Aspect, Negation, and the Visual World Paradigm: An investigation into Russian and Polish

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Overview

1. Aspect
2. Negation
3. Aspect, Negation, and the Visual World Paradigm (VWP)
4. Methods
   a. Pilot Study
   b. Current Study
      i. Visual Likert Scale
      ii. Scalar Implicatures
      iii. Predictions
      iv. Data Analysis
5. Further Implications

1. Aspect

Aspect

- Aspect: expresses a temporal relation between an event time (E) and a reference time (R)

- Contrast with Tense: a relation between reference time (R) and speech/utterance time (S)

Perfective

- often associated with event completion or boundedness

- result of the event is focused

- runtime of event contained in reference time

  - $\tau(e) \subseteq t$

Imperfective

- event as an in-progress activity

- process of the event is focused

- reference time included in the event time

  - t ⊆ e

Russian Verbs

IMPERFECTIVE | PERFECTIVE

1. čitat'

   to read.IPFV

2. pro-čitat'

   PFV-to read

Polish Verbs

IMPERFECTIVE	PERFECTIVE
3. czytać	4. prze-czytać
to read.IPFV	PFV-to read

Bipartite Structure
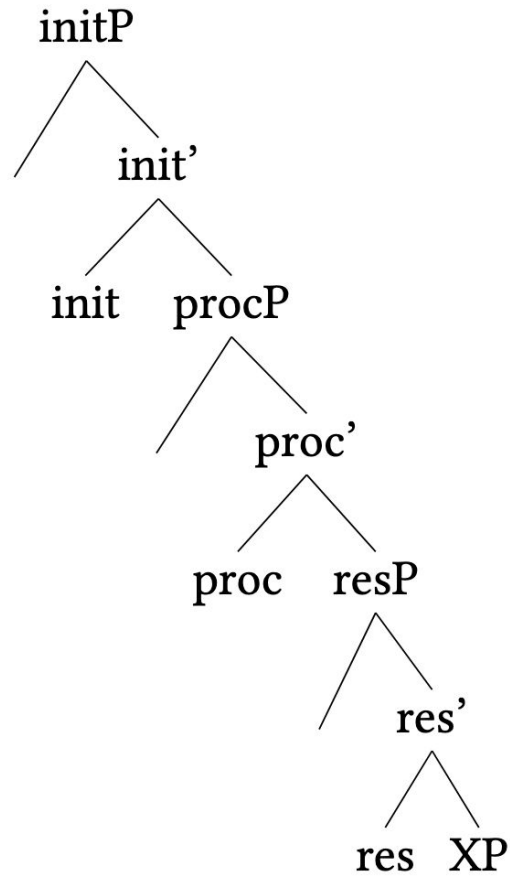
- the Russian linguistic tradition assumes a bipartite structure for perfective verbs

  - an **eventive part** and a **resultative part**

  - Maslov (1984)

- Zinova & Filip (2014a,b) assume a **process part** and a **culmination part** (result)

Ramchand (2008)

- decomposes the verb into three syntactic heads

  - init(iator), proc(ess), res(ult)

- builds event structure into the syntax

Ramchand (2008)

2. Negation

Negation

- Negation interacts with aspect in Russian

- Single negation, introduced by the negative marker

  - *ne* (Russian); *nie* (Polish)

Aspect Under Negation

IMPERFECTIVE

5a. Ivan ne   čital   ètu knigu.

    Ivan NEG read.IPFV.PST.3SG this book

    'Ivan did not read this book.'

PERFECTIVE

5b. Ivan ne   pro-čital   ètu knigu.

    Ivan NEG PFV-read.PST.3SG this book

    'Ivan did not read this book completely through.'

— Zinova & Filip (2014b)

Aspect Under Negation

PERFECTIVE

6a. Ivan ne   pro-čital   ètu knigu.

   Ivan NEG PFV-read.PST.3SG this book

   'Ivan did not read this book completely through.'

PERFECTIVE

6b. Ivan ne   pro-čital   ètu knigu.

