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The brain, verbs, and the past: Neurolinguistic studies on time reference

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Document Version

Publisher's PDF, also known as Version of record

Publication date:

2015

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Bos, L. (2015). *The brain, verbs, and the past: Neurolinguistic studies on time reference*. [Thesis fully internal (DIV), University of Groningen, Univ Potsdam, University of Potsdam, Macquarie University]. [S.n.].

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Appendix

A Appendix to chapter 2: Understanding discourse-linked elements in aphasia

A.1 Individual Russian participant characteristics

Table A.1.1: Individual Russian participant characteristics.

| Pp | Sex | Age | Education | Aphasia type | Time PO | Etiology | Location of lesion | Hemi-plegia |
|---------------------------------|-----|-----|-----------|---------------------------------|---------|--------------------|--|-------------|
| Agrammatic aphasic participants | | | | | | | | |
| A1 | f | 43 | higher | efferent / mild dynamic, medium | 5y | hCVA | left temporo-parietal | right |
| A2 | m | 35 | higher | efferent (Broca), medium | 4m | hCVA | arteriovenous malformations left temporo-parietal | right |
| A3 | f | 46 | higher | efferent (Broca) | 2y / 5m | CVA | left middle cerebral artery | right |
| A4 | f | 36 | higher | dynamic | 2y | iCVA | left middle cerebral artery thrombosis, post-stroke changes in left frontoparietal-temporal region | right |
| A5 | f | 38 | secondary | efferent, medium | 2y | TBI | subarachnoid - parenchymal left | no |
| A6 | m | 66 | secondary | mild efferent | 1y / 4m | CVA | left middle cerebral artery | right |
| A7 | f | 37 | higher | mild efferent | 5y4m | CVA | left middle cerebral artery | right |
| A8 | m | 53 | secondary | efferent, dynamic | 1y9m | CVA (mixed) | origin in the left middle cerebral artery | no |
| A9 | m | 44 | secondary | afferent, efferent | 8m | CVA | cortico-subcortical left frontal, parietal and temporal | no |
| A10 | f | 37 | secondary | dynamic, efferent, afferent | 2y10m | CVA after aneurysm | anterior and middle cerebral arteries | right |
| Fluent aphasic participants | | | | | | | | |
| F1 | f | 57 | secondary | sensory / acoustic-mnestic | 2y3m | CVA | left middle cerebral artery | no |
| F2 | f | 68 | higher | sensory | 4.5m | iCVA | left parietal region, with impregnation | no |
| F3 | m | 55 | higher | sensory | 7y2m | CVA | left middle cerebral artery | no |
| F4 | m | 59 | higher | sensory | 3m | iCVA | left temporo-occipital region | no |

| Pp | Sex | Age | Education | Aphasia type | Time PO | Etiology | Location of lesion | Hemiplegia |
|--------------------------------|-----|-----|-------------------|---|------------|--|--|------------|
| F5 | f | 58 | higher | sensory | 1y10m/2y2m | subarachnoid hCVA/intracerebral hematoma | right temporal lobe, 4.5 months later aneurysm clipping left hemisphere | no |
| F6 | m | 65 | secondary | severe sensory | 7m | iCVA | left internal carotid artery, vascular-alcoholic genesis | no |
| F7 | m | 48 | secondary | medium / severe sensory, acoustic-mnestic | 3m | CVA | left middle cerebral artery | no |
| F8 | m | 22 | incomplete higher | medium-severe sensory / acoustic-mnestic | 2y4m | TBI | intracerebral hematoma of the left parietal region, midline shift of the brain | no |
| F9 | m | 65 | higher | sensory / acoustic-mnestic | 4y6m | CVA | left parietal / signs of lacunar strokes basal ganglia right | no |
| F10 | f | 55 | higher | sensory | 1y2m | hCVA | post-hemorrhagic cyst left temporo-parietal-occipital | no |
| Non-brain-damaged participants | | | | | | | | |
| C1 | f | 28 | higher | | | | | |
| C2 | f | 48 | higher | | | | | |
| C3 | f | 53 | higher | | | | | |
| C4 | m | 22 | incomplete higher | | | | | |
| C5 | f | 49 | higher | | | | | |
| C6 | f | 74 | secondary | | | | | |
| C7 | m | 47 | higher | | | | | |
| C8 | f | 55 | higher | | | | | |
| C9 | f | 31 | higher | | | | | |
| C10 | m | 32 | higher | | | | | |

