

7. Parsing a modularita mysli

LGV22 PSYCHOLINGVISTIKA
PŘEDNÁŠKA 7

Opakování z minula

Minulý týden jsme mluvili o **inkrementalitě jazykové produkce**

→ tvrzení, že jazyková produkce postupuje po **kusech** („chunks“)

Co se týče rozsahu inkrementality jsme se podívali na tři hypotézy

- Radikální
- Frázová
- Klauzální

Dále jsme se podívali na to, jaké byly naše původní předpoklady

Je rozsah plánování nutně fixován?

Je rozsah pro lexikální přístup a strukturální plánování vždy stejný?

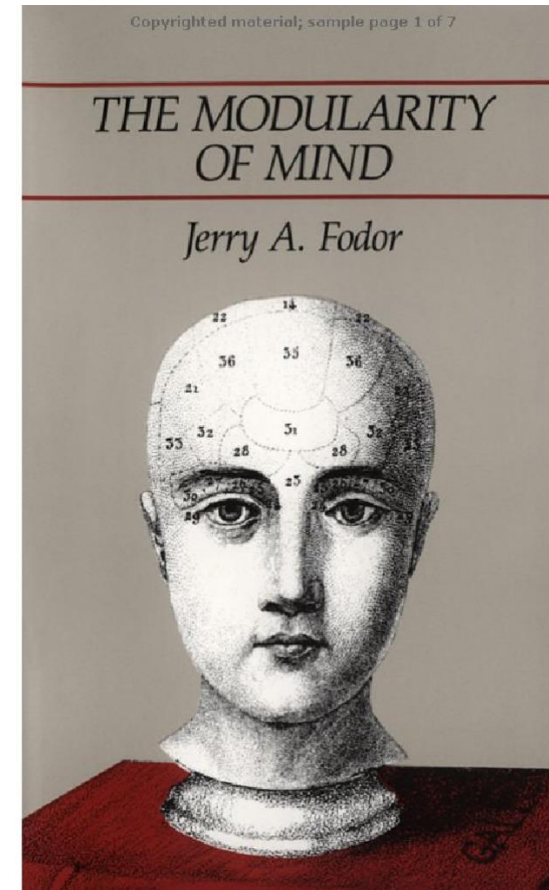
Dnešní hodina

1. Modularita mysli
2. „Information encapsulation“ jako esence modularity
3. Problém porozumění – dvojznačnost
4. Věty se slepou kolejí
5. Parsing – model slepé koleje
6. Data pro interaktivní parsing

Modularita mysli



Fodor, J. (1983) *Modularita mysli*



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Obecná teorie mysli

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Mysl se skládá ze **tří typů systémů:**

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- Output systémy
- Input systémy
- Centrální systém

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Obecná teorie mysli

Mysl se skládá ze **tří typů systémů**:

- Output systémy
- Input systémy
- Centrální systém

Fodor tvrdí, že **input systémy jsou modulární**

Co to znamená?

Co je to modularita?

Idea, že input systémy jsou **samostatné moduly**, které operují nezávisle na sobě.

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Moduly mají následující vlastnosti dle Fodora:

- Doménová specificita
- Povinný provoz
- Limitovaná centrální přístupnost
- Rychlé zpracování
- **Information encapsulation** – „informační zapouzdření“
- „Povrchní“ výstupy
- Fixovaná neurální architektura
- Charakteristické a specifické vzorce selhání
- Charakteristický postup ontogeneze

„Information
encapsulation“



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Esence modularity

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Esence modularity

→ pro Fodorovu modularitu podmínka *sine qua non*

„Information encapsulation“

Esence modularity

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Je to tvrzení, že moduly jsou **izolované od centrálního systému**

„Information encapsulation“

Esence modularity

→ pro Fodorovu modularitu podmínka *sine qua non*

Je to tvrzení, že moduly jsou **izolované od centrálního systému**

→ nelze využívat informace přicházející z **přesvědčení a tužeb**

→ žádné „top-down“ vlivy

Porozumění



Problém jazykového porozumění

Opak produkce – jak dokáže posluchač **dešifrovat zprávu?**

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Dvojznačnost může být **dočasná** či „úplná“