   Ivan NEG PFV-read.PST.3SG this book.

   On daže ne   otkryl   eë.

   He even NEG open.PST.3SG it.ACC.F

   'Ivan didn't read this book. He did not even open it.'

— Zinova & Filip (2014a)

Evidence for Implicature

7. Esli Vasja pro-čital   učebnik, on sdast   èkzamen.

   if   Vasja PFV-read.PAST.SG.M textbook, he passes exam

   'If Vasja completely read the textbook, he will pass the exam.'

   ⇸ Vasja read/began reading the textbook.

                                              — Zinova & Filip (2014a)

Evidence for Implicature

8a. Katya pro-čitala   skazki   Puškina.

    Katya PFV-read.PST.3SG.F fairy tales Pushkin.GEN

    'Katya read the fairy tales by Pushkin completely through.'

8b. #Pogodi-ka! Ja ne   znal,   čto ona ix   čitala!

    wait!   I   NEG knew that she them read.

    'Wait a minute! I didn't know that she was reading them!'

                                        — Zinova & Filip (2014a)

Cross-Slavic Predictions

- Zinova & Filip (2014a,b) present data from Russian

- They predict that their methodology is extendable across Slavic languages

- Slavic aspect is known to have variation (Dickey 2000, Gehrke 2024), so this should be verified

3. Aspect, Negation, and the Visual World Paradigm (VWP)

Visual World Paradigm

- Written language (reading) vs. **spoken language** (VWP)

- **Comprehension**: visual display while listening to an utterance

- Researchers assume an **eye-mind link** that relates the eye gaze (an index of overt attention) to ongoing processing in the mind

- Early work uncovered a link between **audio materials**, visual information and eye-fixation behavior (Cooper 1974; Tanenhaus et al., 1995)

- Allows for **fine-grained** time-course analysis of language processing
  - Speech perception, lexical competition, syntactic ambiguity resolution, prediction etc.

- Main measure is the proportion of looks to one of the visual items

Previous VWP Research on Aspect

- Psycholinguistic methods can be used successfully to examine the interpretation of grammatical aspect in a variety of languages (Minor et al., 2022; Vos et al., 2022; Minor et al., 2023)
- Minor et al. (2022) and Minor et al. (2023) used the VWP to examine the time course of verb aspect processing in Russian-speaking adults
- Eye movement and mouse click results suggested that the participants demonstrated a preference for pictures of ongoing events in the imperfective condition and a preference for pictures of completed events in the perfective condition

(a) Ongoing event   (b) Completed event

a.   Babuška   **saža-la**   bjelyj cvjetok.
     grandma   **plant.IMP**-PST   white flower
     'Grandma was planting a white flower.'
b.   Babuška   **posadi-la**   bjelyj cvjetok.
     grandma   **plant.PFV**-PST   white flower
     'Grandma planted a white flower.'

Research Questions

- Previous work only looked at affirmative sentences
- The current study investigates the interaction between aspect and negation in Russian and Polish using the VWP
- A **'no event'** picture

- Is the i**nteraction between aspect and negation** reported by Zinova & Filip (2014a,b) verifiable using the VWP?
- Can this methodology provide us any insights into time course of **processing** of these negated sentences?

Predictions Without Negation (Ongoing vs. Completed)

IMPERFECTIVE

- proportions of glances to pictures of ongoing events will increase after hearing an imperfective verb

PERFECTIVE

- proportions of glances to pictures of completed events will increase after hearing a perfective verb

Predictions With Negation (No event vs. Ongoing)

IMPERFECTIVE

● After hearing an imperfective verb, proportions of glances towards an image where no event has occurred should increase

PERFECTIVE

● After hearing a perfective verb, proportions of glances towards an image of an ongoing event should increase
    ○ predict a general preference
● But, there may be variation
    ○ intra- and interlanguage variation shown in processing of pragmatic implicatures
    ○ e.g. *finger* ↗ *not thumb* shown by ~ 75% of English speakers (Dionne & Coppock 2022)