Pp = participant; Time PO = Time post-onset; y = years; m = months; hCVA = hemorrhagic cerebrovascular accident; iCVA = ischemic cerebrovascular accident; TBI = traumatic brain injury.

A.2 Verbs used in the Russian tests

Table A.2.2: Verbs used in the Russian aphasia tests (plus object nouns of TART).

| TART | | | | RePro | | WHEAT | |
|------------|-----------|------------|---------|-----------------|---------------------|-----------------|---------------------|
| Russian | Russian | Transl. | Transl. | Russian verb | Transl. verb | Russian verb | Transl. verb |
| verb | noun | verb | noun | | | | |
| vymyt' | pol | to mop | floor | vzveshivat' | to weigh | vzveshivat' | to weigh |
| podmesti | pol | to sweep | floor | vytirat' | to dry | vytirat' | to dry |
| vypit' | moloko | to drink | milk | katat' | to kart | gladit' | to stroke |
| nalit' | moloko | to stir | milk | kachat' | to swing | nakryvat' | to cover |
| napolnit' | papku | to fill | folder | myt' | to soap | nesti | to carry |
| osvobodit' | papku | to empty | folder | nakryvat' | to cover | obuvat' | to put-shoes- on |
| narisovat' | kvadrat | to paint | square | obhvat' | to splash on | odevat' | to dress |
| nachertit' | kvadrat | to draw | square | obuvat' | to put-shoes- on | ostanavyivat' | to stop |
| pogladit' | sviter | to iron | sweater | odevat' | to dress | podnimat' | to lift |
| slozhit' | sviter | to fold | sweater | osvobodhat' | to free | presledovat' | to chase |
| podt'anut' | telezhku | to pull | kart | podnimat' | to walk up | prity'azyvat' | to tie |
| tolknut' | telezhku | to push | kart | podstignat' | to cut | pr'atat' | to hide |
| porvat' | bumagu | to tear | paper | prist'ogivat' | to fasten | razgl'adyvat' | to investigate |
| prikleit' | bumagu | to glue | paper | pr'atat' | to hide | razdevat' | to undress |
| potocnit' | karandash | to sharpen | pencil | razdevat' | to undress | raschesyvat' | to undress |
| sloimat' | karandash | to break | pencil | raschesyvat' | to comb | tolkat' | to push |
| pochistit' | jabloko | to peel | apple | spuskat' | to walk down | fotografirovat' | to photograph |
| s'est' | jabloko | to eat | apple | umyvav' | to wash | zeloavat' | to kiss |
| sv'azat' | koftu | to knit | shirt | fotografirovat' | to photograph | schekotat' | to tickle |
| sshit' | koftu | to sew | shirt | chistit' | to brush | schipat' | to pinch |

A.3 Accuracy per Russian aphasic participant

Table A.3.3: Individual Russian aphasic participant accuracy, calculated over 20 items per condition for the TART and WHEAT, and 40 items for the RePro. The non-brain-damaged control participants did not make any errors.

