of fluency in determining the pattern of impairment was also explored.

Methods & procedures: Fourteen healthy adults and 20 PWA, 14 with fluent aphasia and 6 with non-fluent aphasia, took part in a comprehension study in standard Malay. Standard Malay is a flexible word order language that relies on the parsing of the voice affix on the verb to correctly interpret both active and passive sentences. Participants were tested on a sentence-picture matching task on comprehension of active and passive reversible clauses.

Outcomes and results: The study revealed that PWA were overall less accurate than healthy speakers in comprehension of reversible active and passive sentences, and non-fluent PWA were less accurate than fluent PWA with no effect of sentence type (active/passive). While not predominant, an asymmetric pattern was

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present in some participants. We propose that an impairment in thematic role assignment leads to a generalised impairment in comprehension of reversible sentences, while preserved thematic role mapping and impaired syntax lead to an asymmetric impairment.

Conclusions: The study confirmed that speakers of Malay mostly show a generalised impairment in both active and passive sentences. Given the nature of the language, we propose that this suggests that impairment in Malay is predominantly shown on affix integration, first in mapping of thematic roles, and then in the full syntactic processing.

1. Introduction

The description of the language impairment of aphasia has been at the centre of linguistic theory for several decades (refer to Druks, 2016; Garraffa & Fyndanis, 2020 for an overview). The first indication that aphasia and, more specifically, non-fluent aphasia was a disorder originating in grammar (and not in speech-sound) was the discovery that not only sentence production, but also sentence comprehension was affected. Impaired comprehension was first described in the 1976 influential study by Caramazza and Zurif, who discovered that semantically reversible sentences with centre embedding (as in *The cow that the monkey is scaring is yellow*) were more adversely affected than non-reversible sentences with centre embedding (as in *The apple that the boy is eating is red*) in patients with conduction aphasia. Crucially, sentence meaning is not derivable from semantics alone in reversible sentences and must therefore rely on an accurate parsing of the underlying syntactic structure, which led to the conclusion that difficulties with parsing these sentences are rooted in syntax.

A similar observation was made for semantically reversible passives, like English *The boy was kissed by the mum*. English has a fixed subject-first word order, with the subject typically associated with an agent role. Consequently, interpreting reversible noncanonical passive sentences like the one above requires overriding an “agent-first” interpretation in thematic role assignment, which is only possible if the sentence (i.e., the passive structure) is parsed correctly. In some theoretical accounts of grammar based on transformations (e.g., Chomsky, 1981, 1993), a passive sentence is described as the consequence of movement of the patient argument to the subject position of the sentence. The argument (*the boy*) originates in object position to receive its thematic role (patient) and is then moved to the subject position. All moving NPs are understood to leave a *trace* in their originating position, which is necessary in the parsing of the thematic role. In this case, the trace of *the boy* in object position is necessary to assign the moved element the correct thematic role. Drawing on this, Grodzinsky (1986, 1990, 1995) proposed that PWA showing impaired grammar struggle with reversible passive sentences because they apply an agent-first heuristic strategy (NP1=Agent). When they do so, they assign thematic roles incorrectly, which results in passive sentences having an active reading. According to the author, the [NP1+Agent] heuristic is the only strategy available in the presence of a deficit in

the syntactic representation of the sentence, which he identifies as a specific deficit in the retainment of traces, which he proposes to be “deleted” (*Trace Deletion Hypothesis*, TDH).

A subsequent proposal for the interpretation of so-called “canonicity pattern” was described in A. Grillo (2005, 2008), which does not propose a different parsing mechanism at play in impaired vs. healthy speakers. Drawing on the Relativised Minimality (RM) locality theory (Rizzi, 1990, 2004), this approach proposes deficits in the interpretation of sentences with moved elements to ensue from an impoverished set of morphosyntactic features (e.g., person, number, gender, case, *Wh-*, focus). According to RM, a relationship between the moved object (X) and the trace (Y) is established in long dependencies as in the sentences in (1). To interpret the moved object X as the patient of the action, access to Y (i.e., its originating position) must be granted. If the intervening argument Z and Y have different morphosyntactic features, as in (1a), where one noun plural and the other singular, the distinction between arguments more accessible; if Z and Y share morphosyntactic features, like in (1b) (both singular), access to Y is more effortful.

(1a) The girls that the woman hugs <the girls>
 X Z Y
 [N, +animate, Plur, $\theta 2$] [N, +animate, Sing, $\theta 1$] [N, +animate, Plur, Nom, $\theta 2$]

(1b) The girl that the woman hugs <the girl>
 X Z Y
 [N, +animate, Sing, $\theta 2$] [N, +animate, Sing, $\theta 1$] [N, +animate, Sing, $\theta 2$]

In speakers with agrammatic symptoms, intermittent failures to maintain activation of the full representation of features normally associated with any element result in a failure to compute structures involving dependencies. This approach accommodates results from relative clauses, as expanded in Garraffa and Grillo (2008), but also passive clauses (N. Grillo, 2008).