Predictions With Negation (No event vs. Ongoing)

- Minor et al. (2023) found that Spanish speakers were selecting the Completed Event picture significantly less often than Russian participants
- The authors suggested that this pattern is in line with the hypothesis that Russian perfective predicate semantically **entail** that the event reached completion, whereas corresponding predicates in the Preterite form in Spanish only entail the existence of a final boundary, with event completion arising as a cancellable **pragmatic implicature**
- They predicted that the emergence and strength of this implicature to be subject to a **greater degree of variation,** leading to a less uniform pattern of responses

Pilot Study #1

Experimental Design

Sentences:

- Negation (negation vs. no negation)
- Aspect (imperfective vs. perfective)

Pictures:

- No event vs. Ongoing event (negated sentences)
- Ongoing event vs. Result (non-negated sentences)

Dependent variables:

- ~~Proportion of looks (PCIbex)~~
- Mouse clicks

Sample

- 6 native Russian speakers

    - 8 items per list

    - 2 verbs per condition

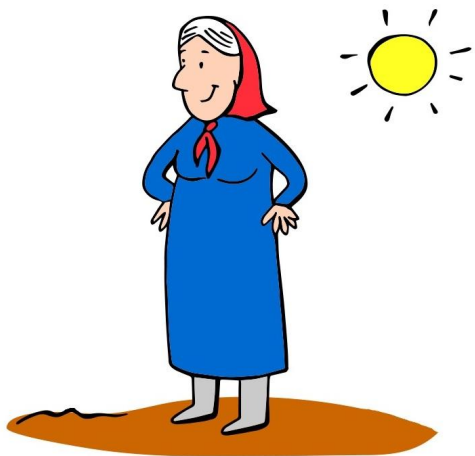   - Previxed perfectives from Minor et al. (2022)

Materials

IMAGE: NO EVENT

IMAGE: ONGOING EVENT

Babuška **ne   sažala**   /   **posadila**   bjelyj cvetok.

Grandma **NEG plant.impf.pst.f/   plant.pfv.pst.f**   white flower

'Grandma was not planting / did not plant a white flower.'

Results: Mouse Clicks

Non-negated sentences

	Ongoing event	Result
Imperfective	10	2
Perfective	1	11

Fisher's exact test $p<0.001$

Negated sentences

	Ongoing event	No event
Imperfective	1	11
Perfective	1	11

Fisher's exact test $p=1$

Discussion

- Offline results from Minor et al. (2022) were replicated
  - replication allows us to infer that the results are not random
- Imperfective and perfective aspect under negation showed similar results
  - contradicts Zinova & Filip (2014a,b)
- Suggests no pragmatic implicature for perfective under negation (at least for out of the blue sentences)
  - pragmatic implicature subject to variation (Dionne & Coppock 2022) but no variation here
- Results only based on click data; online processing might be different
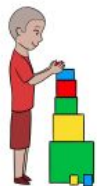
Pilot Study #2

Visual Likert Scale

- The Likert scale is widely used as an offline measure of linguistic judgements of grammaticality or acceptability (Schütze, 2016)
- Visual scales have proved to be effective when examining nuanced judgments regarding negation (Tessler & Franke, 2019)
- Can a visual variant of a Likert scale be used to investigate processing of subtle semantic and pragmatic phenomena in an eye tracking study?
- We mapped a 4-staged event structure onto a visual scale with four pictures
- Allows to compare affirmative and negated sentences in a direct manner