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V této přednášce se budeme zejména věnovat porozumění **větám**

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V této přednášce se budeme zejména věnovat porozumění **větám**

→ takzvaný „**parsing**“

Věty se slepou
kolejí



„Věty se slepou kolejí“



„Garden-path sentences“



Věty se slepou kolejí

Myš

Věty se slepou kolejí

Myš snědla

Věty se slepou kolejí

Myš snědla včera

Věty se slepou kolejí

Myš snědla včera večer

Věty se slepou kolejí

Myš snědla včera večer ve spíži

Věty se slepou kolejí

Myš snědla včera večer ve spíži kočka.

Věty se slepou kolejí

Myš snědla včera večer ve spíži **kočka**.

Věty se slepou kolejí

Nominativ nebo akuzativ?


Myš snědla včera večer ve spíži **kočka**.

Co se tady děje?

Klasický anglický příklad

The horse **raced** past the barn **fell**.

Klasický anglický příklad

Hlavní sloveso?

The horse **raced** past the barn **fell**.

Klasický anglický příklad

Hlavní sloveso?

The horse **raced** past the barn **fell**.

„Reduced relative clause“?

Klasický anglický příklad

Hlavní sloveso?

The horse **that was raced** past the barn **fell**.



„Reduced relative clause“?

Model slepé koleje

Vytvořen Frazier a Raynerem (1982)

COGNITIVE PSYCHOLOGY 14, 178–210 (1982)

Making and Correcting Errors during Sentence Comprehension: Eye Movements in the Analysis of Structurally Ambiguous Sentences

LYN FRAZIER AND KEITH RAYNER

University of Massachusetts

Eye movements were recorded as subjects read sentences containing temporary structural ambiguities. In accord with the garden-path theory of sentence comprehension, shorter reading times were found for sentences conforming to certain independently motivated parsing strategies (late closure and minimal attachment) than for comparable sentences which violate these strategies. Further, longer fixation durations were associated with the very first fixation in the region of the sentence which disambiguated the sentence, suggesting that the human sentence-parsing mechanism operates in a rather systematic fashion, immediately computing the structural consequences of fixated material for the analysis of preceding material. The pattern of regressive eye movements did not conform to the view that the parsing mechanism automatically returns to the beginning of the sentence to revise an incorrect analysis of linguistic material nor did it support the view that the parsing mechanism systematically backtracks through the sentence until the source of the erroneous analysis is located. Rather, the pattern of regressions indicated that the parsing mechanism typically engages in selective reanalysis, exploiting whatever information it has available about the type of error it has committed to guide its reanalysis attempts. Finally, it is emphasized that an understanding of the parser's revision procedures is essential to an explanation of why certain linguistic structures cannot be successfully parsed by humans.

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Sestává se ze **dvou pravidel**

→ **Minimalizace uzlů** (Minimal attachment)

→ **Oddalované uzavření** (Late closure)

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Minimalizace uzlů

For every new word encountered, construct the syntactic structure with the smallest number of nodes that is grammatical:

Minimalizace uzlů

For every new word encountered, construct the syntactic structure with the smallest number of nodes that is grammatical:

- (2) The city council argued the mayor's position . . .
 - (a) The city council argued the mayor's position forcefully.
 - (b) The city council argued the mayor's position was incorrect.