In a third account, Schwartz et al. (1987) argue that the issue with impaired thematic role mapping lies in the asymmetry between direct and indirect transmission of thematic roles. Thematic roles are mapped from the position in which they are assigned (i.e., theta positions, e.g., Chomsky, 1981) onto the parsed constituent. The parsed constituent can be occupying the theta position, as is the case in canonical sentences (e.g., active declarative sentences), and transmission of thematic roles is therefore direct. If the parsed constituent has moved out of that position, as is the case in noncanonical sentences (e.g., passive sentences, sentences including object-extracted relative clauses), transmission is indirect. Indirect transmission of thematic roles, the authors argue, is more demanding than direct transmission and, as a result, in speakers presenting agrammatic patterns sentences with direct transmissions are usually preserved, but sentences with indirect transmission may not. This account focusing on thematic role transmission and the account following RM described above are not incompatible: a milder grammatical deficit may impact the processing of grammatical features but not thematic role assignment, while a severe grammatical deficit might impact both thematic assignment and syntactic processing. Consequently, agrammatic behaviours may show differently across aphasia, as well as across disorders (as seen for example in the presence of cognitive decline, e.g., Sung et al., 2020, or neurodevelopmental disorders, see; Smith et al., 2023 for a scoping review).

2. Sentence comprehension in aphasia: an emphasis on passives

The accounts reviewed above predict the disorder of grammar to be on noncanonical sentences. In the case of passive sentences, the prediction is that, in the presence of an agrammatic profile, (reversible) passive sentences are impaired, but active sentences should not. This prediction has been robustly attested cross-linguistically, including in Dutch (Kolk & vanGrunsven, 1985), Japanese (Hagiwara, 1993), Korean and Spanish (Beretta et al., 2001), and more.

Despite the robustness of this pattern, the generalisation that passive clauses are indicative of the presence or absence of an impairment in syntax has been challenged. Berndt et al. (1996) reported that there are three patterns of performance in comprehension of reversible sentences based on their meta-analysis of 15 published studies (mostly on English) from 1980 to 1991: above chance performance on reversible active sentences and below chance performance of reversible passive sentences, above chance comprehension of both reversible active and passive sentences; below chance comprehension of reversible active sentences and passive sentences either above or below chance. What is particularly problematic for the validity of the proposed theoretical frameworks is the existence of the reverse order, namely passive sentences being more preserved than active sentences, first described in Druks and Marshall (1995). The authors find two complementary distributions in comprehension, with one participant with a disorder of grammar following the expected pattern for English (active > passive), but the other showing the opposite one (passive > active), which they suggest to be the result of different selective impairments (specifically in nominative or accusative case assignment).

2.1. Reversible active and passive sentences in Indonesian- and Malay-speaking PWA

Indonesian and Malay belong to the family of Austronesian languages and have 290 million speakers altogether. While being recognised as separate languages, the two have similar sentence structure and Indonesian is recognised to be a standardised variety of Malay (Paauw, 2008). Despite a base SVO word order, relative freedom is attested for constituent placement (Karim et al., 2015; Knowles & Don, 2006; Omar, 2014), with both subject-first and (derived) object-first orders attested in unmarked sentences interchangeably, as shown in (2a) a subject-first sentence and (2b) an object first sentence. As typically the case in agglutinative languages, they rely heavily on affixation on the verb to determine sentence structure.

SVO:

(2a) Lelaki sedang membaca buku
 Man Aspect ACT-read book
 [N, +animate, Sing, θ1] [N, -animate, Sing, θ2]
 "The man is reading the book".

OSV:

(2b) Buku itu lelaki sedang baca
 Book that(book) man Aspect read
 [N, -animate, Sing, θ2] [N, +animate, Sing, θ1]
 "The man is reading the book".

The affix *meN-* shown in (2a) is generally understood to be an active voice marker in Malay/Indonesian (e.g., Chung, 1976; Nomoto & Shoho, 2007; Son & Cole, 2008). Although obligatory in the standard varieties, *meN-* is often omitted in colloquial Malay as well as in many dialects,¹ as in (3).

Colloquial Malay:

- (3) Anjing sedang ~~men~~-kejar kucing
 Dog Aspect chase cat
 [N, +animate, Sing, θ1] [N, +animate, Sing, θ2]
 "The dog is chasing the cat".