Visual Scale

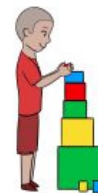Layout 1: Grid

Layout 2: Linear

Malčik   **(ne)**   **stroil /**   **postroil**   vysokuyu bašn'u

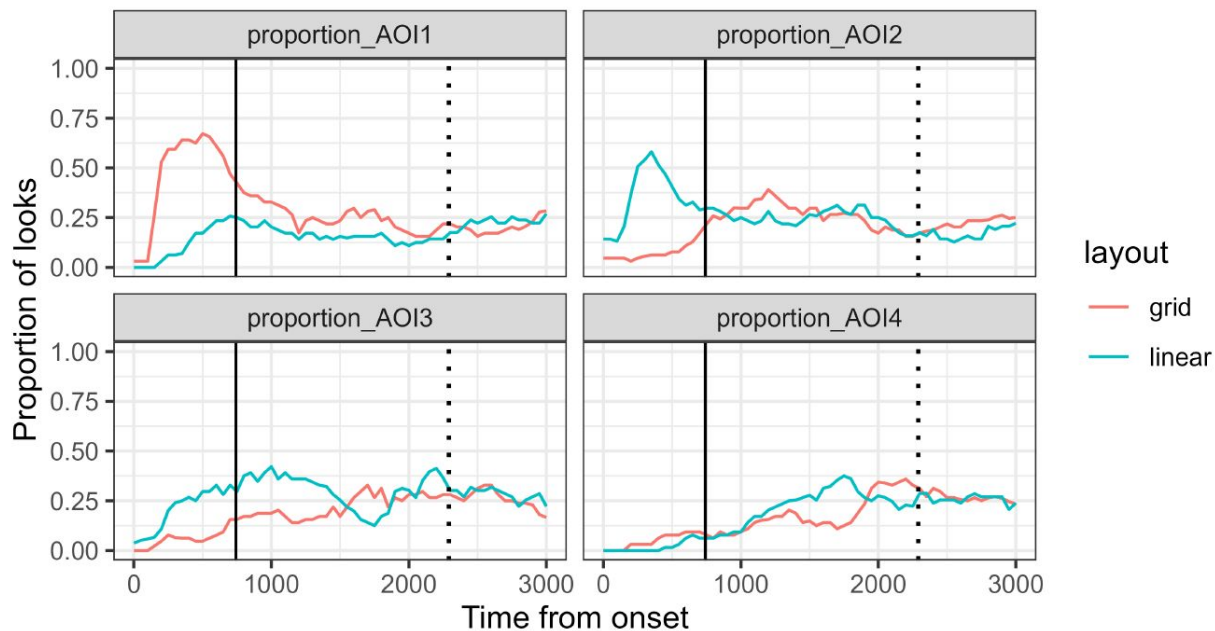Boy   (**NEG)**   **build.impf.pst.m/**   **build.pfv.pst.m** tall tower

'The boy (didn't) build a tall tower'
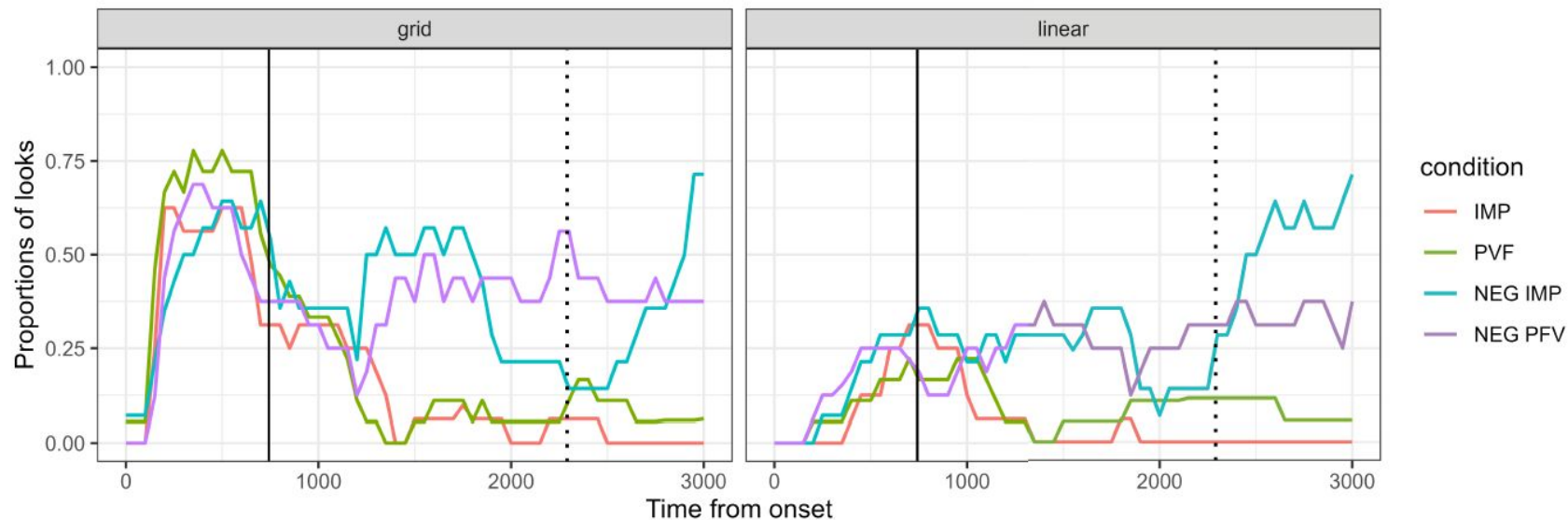
Experimental Design