Minimalizace uzlů

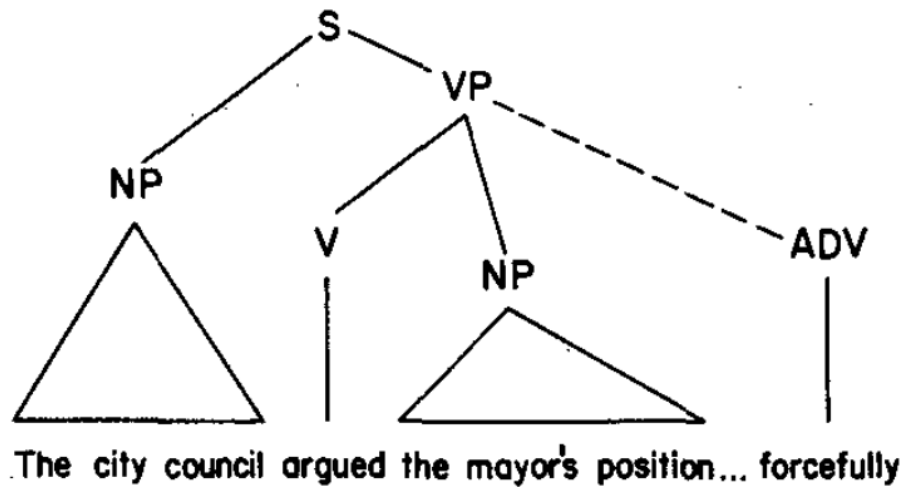


FIG. 1

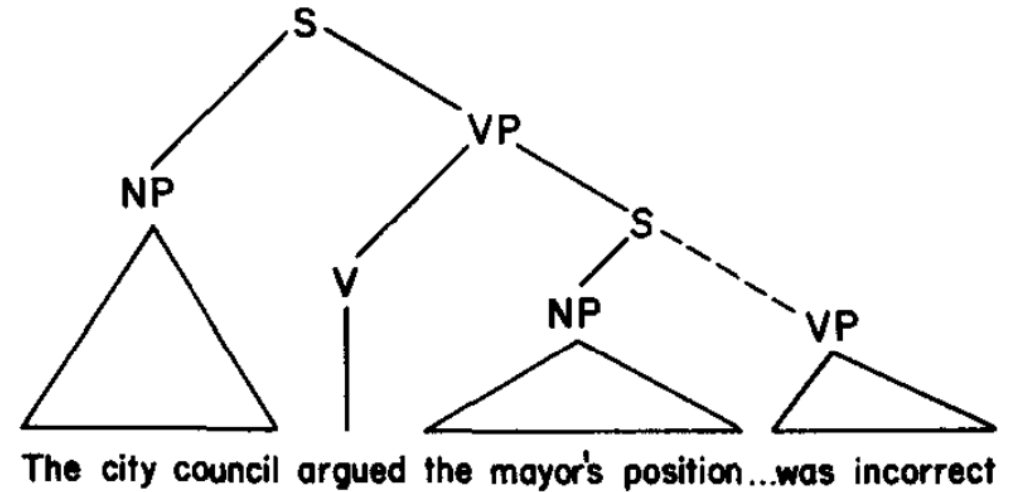


FIG. 2

Oddalované uzavření

When possible, attach incoming lexical items into the clause or phrase currently being processed (i.e., the lowest possible nonterminal node dominating the last item analyzed).

Tom said that Bill had taken the cleaning out yesterday.

Frazier & J. Fodor (1978)

Oddalované uzavření

When possible, attach incoming lexical items into the clause or phrase currently being processed (i.e., the lowest possible nonterminal node dominating the last item analyzed).

Strukturně vyšší připojení

[Tom said [that Bill had taken the cleaning out] yesterday].

Frazier & J. Fodor (1978)

Oddalované uzavření

When possible, attach incoming lexical items into the clause or phrase currently being processed (i.e., the lowest possible nonterminal node dominating the last item analyzed).

Strukturně nižší připojení

[Tom said [that Bill had taken the cleaning out yesterday]].

Frazier & J. Fodor (1978)

Tak co uděláme s tím koněm?