Following Nomoto & Kartini's analysis (2012), passives in Malay consist of two types: agentive passives, as in (4a), and agentless passives, as in (4b). The *di-* form in (4a) includes an agentive *di-* passive [*di-* +V preposition oleh/by +N], whereas the passive in (4b) is a bare form, and the agent meaning is entailed in the pragmatic of the sentence. The prefix *di-* can be interpreted as a Patient Focus, in contrast with the *meN-* prefix mentioned above that has an Agent Focus, making it plausible to interpret the DP in (4a) as both the grammatical subject and the topic of the sentence.

- (4a) Kucing sedang dikejar (oleh anjing)
 Cat Aspect PASS-chase by dog
 [N, +animate, Sing, θ2] [N, +animate, Sing, θ1]
 "The cat is being chased by the dog".
- (4b) Pakaian telah disidai
 clothes have PASS-hang out
 "The clothes have been hung out (to dry)"

Other types of passives are also present in Malay, for instance *get*-passives as exemplified in (5). *Kena/get* passive is constrained by pragmatic specifications related to the context in which it appears.

- (5) Ali **kena** buli
 Ali **get** bully
 "Ali got bullied".

Studies on comprehension in standard Indonesian have reported no difficulty in patients with Broca's aphasia in either producing or comprehending passive clauses (Anjarningsih et al., 2012; Jap et al., 2016; Postman, 2004). Jap et al. (2016) compare the performance of a group of patients with Broca's aphasia and healthy participants on the comprehension of actives to that of passives and clefts. At odds with the selective impairment reported in many languages, the speakers with aphasia were found to be worse than healthy speakers overall but showed no selective difficulty in either passives or subject clefts (*it is the horse that bites the cow*) compared to actives, therefore showing that word order was not the most relevant property in determining impairment in speakers of Indonesian. Postman (2004) tested precisely the prediction that the concept of "canonical order of thematic roles" may be irrelevant in languages that attest SVO and OVS orders with the same frequency, and that the linear-order heuristic would not be able to explain results in these languages. Analysing the results of an act-out task on an aphasic speaker, Postman

postulates a model which posits that in free word order languages like Indonesian, the thematic prominence of arguments is more salient than their linear position.

Similar results were recently found for Malay. In a pilot study with 5 non-fluent speakers with aphasia, Aziz et al. (2020) confronted the comprehension of reversible active and passive sentences with varying number of arguments in a sentence-picture matching task. The authors found participants to perform worse than controls overall, but to show no asymmetry across sentence type (active/passive) and no effect of argument number, showing a similar pattern to that of Indonesian speakers.² Given the generalised impairment across sentence types, the authors conclude that the difficulty experienced by these speakers lies at the level of (voice) affix processing: since the interpretation of the (active or passive) sentence heavily relies on the interpretation of the voice affix on the verb in Malay, an impairment in this interpretation (or an underspecification of the voice feature in Grillo's framework, 2008) hinders the correct processing of both the active (as in (6a)) and the passive (as in (6b)) sentence.

Impaired syntactic representation of active sentences

(6a) Budak lelaki sedang ~~men~~ kejar budak perempuan
 Child man Aspect (ACT) chase child woman
 [N, +animate] [N, +animate]
 "The boy is chasing the girl"

Impaired syntactic representation of passive sentences

(6b) Budak lelaki sedang di kejar oleh budak perempuan
 Child man Aspect (PASS)chase -by child woman
 [N, +animate] [N, +animate]
 "The boy is chased by the girl"

3. Current study

Standard Malay is a language with flexible word order admitting both subject-first and object-first active sentences, therefore no canonicity effects (for example NP1=Agent strategy) are expected upon reading of the first constituent. Moreover, no overt morphology on the nouns identifies their thematic roles. Both in the case of passive and active sentences, therefore, correct thematic role mapping relies on the parsing of the voice affix of the verb. We hypothesise that speakers of Malay will show a symmetrical impairment. The study is a follow-up of Aziz et al. (2020)'s investigation on sentence comprehension in Malay speakers with non-fluent aphasia. In this study, we aimed to expand the investigation to a larger group of both fluent and non-fluent speakers.

4. Methods

For this study, a sentence-picture matching task was administered to a group of PWNFA and PWFA. The study received ethical approval from the Medical Research Ethics Committee of the Ministry of Health Malaysia (NMRR ID-21-02071-BPE (IIR)) and International Islamic University Malaysia (IIUM) Research Ethic Committee (IREC 2020-135). Prior to the study's initiation, all participants were informed about the purpose, procedures, potential risks, and benefits of the research. Written informed consent was obtained from each participant, confirming their voluntary agreement to participate in the study.