| | TART | | RePro | | WHEAT | |
|-------------|--------------|-------------|-------------|-------------|-------------|-------------|
| | PastPerf (%) | PresImp (%) | Pro (%) | Refl (%) | Who (%) | Which (%) |
| A1 | 70.0 | 100.0 | 92.5 | 87.5 | 80.0 | 60.0 |
| A2 | 85.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| A3 | 70.0 | 95.0 | 100.0 | 100.0 | 40.0 | 85.0 |
| A4 | 85.0 | 100.0 | 100.0 | 100.0 | 95.0 | 85.0 |
| A5 | 85.0 | 100.0 | 97.5 | 100.0 | 100.0 | 95.0 |
| A6 | 55.0 | 90.0 | 95.0 | 80.0 | 55.0 | 40.0 |
| A7 | 95.0 | 100.0 | 100.0 | 100.0 | 90.0 | 60.0 |
| A8 | 45.0 | 90.0 | 100.0 | 100.0 | 100.0 | 90.0 |
| A9 | 90.0 | 100.0 | 100.0 | 97.5 | 100.0 | 100.0 |
| A10 | 70.0 | 95.0 | 97.5 | 97.5 | 100.0 | 65.0 |
| <i>Mean</i> | <i>75.0</i> | <i>97.0</i> | <i>98.3</i> | <i>96.3</i> | <i>86.0</i> | <i>78.0</i> |
| F1 | 75.0 | 100.0 | 100.0 | 95.0 | 100.0 | 95.0 |
| F2 | 75.0 | 90.0 | 85.0 | 92.5 | 35.0 | 60.0 |
| F3 | 85.0 | 100.0 | 97.5 | 97.5 | 80.0 | 85.0 |
| F4 | 95.0 | 100.0 | 95.0 | 100.0 | 35.0 | 10.0 |
| F5 | 50.0 | 95.0 | 82.5 | 90.0 | 70.0 | 55.0 |
| F6 | 60.0 | 65.0 | 57.5 | 85.0 | 50.0 | 60.0 |
| F7 | 95.0 | 95.0 | 97.5 | 97.5 | 100.0 | 60.0 |
| F8 | 95.0 | 100.0 | 100.0 | 100.0 | 100.0 | 85.0 |
| F9 | 85.0 | 95.0 | 100.0 | 100.0 | 90.0 | 90.0 |
| F10 | 95.0 | 100.0 | 100.0 | 100.0 | 65.0 | 40.0 |
| <i>Mean</i> | <i>81.0</i> | <i>94.0</i> | <i>91.5</i> | <i>95.8</i> | <i>72.5</i> | <i>64.0</i> |

B Appendix to chapter 3: Time reference decoupled from tense in aphasia

B.1 Individual Dutch aphasic participant data

Table B.1.1: Individual Dutch aphasic participant characteristics.

| Participant | Age | Sex | Hand | (Former) profession | Speech rate w/m | Aetiology | Time PO | BDAE |
|-----------------------------|-----|-----|------|------------------------------|-----------------|---|---------|------|
| Agrammatic aphasic speakers | | | | | | | | |
| B1 | 50 | F | R | Cleaning lady, housewife | 22 | iCVA left | 8 m | 72 |
| B2 | 56 | M | R | Software designer | 37 | iCVA left ACM | 7 m | 72 |
| B3 | 42 | F | R | Office employee | 27 | iCVA left frontoparietal and smaller right parietal | 3 y 4 m | 68 |
| B4 | 49 | F | R | Elderly caretaker | 42 | iCVA left | 5 y 4 m | 71 |
| B5 | 76 | M | R | Architect | 70 | iCVA left ACM | 4 y | 66.5 |
| B6 | 56 | F | R | Canteen manager | 87 | iCVA left ACM | 3 y 6 m | 64 |
| B7 | 49 | M | R | Mechanical engineer | 46 | iCVA left with hemorrhagic component | 5 y 9 m | 66 |
| B8 | 58 | M | R | History teacher | 40 | iCVA left ACM and capsula interna | 5 y 6 m | 65.5 |
| B9 | 40 | F | R | Bookkeeper | 29 | iCVA left ACM | 4 y | 69 |
| B10 | 56 | M | R | Logistic manager | 68 | iCVA left ACM | 4 y 6 m | 64 |
| B11 | 78 | M | R | Technical manager | 56 | iCVA left ACM | 15 y | 72 |
| B12 | 63 | M | L | Constructional calculator | 51 | iCVA left | 1 y | 72 |
| B13 | 67 | F | R | Guesthouse owner | 20 | iCVA left frontoparietal ACM | 6 m | 60 |
| B14 | 39 | M | R | Carpenter historic buildings | 34 | iCVA left ACM | 1 y 2 m | 72 |