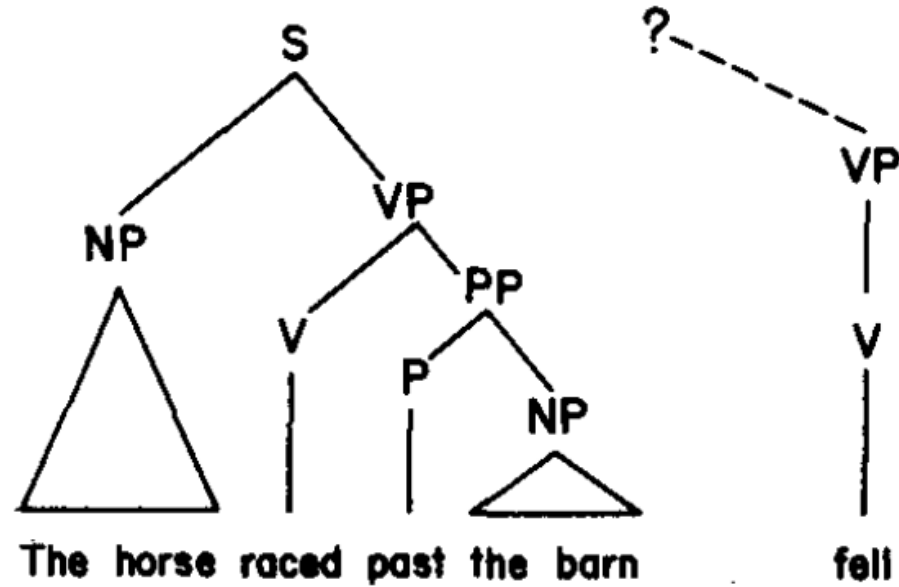


FIG. 4

Ferreira & Clifton (1986)

JOURNAL OF MEMORY AND LANGUAGE 25, 348–368 (1986)

The Independence of Syntactic Processing

FERNANDA FERREIRA AND CHARLES CLIFTON, JR.¹

University of Massachusetts, Amherst

Three experiments addressed the question whether semantic content or pragmatic context can direct the initial syntactic analysis assigned to sentences. Each experiment determined whether syntactic processing biases that have been observed in sentences presented in isolation can be overcome. In two experiments that measured eye movements, we found that the syntactic processing biases remained even when they resulted in thematically based anomaly or when they conflicted with discourse biases. In a third experiment, we used a self-paced reading task to replicate some of the results obtained using eye movement measures. We argue that the data support the existence of a syntactic processing module. © 1986 Academic Press, Inc.



Ferreira & Clifton (1986)

Platí pro syntaktický parser teorie slepé koleje?

Využívá **pouze syntaktické informace**?

→ využívá sémantický nebo pragmatický kontext?

Eye-tracking studie při čtení – „first pass“ a „second pass“ čtení

Ferreira & Clifton (1986)


Jejich participantů měli za úkol číst věty podobné těmto:

1. The defendant examined by the lawyer turned out to be unreliable.
2. The evidence examined by the lawyer turned out to be unreliable.
3. The defendant that was examined by the lawyer turned out to be unreliable.
4. The evidence that was examined by the lawyer turned out to be unreliable.

Ferreira & Clifton (1986)

Jeich participantí měli za úkol číst věty podobné těmto:

Věty se slepou kolejí

1. **The defendant examined** by the lawyer turned out to be unreliable.
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Ferreira & Clifton (1986)

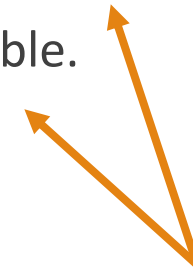
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Věty se slepou kolejí



Desambiguované věty



Ferreira & Clifton (1986)

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Kritický region



Věty se slepou kolejí



Desambiguované věty



Ferreira & Clifton (1986)

TABLE 1
MEAN FIRST PASS AND SECOND PASS READING TIMES PER CHARACTER (IN ms) EXPERIMENT 1

Condition	First pass			Second pass		
	Region			Region		
	c - 1	c	c + 1	c - 1	c	c + 1
Animate Reduced	33.3	40.4	31.9	15.3	8.2	12.8
Animate Unreduced	31.9	30.7	33.1	6.9	3.6	8.0
Inanimate Reduced	37.7	38.4	32.6	12.6	14.9	16.9
Inanimate Unreduced	30.1	30.3	28.6	0.0	0.0	2.5

Ferreira & Clifton (1986)

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Ferreira & Clifton (1986)

Výsledky konzistentní s modelem slepé koleje!