4.1. Participants

Three groups were included in the study: 14 healthy adults (HA, mean age = 52.2, SD 11.57), 14 adults with non-fluent aphasia (NFA, mean age = 51.64, SD 8.24), and 6 adults with fluent aphasia (FA, mean age = 48.5, SD 12.02). Groups were matched based on their level of education (HA, mean = 12.86, SD 1.26; Aphasia, mean = 13, SD 1.70). All participants were native speakers of Malay. Participant demographics and aphasia information for the FA and NFA are reported in [Table 1](#).

Participants with aphasia were recruited from the Speech Therapy Unit at Hospital Rehabilitasi Cheras (HRC) and the Speech Therapy Unit at the Otorhinolaryngology (ORL) Clinic, Hospital Kuala Lumpur (HKL), under the Ministry of Health Malaysia. The process of invitation and recruitment was carried out using patient lists from both hospitals, ensuring a focused and efficient selection of study participants. Individuals for the non-brain damaged group were chosen from within the Kuala Lumpur and Klang Valley regions.

To take part in the study, participants should have a left hemisphere lesion resulting in aphasia; a minimum of three months post-onset; good comprehension of single words; and normal or corrected-to-normal auditory and visual acuity. The level of aphasia was assessed using an adapted version to Malay of the Boston Diagnostic Aphasia Examination (BDAE) (Goodglass et al., 2001). Classification into non-fluent aphasia and fluent aphasia was carried out based on the fluency criteria. Fluency categorization in the BDAE was determined by the average number of words generated in spontaneous speech tasks. Specifically, the response to the picture description task of the Cookie Theft Picture was used, with the result from the phrase length section determining participants' fluency. Participants producing fewer than five words per sentence on average were categorized as having non-fluent aphasia. In contrast, those generating more than five words per sentence were classified as having fluent aphasia, following Hedge's (2022) criteria.

Table 1. Participants' demographic of the groups of PWA (FA = fluent aphasia, NFA = non-fluent aphasia, LH = left hemisphere).

Subject	Sex	Age at testing	Time post-onset when first tested	Lesion side	Fluency	Receive speech & language therapy
AK	M	62	11 months	LH	NFA	Yes
HA	M	61	5 years	LH	NFA	Yes
RS	M	58	3; 1 years	LH	NFA	No
AS	M	64	2; 2 years	LH	NFA	Yes
SB	F	43	5 months	LH	NFA	Yes
AR	M	45	1; 8 years	LH	NFA	Yes
BT	M	62	5 months	LH	NFA	Yes
AZ	M	43	12 months	LH	NFA	Yes
AKH	M	50	9 years	LH	NFA	Yes
AZH	F	50	5 months	LH	NFA	Yes
HS	M	52	1 year	LH	NFA	Yes
MU	M	47	8 months	LH	NFA	Yes
AZM	M	46	5 months	LH	NFA	Yes
SP	F	40	6 months	LH	NFA	Yes
FA	F	28	5; 2 years	LH	FA	Yes
MY	M	55	1; 9 years	LH	FA	Yes
RZ	F	49	9 months	LH	FA	Yes
ZM	F	53	1; 8 years	LH	FA	Yes
MJ	M	63	10 months	LH	FA	No
MS	M	43	3 months	LH	FA	Yes

4.2. Design and materials

A sentence-to-picture comprehension task was developed for this study. The task consisted of 40 items, 20 active sentences and 20 passive sentences. A complete list of sentences is provided in Appendix A. Twenty verbs were selected to have high imageability and familiarity based on the Malay verb imageability and familiarity list (Aziz et al., 2017). Of the 20 verbs, 14 were semantically reversible verbs, such as *cium*, *kiss*, *tangkap*, *catch*, *kejar*, *chase* (items 1–14 in APPENDIX A), forming sentences of the kind subject-verb-object (active) or subject-verb-by phrase (passive). Six verbs were nested in a semantically reversible verb phrase, e.g., *baca budak*, *read a book*, *speak bola*, *kick a ball* (items 15–20 in APPENDIX A), and sentences followed the structure subject-verb-object + indirect object (active) or subject-verb-by-phrase + indirect object (passive). Each stimulus consisted of an orally presented sentence and four pictures. Each picture represents two animate characters engaged in an action, sometimes involving an inanimate object. The four pictures represented the target sentence, a role reversal foil, a lexical foil, and a combination of role reversal and lexical foil, following the format utilized in other sentence comprehension studies (Bastiaanse et al., 2003; Druks & Marshall, 1995). Figure (1a) represents the **target picture** for stimulus *Anjing sedang mengigit kucing* (the dog is biting the cat). Figure (1b) represents a **reverse roles foil**,