- Participants: 16 adult native Russian speakers

- In-lab eye movement recording (EyeLink 1000+)

- 8 target items

- Independent variable:

  - Negation (negated vs. not negated)

  - Aspect (imperfective vs. perfective)

Average Looks to Pictures

Looks to the 'No Event' Picture

average verb onset .... average sentence offset

Results: mouse clicks

Conditon	AOI1	AOI2	AOI3	AOI4
IPFV	0	7	23	2
PFV	1	0	1	34
NEG IPFV	26	0	1	1
NEG PFV	27	2	0	3

Implications

Methodological Implications:

- The different patterns of looks across layouts suggest that results cannot be generalized from one layout to another
- Experimenters should carefully consider visual layout

Theoretical Implications:

- The click data from our pilot does not appear to support Zinova & Filip (2014a,b)
- The eye movement dataset is too small for inference, but the visual inspection suggests that there might be some similarities in the processing of negated verbs

Current Study

Current Study

- 20 experimental items (5 verbs per condition)
- 20 fillers
    - 8 fillers will be classic examples of scalar implicatures (numerals, two ↝ not three) which are compatible with our 4-point visual scale
    - a separate analysis of the scalar implicatures would provide further support for use of visual scales to assess processing of implicatures
    - processing evidence could potentially be used to bear upon theoretical semantic/pragmatic debates
- Linear layout
- In-lab eye tracking
- Larger sample size

Scalar Implicature Fillers

Malčik   pročital   **dve/ tri**   knigi

Boy   read.impf.pst.m **two/ three**   books

'The boy read two/three books'

Predictions With Negation

IMPERFECTIVE

- After hearing an imperfective verb, proportions of glances towards an image where no event has occurred should increase

PERFECTIVE

- After hearing a perfective verb, proportions of glances towards an image of an ongoing event should increase
    - predict a general preference
- But, there may be variation
    - intra- and interlanguage variation shown in processing of pragmatic implicatures (Dionne & Coppock 2022)
    - implicatures may be subject to more variation in eye movements (Minor et al., 2023)
- And the offline data suggests a general preference for the 'No event' reading

Data Analysis

- To assess the effect of negation on aspect processing, we will compare looks to each of the four pictures separately
- We are considering other options that would allow us to include all four pictures in the analysis and/or to account for the ordered nature of visual stimuli (multinomial models, ordinal models)
- We are open to suggestions with regards to the analysis

5. Further Implications

Future Research

- Potential effect of position of affix on the verb in Russian
    - we only examined prefixes
    - do implicatures under negation arise later if the affix appears later on the verb?
- Effect of linguistic context
    - would linguistic context strengthen certain interpretations?
- Event structure
    - other stages (e.g. initiation)
- Processing of different types of verbs under negation (Paducheva, 2013):
    - *ne chital/ ne prochital* ('read') vs. *ne reshal/ne reshil* ('solve')
- Other Slavic languages
    - czech (Western-Eastern aspectual continuum)

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