→ Tohle je přesně podle Fodorovy teorie modularity!

Ale...

Ale... Ferreira et al. (2021)

25TH ANNIVERSARY RE-RELEASE
A DIGITAL PRESENTATION

DO INFLUENTIAL RESULTS FROM 1980s PSYCHOLINGUISTICS REPLICATE?

STARRING FERNANDA FERREIRA · GWENDOLYN REHRIG
MADISON BARKER · ELEONORA BEIER
SUPHASIREE CHANTAVARIN · BEVERLY COTTER
ZHUANG QIU · MATTHEW W. LOWDER
& HOSSEIN KARIMI

00:30:39 / 00:54:49

Speed CC

Ale... Ferreira et al. (2021)

were those reported in F&C86: first-pass reading time, probability of a first-pass regression out of a region, and second-pass reading time. Norming data and accuracy were also analyzed.

Results. Behavioral results were as follows: First, analyses of norms suggest the contexts from both studies were less effective than assumed by the original investigators. For the F&C86 stimuli, context had no effect on offline ratings of the appropriateness of either the MA or NMA sentences; instead, overall, subjects rated MA sentences as better than NMA sentences regardless of context bias. For A&S, the NMA-biased contexts did support the NMA form, but raters given MA-biased contexts had no preference for either the MA or the NMA sentence. Question-answering accuracy did not differ across conditions either for F&C86 or A&S88 (contrary to F&C86). Eyetracking results for regressions and first pass reading times are shown on the following page (Fig. 1). The F&C86 replication showed no clear pattern of results for first-pass reading times, and the likelihood of a first-pass regression was overall greater for NMA than for MA structures, regardless of context. For A&S88 stimuli, regression probability was higher for VP attached (MA) than for NP attached (NMA) forms, with no effect of context. First-pass reading times for A&S88 did not differ for either structure given NP-biased contexts and were faster for VP-attached (MA) sentences given VP-biased contexts.

Conclusions. The results of this replication study differed substantially from the findings reported in F&C86 and A&S88. The discrepancies are due to numerous factors including lack of norming data for contexts and low statistical power. Overall, replicability is an important issue in psycholinguistics, and we would suggest that psycholinguistics has much to contribute to discussions concerning how to conduct and evaluate replication studies.

Trueswell, Tanenhaus, & Garnsey (1994)

JOURNAL OF MEMORY AND LANGUAGE 33, 285–318 (1994)

Semantic Influences on Parsing: Use of Thematic Role Information in Syntactic Ambiguity Resolution

JOHN C. TRUESWELL AND MICHAEL K. TANENHAUS

University of Rochester

AND

SUSAN M. GARNSEY

University of Illinois at Urbana

Ferreira and Clifton (1986, Experiment 1) found that readers experienced equal difficulty with temporarily ambiguous reduced relatives clauses when the first noun was animate (e.g., "The defendant examined by the lawyer was . . .") and when it was inanimate and thus an unlikely Agent (e.g., "The evidence examined . . ."). This data pattern suggested that a verb's semantic constraints do not affect initial syntactic ambiguity resolution. We repeated the experiment using: (1) inanimate noun/verb combinations that did not easily permit a main clause continuation, (2) a baseline condition with morphologically unambiguous verbs (e.g., "stolen"), (3) a homogeneous set of disambiguating prepositional phrases, and (4) a display in which all of the critical regions were presented on the same line of text. In two eye-movement experiments, animacy had immediate effects on ambiguity resolution: only animate nouns showed clear signs of difficulty. Post-hoc regression analyses revealed that what little processing difficulty readers had with the inanimate nouns varied with the semantic fit of individual noun/verb combinations: items with strong semantic fit showed no processing difficulty compared to unambiguous controls, whereas items with weak semantic fit showed a pattern of processing difficulty which was similar to Ferreira and Clifton (1986). The results are interpreted within the framework of an evidential (constraint-based) approach to ambiguity resolution. Analyses of reading times also suggested that the millisecond per character correction for region length is problematic, especially for small scoring regions. An alternative transformation is suggested. © 1994 Academic Press, Inc.