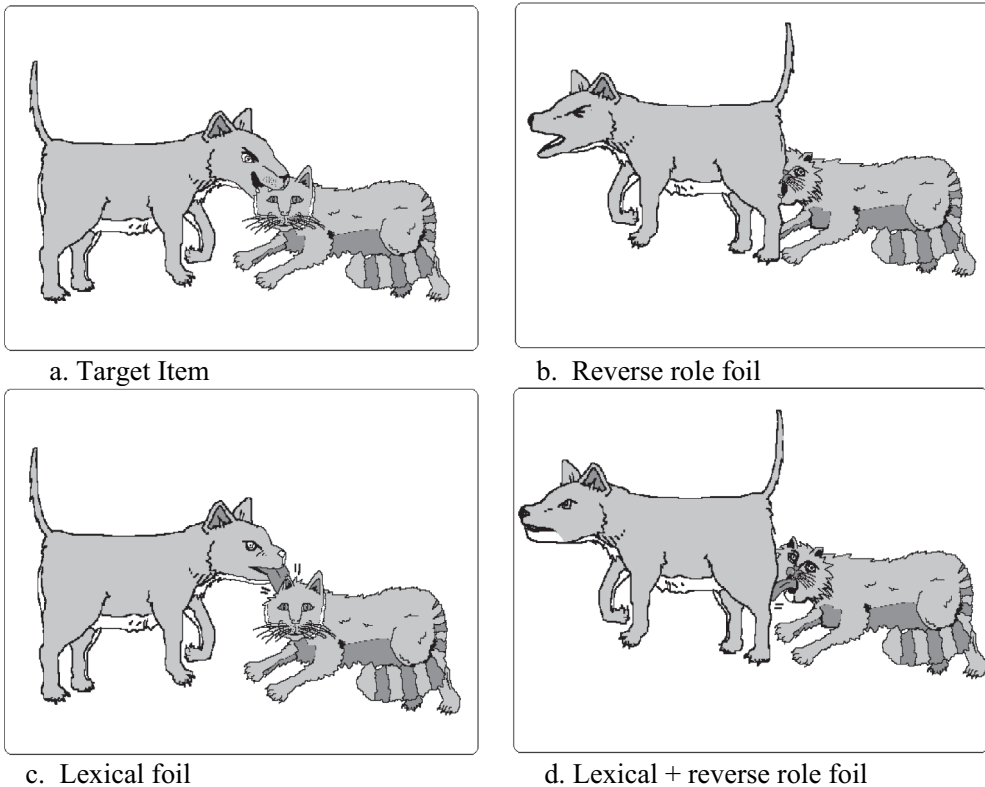


Figure 1. Example images for the sentence *Anjing sedang mengigit kucing* (the dog is biting the cat), with target answer in 1a and the three distractors in 1b-d.

namely a picture in which the action and the participants are the same but the thematic roles are reversed. Figure (1c) represents a **lexical foil**, namely a picture in which a different action is depicted. Importantly, in this experiment the distractors are semantically related. Figure (1d) represents a **reverse role + lexical foil**, namely a picture with reverse roles for the lexical distractor.

The illustrations were black and white, rendered on 6in x 4in cards. The order of presentation of the images as well as the order of presentation of the items were pseudorandomised and were the same for all participants.

Participants were tested in one session in a quiet room by a speech and language therapist.

4.3. Statistical analysis

Normality tests revealed the data are not normally distributed. Therefore, GLM were conducted to investigate the effects of sentence type (reversible active, reversible passive³) and group (FA, NFA, HA) on accuracy, as well as their interaction. Next, a one-sample proportion test was run to compare the active/passive asymmetry of each participant of the two PWA groups against the control group performance. Inferential statistics were run on R.

5. Results

5.1. Comprehension of reversible active and passive sentences

Table 2 shows the accuracy of reversible active and passive sentences of the three groups.

There was no effect of group between controls and FA, and a significant effect of group between controls and NFA ($z = -9.731$, $p > .001$). There was no effect of sentence type (active vs. passive) and no significant interaction between sentence and group. Tukey post-hoc analyses revealed that group effect is significant between controls and NFA ($p < .0001$) and between FAs and NFAs ($p < .0001$), while it is at trend between controls and FA ($p = 0.06$).

Table 2. Mean, percentage, σ , and (range) for active and passive sentence comprehension of controls, people with fluent aphasia (FA) and people with nonfluent aphasia (NFA).

GROUP	Active ($N = 20$)	Passive ($N = 20$)
Controls	18.57 (92.86%) $\sigma = 0.19$ (17-20)	19.00 (95%) $\sigma = 0.17$ (18-20)
FA	17.83 (89.17%) $\sigma = 1.60$ (16-20)	17.13 (82.5%) $\sigma = 2.20$ (13-19)
NFA	8.14 (40.71%) $\sigma = 4.57$ (2-18)	6.71 (33.57%) $\sigma = 2.20$ (4-11)

5.2. Individual results

A one-sample proportion test was run to compare individual results of the NFA and FA participants on active and passive sentences to the control group mean for active and passive sentences. As shown in Figure 2, fluent participants are either comparable to controls in both active and passive sentences (4/6 participants), or they show an asymmetry between passive and active sentences, with only passive sentences being significantly worse than control mean (2/6). This asymmetry is also shown in one NFA participant (1/14), as shown in Figure 3. The rest of the NFA participants (13/14) are significantly worse than controls on both active and passive sentences.