| Participant | Age | Sex | Hand | (Former) profession | Speech rate w/m | Aetiology | Time PO | BDAE |
|-------------------------|-----|-----|------|-------------------------------|-----------------|--|---------|------|
| Fluent aphasic speakers | | | | | | | | |
| F1 | 41 | M | R | Construction worker | 111 | iCVA left | 4 m | 72 |
| F2 | 66 | M | R | Navy officer | 119 | iCVA left ACM | 10 m | 61 |
| F3 | 57 | M | R | Administrative assistant | 135 | CVA subcortical left | 5 m | 72 |
| F4 | 59 | M | R | Teacher polytechnic | 161 | CVA left temporal | 4 m | 72 |
| F5 | 80 | F | R | Housekeeper | 117 | CVA left | 6 m | 72 |
| F6 | 71 | M | R | Director building agency | 141 | iCVA right | 11 y | 72 |
| F7 | 62 | F | R | Office employee in factory | 140 | hCVA during resection meningioma left frontal, post-operative bifrontal iCVA | 1 y 4 m | 72 |
| F8 | 45 | M | R | Electrician | 161 | TIA's after dissection carotis interna left | 1 y 9 m | 72 |
| F9 | 46 | M | R | Military policeman | 100 | iCVA left | 9 m | 69.5 |
| F10 | 41 | F | R | Communication specialist | 147 | iCVA left temporal | 6 y | 70 |
| F11 | 63 | F | R | Tourist guide | 207 | Dissection abscess left temporoparietal | 3 y | 72 |
| F12 | 65 | M | R | Project leader in electricity | 150 | iCVA left temporofrontoparietal | 1 y 6 m | 72 |
| F13 | 53 | M | R | Teacher polytechnic | 122 | hCVA left frontotemporal | 9 m | 72 |
| F14 | 83 | M | R | Construction worker | 149 | iCVA left temporoparietal | 5 y | 71 |
| F15 | 37 | F | R | Financial administrator | 106 | iCVA left | 2 y 2 m | 72 |
| F16 | 83 | M | R | General director | 102 | iCVA left | 2 y 3 m | 69 |

B = agrammatic, F = fluent speaker, Hand = Handedness. Speech rate: number of words in two minutes divided by two. Utterances taken from answers to interview questions of the AAT (Graetz, De Bleser, & Willmes, 1992). iCVA: ischemic Cerebrovascular Infarct. ACM: artery cerebri media. Time post-onset (PO) y = year, m = months. BDAE: The score on 'Auditory Word Discrimination' of the Boston Diagnostic Aphasia Test (BDAE; Goodglass & Kaplan, 1972; Goodglass, Kaplan, & Baresi, 2001). Participants were asked to point at objects, geometrical forms, letters, actions, colours and numbers. The maximum score on this subtest was 72.

B.2 Verbs used in the Dutch aphasia test

Table B.2.2: Verb pairs with corresponding nouns used in the Dutch test.