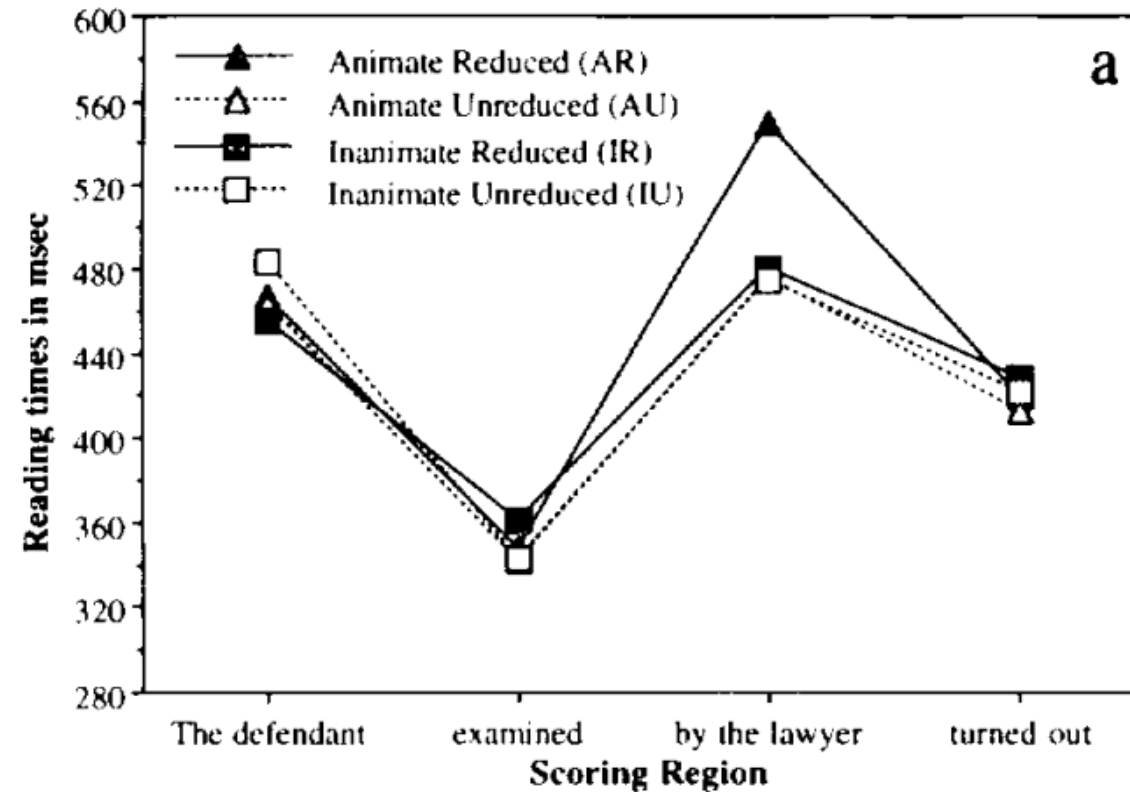


Trueswell, Tanenhaus, & Garnsey (1994)

Replikace studie Ferreira a Clifton (1986)

Trueswell et al. (1994) kritizovali jejich metodologii → sémantická manipulace byla **příliš slabá!**

Trueswell, Tanenhaus, & Garnsey (1994)



Trueswell, Tanenhaus, & Garnsey (1994)

Výsledky byly **inkonzistentní s modelem slepé koleje!**

Sémantická informace byla užívána během „first pass“ čtení!

→ Znamená to, že **modularita vyletěla oknem?**

Myšlenky do diskuze?

Zdá se vám modularita mysli jako pravděpodobná?

Myslíte si, že výsledky Trueswella et al. (1994) ukazují, že jazykové porozumění není modulární?

Co by se muselo najít, aby byla modularita vyvrácena?