5.3. Qualitative error analysis

Table 3 reports the types of errors of the participants of the NFA group. As explained in 4.2, pointing to one of three non-target pictures resulted in three possible error types: role reversal, lexical errors, or both role reversal and lexical.

Overall, errors were distributed across active and passive sentences, with most errors being role reversal.

6. Discussion

The study is an investigation of sentence comprehension in a free word order language across fluent and non-fluent aphasia. The data reported were revealing in two directions: firstly, they confirm that, in Malay, the asymmetrical dissociation of active and passive sentences in comprehension which has been greatly reported for languages such as English, Dutch, Hebrew, and more, is not generalisable to Malay; in fact, when a disorder in grammar is evident, the most common pattern in speakers of Malay is an

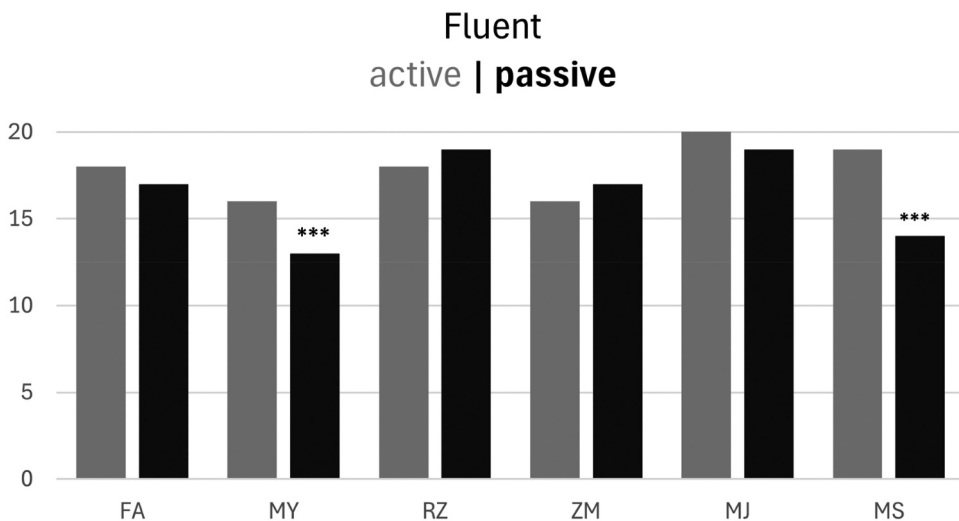


Figure 2. Individual results of the FA group. Asterisks refer to significance with respect to controls (***) = $p < .0001$).

Non-fluent active | passive

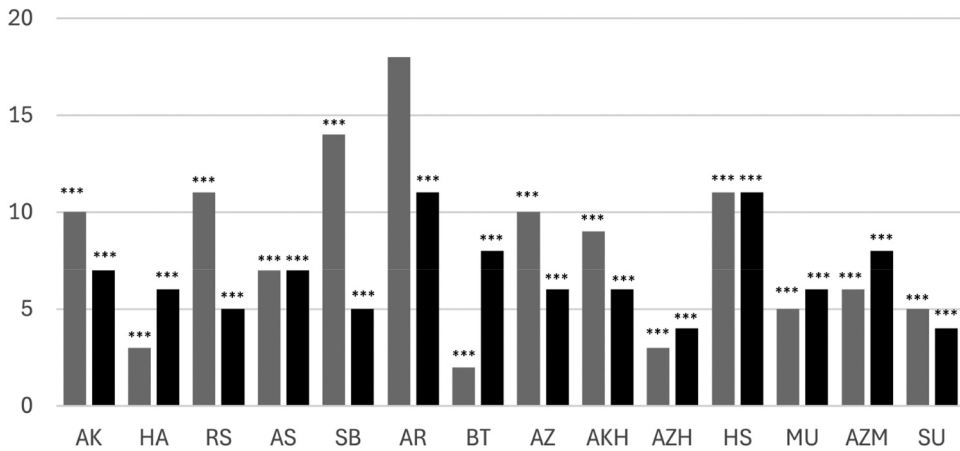


Figure 3. Individual results of the NFA group. Asterisks refer to significance with respect to controls (***) = $p < .0001$).

Table 3. Number of errors (x/20) per error type in active and passive sentences for NFAs.