| Dutch verb | Translated verb | Dutch noun | Translated noun |
|--------------------|------------------------|-------------------|------------------------|
| Practice items | | | |
| lezen | <i>to read</i> | brief | <i>letter</i> |
| schrijven | <i>to write</i> | brief | <i>letter</i> |
| Experimental items | | | |
| drinken | <i>to drink</i> | melk | <i>milk</i> |
| inschenken | <i>to pour</i> | melk | <i>milk</i> |
| plakken | <i>to paste</i> | papiertje | <i>paper</i> |
| scheuren | <i>to tear</i> | papiertje | <i>paper</i> |
| tekenen | <i>to draw</i> | vierkant | <i>square</i> |
| schilderen | <i>to paint</i> | vierkant | <i>square</i> |
| strijken | <i>to iron</i> | trui | <i>sweater</i> |
| vouwen | <i>to fold</i> | trui | <i>sweater</i> |
| slijpen | <i>to sharpen</i> | potlood | <i>pencil</i> |
| breken | <i>to break</i> | potlood | <i>pencil</i> |
| naaien | <i>to sew</i> | lapje | <i>cloth</i> |
| breien | <i>to knit</i> | lapje | <i>cloth</i> |
| schillen | <i>to peel</i> | appel | <i>apple</i> |
| eten | <i>to eat</i> | appel | <i>apple</i> |
| trekken | <i>to pull</i> | kar | <i>cart</i> |
| duwen | <i>to push</i> | kar | <i>cart</i> |
| vullen | <i>to fill</i> | doos | <i>box</i> |
| leggen | <i>to empty</i> | doos | <i>box</i> |

B.3 Accuracy per Dutch aphasic participant

Table B.3.3: Individual accuracy scores, calculated over 18 items per condition.

| | Simple past (%) | Periphrastic past (%) | Simple present (%) |
|-----------------------------|----------------------------|----------------------------------|-------------------------------|
| Agrammatic aphasic speakers | | | |
| B1 | 44 | 6 | 78 |
| B2 | 50 | 50 | 72 |
| B3 | 50 | 83 | 89 |
| B4 | 0 | 61 | 11 |
| B5 | 33 | 0 | 78 |
| B6 | 0 | 0 | 11 |
| B7 | 0 | 6 | 17 |
| B8 | 17 | 50 | 28 |
| B9 | 6 | 28 | 56 |
| B10 | 11 | 0 | 72 |
| B11 | 6 | 11 | 39 |
| B12 | 28 | 94 | 94 |
| B13 | 0 | 22 | 33 |
| B14 | 28 | 83 | 50 |
| <i>Mean</i> | <i>19</i> | <i>35</i> | <i>52</i> |
| Fluent aphasic speakers | | | |
| F1 | 61 | 39 | 67 |
| F2 | 0 | 6 | 33 |
| F3 | 89 | 94 | 94 |
| F4 | 83 | 100 | 100 |
| F5 | 0 | 44 | 28 |
| F6 | 44 | 17 | 83 |
| F7 | 89 | 89 | 100 |
| F8 | 83 | 94 | 100 |
| F9 | 50 | 72 | 56 |
| F10 | 56 | 94 | 100 |
| F11 | 100 | 89 | 100 |
| F12 | 17 | 83 | 94 |
| F13 | 89 | 100 | 100 |
| F14 | 0 | 6 | 89 |
| F15 | 94 | 72 | 100 |
| F16 | 33 | 50 | 67 |
| <i>Mean</i> | <i>56</i> | <i>66</i> | <i>82</i> |

C Appendix to chapter 5: Losing track of time? Incremental time reference processing

C.1 Individual German participant characteristics

Table C.1.1: Individual German participant characteristics.