	Reverse role		Lexical		Reverse role + lexical		TOTAL	
	Active	Passive	Active	Passive	Active	Passive	Active	Passive
AK	3 (15%)	8 (40%)	5 (25%)	3 (15%)	2 (10%)	2 (10%)	10 (50%)	13 (65%)
HA	8 (40%)	9 (45%)	4 (20%)	2 (10%)	5 (25%)	3 (15%)	17 (85%)	14 (70%)
RS	2 (10%)	6 (30%)	4 (20%)	4 (20%)	3 (15%)	5 (25%)	9 (45%)	15 (75%)
AS	8 (40%)	3 (15%)	4 (20%)	3 (15%)	1 (5%)	7 (35%)	13 (65%)	13 (65%)
SB	2 (10%)	11 (55%)	1 (5%)	3 (15%)	3 (15%)	1 (5%)	6 (30%)	15 (75%)
AR	1 (5%)	9 (45%)	1 (5%)	0 (0.0)	0 (0.0)	0 (0.0)	2 (25%)	9 (45%)
BT	5 (25%)	6 (30%)	6 (30%)	3 (15%)	7 (35%)	3 (15%)	18 (90%)	12 (60%)
AZ	0 (0.0)	8 (40%)	5 (25%)	3 (15%)	5 (25%)	3 (15%)	10 (50%)	14 (70%)
AKH	7 (35%)	7 (35%)	1 (5%)	4 (20%)	3 (15%)	3 (15%)	11 (55%)	14 (70%)
AZH	10 (50%)	7 (35%)	3 (15%)	2 (10%)	4 (20%)	7 (35%)	17 (85%)	16 (80%)
HS	5 (25%)	6 (30%)	2 (10%)	2 (10%)	2 (10%)	1 (5%)	9 (45%)	9 (45%)
MU	6 (30%)	8 (40%)	7 (35%)	5 (25%)	2 (10%)	1 (5%)	15 (75%)	14 (70%)
AZM	5 (25%)	6 (30%)	5 (25%)	5 (25%)	4 (20%)	1 (5%)	14 (70%)	12 (60%)
SU	9 (45%)	6 (30%)	4 (20%)	6 (30%)	2 (10%)	4 (20%)	15 (75%)	16 (80%)

equally distributed impairment across conditions. We will propose to be a disorder in thematic mapping. The active/passive asymmetry is present in a small portion of speakers. We will refer to it as a disorder in syntactic parsing.

The second result of the study is that the distribution of these two profiles is not completely consistent with different profiles of aphasia, namely fluent vs. non-fluent. Rather, both patterns can be found in fluent and non-fluent aphasics.

6.1. Disorder in thematic mapping and disorder in syntactic parsing

The difficulty experienced with passive sentences in disorders of language, particularly aphasia, have been mainly attributed to two sources in the literature (see 1.1): as a disturbance in the process of thematic mapping, which may in turn have different sources (Schwartz et al., 1987), and as the result of an under specification of the syntactic structure (Grodzinsky; A. Grillo, 2005). Results from this study suggest that in a language with flexible word order and reliance on affixes, both a disorder in thematic mapping and one in syntactic parsing may appear, resulting in different patterns. The data from Malay show that speakers with aphasia of the language do not show an asymmetric impairment in passive vs. active sentences at group level. This confirms results from standard Indonesian, as well as the results of the pilot study in Malay (Anjarningsih et al., 2012; Aziz et al., 2020; Jap et al., 2016; Postman, 2004). Since most participants show difficulties in interpreting both actives and passives indiscriminately, the impairment cannot be a result of the parsing of the sentence structure, which has been shown to lead to an asymmetrical impairment of passives over actives. As argued in Aziz et al. (2020), a symmetrical pattern of impairment is the result of an impairment in the mapping of thematic roles, which likely originates from the necessity to parse a grammatical voice affix for both active and passive sentences. We call this disorder a disorder in thematic mapping. Difficulties with this operation may stem from a reduction of the morphosyntactic specification, which renders morphological analysis effortful in reversible sentences (A. Grillo, 2005, 2008). Given the absence of a strong canonical order, in reversible contexts these individuals who struggle to assign thematic roles have no heuristic to guide them, and therefore fail equally in active and passive sentences, as exemplified in (5a) and (5b) above, with no difference between the under specification for active and passive sentence.

As a novelty from the pilot study, individual results in this larger and more diverse sample reveal that an asymmetry between active and passive may also exist in a minority of participants both at the level of accuracy and in their errors, with a small number of participants reporting more reversible errors on passive sentences than on active sentences, therefore showing a preference for an active reading.

We hypothesise that, in these participants, the voice of the verb is correctly activated, but they show a disorder in the parsing of the syntactic structure of passive sentences, much like what is hypothesised in the syntactic accounts revised in 1 for languages showing an asymmetric pattern. We call this a *syntactic parsing disorder*, simplified as shown below: while the (subject-first) active sentence has a fully accessible structure, the morphosyntax of the passive construction (and not the passive voice) is not correctly

parsed, therefore creating an active reading, as exemplified in (7).

(7) Kucing	sedang	dikejar	oleh	anjing
Cat	Aspect	PASS-chase	by	dog
[N, +animate, Sing, θ1]				[N, +animate, Sing, θ2]

6.2. The role of fluency

A few important facts emerged from the data that relate to groups of aphasic speakers based on measures of fluency. Firstly, not all speakers categorised as fluent had spared sentence comprehension. In fact, more than half of the sample of fluent speakers showed some form of impairment. Specific features of impaired grammar are therefore not limited to a set of individuals who are categorised as non-fluent, but rather may extend beyond the borders of fluency. This is consistent with data from aphasia (see Martini et al., 2020), but also with data across disorders (see Smith et al., 2023). This also highlights the importance of testing comprehension in fluent as well as non-fluent speakers with aphasia. The patterns of performance that were found in this study are not exhaustively described by the fluent/non-fluent distinction, as proven by the fact that the pattern mostly found in non-fluent speakers (namely the thematic mapping impairment) is also found in fluent speakers, and the pattern that emerges in fluent speakers (namely the syntactic parsing impairment) is also found in one non-fluent speaker.

7. Conclusions and future directions

In this study, comprehension of active and passive sentences in speakers of Malay with fluent and non-fluent aphasia was investigated. The results have highlighted the presence of different types of impairment visible in speakers of a flexible word order language that relies on verb affix interpretation to attribute thematic roles: the most common disorder is a disorder in thematic role mapping, which is the result of impairment in parsing voice affix on the verb in both active and passive sentences. This pattern is overwhelmingly attested in non-fluent speakers as well as in some fluent speakers. The second pattern is one of syntactic parsing, where speakers may access the information of the voice affix but struggle in its correct assignment in more complex syntactic structure, namely passive. This pattern is attested in fluent speakers and one non-fluent speaker.

Our study reveals the need to develop protocols sensitive first to both thematic mapping and syntactic analyses of sentences for Malay and not selectively to passive sentences. It also reveals the need to collect more data from fluent speakers to investigate the nature of their impairment. More data are needed from fluent speakers with aphasia or other mild language disorders to see if thematic mapping can be spared in the presence of a mild syntactic based deficit, and whether the deficit reported on passive is a result of processing disorder. More research is also needed on affixation in Malay PWA, to confirm our hypothesis that a disorder of grammar in this language is evident on affixation.

It is also necessary to collect more data on different types of verbs in relation to their event-based distinction. For example, by using markers that makes more plausible to use

an active sentence, such as integrating adverbs *sering* “frequently” or in-situ modifiers of pronoun Agents, such as *sendiri* “self”, the active voice affix could be easier to access, with an important contribution for sentence comprehension intervention plans based on both semantic and syntactic similarities.

Our study also has clinical implications, challenging the traditional view that passive sentence comprehension is a reliable indicator of syntactic processing abilities in aphasia.

For clinicians, this means that assessments and therapy approaches need to be adapted to consider the specific linguistic features of Malay and similar languages. Standard tests that rely heavily on passive sentence comprehension may not accurately reflect the language abilities of Malay-speaking individuals with aphasia. Instead, a more comprehensive approach that evaluates the ability to process verb affixes and assign thematic roles could provide a clearer picture of their language skills.

Furthermore, the study highlights the importance of considering fluency in the categorization of aphasia. The fact that both fluent and non-fluent speakers exhibited similar patterns of impairment suggests that fluency may not be a reliable indicator of the underlying nature of sentence comprehension difficulties. This has implications for the classification and treatment of aphasia in Malay speakers, as well as for our understanding of the relationship between fluency and syntactic processing in aphasia more generally.

Notes

1. The optionality of *meN-* gave rise to discussions on its role as (only) active voice marker. See Nomoto (2010) for a discussion on its role as a telicity marker.
2. Interestingly, a difference between reversible canonical and noncanonical sentences was present only in error analysis, where thematic role reversal errors predominantly occurred in passive sentences.
3. Preliminary inferential analyses were run to check whether the chosen verbs all behaved similarly despite the differences in sentence structure described in 4.2. As expected, no effect was reported for sentences with reversible verb and sentences with reversible verb phrase + indirect object overall, nor were there interactions between the active/passive sentence type variable and this variable. Consequently, only the active/passive variable of sentence type was kept in all subsequent analyses.

Disclosure statement

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