| Pp. | Age | Sex | Educ. years | H | Syndrome (severity) | MLU | Aetiology | Localisation | TPO [y;m] |
|---------------------------------|-----|-----|----------------|---|--|------|-----------|-------------------------------------|--------------|
| Agrammatic aphasic participants | | | | | | | | | |
| B1 | 58 | f | 12 | R | Broca (moderate) | 3.8 | SAH | left ACI | 2;10 |
| B2 | 41 | f | 13 | R | Anomic* (mild) | 4.69 | iCVA | left ACM | 12;6 |
| B3 | 61 | m | 17 | L | Broca (moderate) | 3.42 | hCVA | right temporo-parietal | 18;1 |
| B4 | 73 | m | 10 | R | Broca (moderate) | 2.07 | iCVA | left ACM | 15;0 |
| B5 | 54 | f | 18 | R | Broca (severe) with apraxia of speech | n.a. | hCVA, SAH | n.a. | 4;6 |
| B6 | 58 | m | 13 | R | Broca (moderate-severe) with apraxia of speech | n.a. | iCVA | left ACM and ACI peri-/suprasylvian | 1;0 |
| Non-brain-damaged participants | | | | | | | | | |
| C1 | 45 | m | 10 | R | | | | | |
| C2 | 38 | f | 19 | R | | | | | |
| C3 | 43 | f | 13 | R | | | | | |
| C4 | 66 | f | 12 | R | | | | | |
| C5 | 62 | m | 16 | R | | | | | |
| C6 | 64 | f | 16 | R | | | | | |
| C7 | 69 | f | 13 | R | | | | | |
| C8 | 38 | f | 17 | R | | | | | |
| C9 | 77 | m | 17 | R | | | | | |
| C10 | 67 | f | 14 | R | | | | | |
| C11 | 66 | m | 21 | R | | | | | |
| C12 | 61 | f | 15 | R | | | | | |

Pp. = Participant, Educ. = Education, H = handedness: R = right, L = left, TPO = Time post onset, y;m = years;months, SAH = subarachnoid hemorrhage, iCVA = ischemic cerebrovascular accident, hCVA = hemorrhagic cerebrovascular accident, ACI = arteria carotis interna, ACM = arteria carotis media. *B2 was initially diagnosed as Broca's aphasic. Her spontaneous speech at the time of testing contained substitutions of plural with single nouns, omissions of determiners and verb forms and sometimes substitutions of finite verb forms with an infinitive, and she produced many incomplete utterances.

C.2 Verbs and nouns in the eye-tracking experiment

Table C.2.2: Verbs and nouns used in the eye-tracking experiment.

| German verb | Translated verb | German noun | Translated noun |
|------------------------|----------------------------|------------------------|----------------------------|
| besprühen | to spray | Mauer | wall |
| blockieren | to block | Weg | road |
| dekorieren | to decorate | Zimmer | room |
| demontieren | to disassemble | Fahrrad | bike |
| entblößen | to bare | Schulter | shoulder |
| entfernen | to remove | Zecke | tick |
| entgräten | to filet | Fisch | fish |
| enthäuten | to peel | Zwiebel | onion |
| entkorken | to uncork | Flasche | bottle |
| entsaften | to juice | Orange | orange |
| entsteinen | to remove the stone | Kirsche | cherry |
| entwirren | to disentangle | Seil | rope |
| entzünden | to light | Kerze | candle |
| gravieren | to engrave | Ring | ring |
| lackieren | to polish | Nagel | nail |
| rasieren | to shave | Bein | leg |
| sortieren | to sort | Sammlung | collection |
| verbeulen | to bump | Auto | car |
| verbuddeln | to bury | Dose | can |
| verschmutzen | to soil/dirty | Tischtuch | table cloth |

C.3 Accuracy and RT per German aphasic participant

Table C.3.3: Accuracy and response time per German aphasic participant.

| Parti- cipant | Eye-tracking experiment | | | | TART | | |
|------------------|--------------------------------|------|----------------------------|-------------|--------------|-----------|-----------|
| | Accuracy (%) | | Reaction time [ms] correct | | Accuracy (%) | | |
| | Future | Past | Future | Past | Future | Present | Past |
| B1 | 70 | 90 | 3623 | 3833 | 80 | 80 | 80 |
| B2 | 95 | 95 | 2556 | 2485 | 90 | 95 | 95 |
| B3 | 80 | 90 | 5190 | 3550 | 75 | 100 | 70 |
| B4 | 65 | 95 | 3550 | 3321 | 85 | 90 | 80 |
| B5 | 20 | 85 | 6634 | 3990 | 65 | 90 | 30 |
| B6 | 50 | 95 | 4191 | 3067 | 70 | 90 | 95 |
| <i>Mean</i> | 64 | 92 | <i>3907</i> | <i>3349</i> | <i>75</i> | <i>91</i> | <i>78</i> |