Exploring Czech inflection with the picture-word interference paradigm

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Overview

- Picture - word interference paradigm
- Its application on Czech
  - Grammatical gender
  - Declension class
  - Conjugation class

Interference pardigms

- popular among psychologists studying cognitive phenomena, later used used to explore lexical retrieval processes
- simple: participants are presented with a stimulus made up of two different components and their task is to respond to one component of the stimulus, while ignoring the other
  - Stroop effect (1935): **blue** vs. **blue**

Picture – word distractor/interference pardigm

- the two components of the stimulus are a picture and a word
  - the task is typically one of picture naming: participants are instructed to ignore the distractor word and to name the picture, producing a target word
  - researcher manipulates the relationship between distractor and target words and/or the time interval between the presentations of picture and distractor (SOA: Stimulus Onset Asynchrony)

Effects

Schriefers et al. (1990)

- an influential study conducted in Dutch
- employed this paradigm to study the production of nouns

Semantic interference effect

- naming a picture (e.g., a *lion*) takes longer when the distractor is semantically related (e.g., *tiger*) than when it is unrelated (e.g., *table*)
  - the effect is observed when the distractor is presented shortly before or at the same time as the picture (SOA = -150/0 ms), but disappears when it is presented after the picture (SOA = + 150 ms)

Phonological facilitation effect

- when a target and distractor are phonologically related (e.g., *dog*/*fog*) responses are faster than when they are not (e.g., *dog*/*roof*), provided that the distractor is presented after the target

Benefits of picture-word interference

- Modelling & time course of activation of different features
- Extended the empirical basis traditionally available in support of the notion that the **production of a word** occurs in **two fairly distinct stages**:
  - retrieval of the word‘s semantic and syntactic information
  - the retrieval of the corresponding lexical-phonological information (Bock 1986; Caramazza 1997; Dell 1986; Levelt 1989).
- Later used also to explore grammatical processing

Grammatical gender

Grammatical gender in first languge production

- A lexical-syntactic property of nouns

- Can be accessed fast and without much error
→ stored as an inherent property, not computed each time it is needed

- Gender in models: All nouns of a given grammatical gender are linked to one gender node specifying that grammatical gender (generic gender node)

Gender: Empirical evidence
for overview: Schriefers und Jescheniak (1999)

- Speech errors

  (Berg, 1992, Barbaud, Ducharme, Valois, 1982; experimentally elicited errors Vigliocco, Franck 1999)
- Availability of grammatical gender information in tip-of-the-tongue states

  (Vigliocco, Antonioni, Garret 1997)
- Experimental: e.g. extension of picture-word interference paradigm

  (Dutch: Schriefers, 1993; LaHeij, Mak, Sander, Willenboordse, 1998; for German: Schriefers, Truel, 2000; van Berkum, 1997)

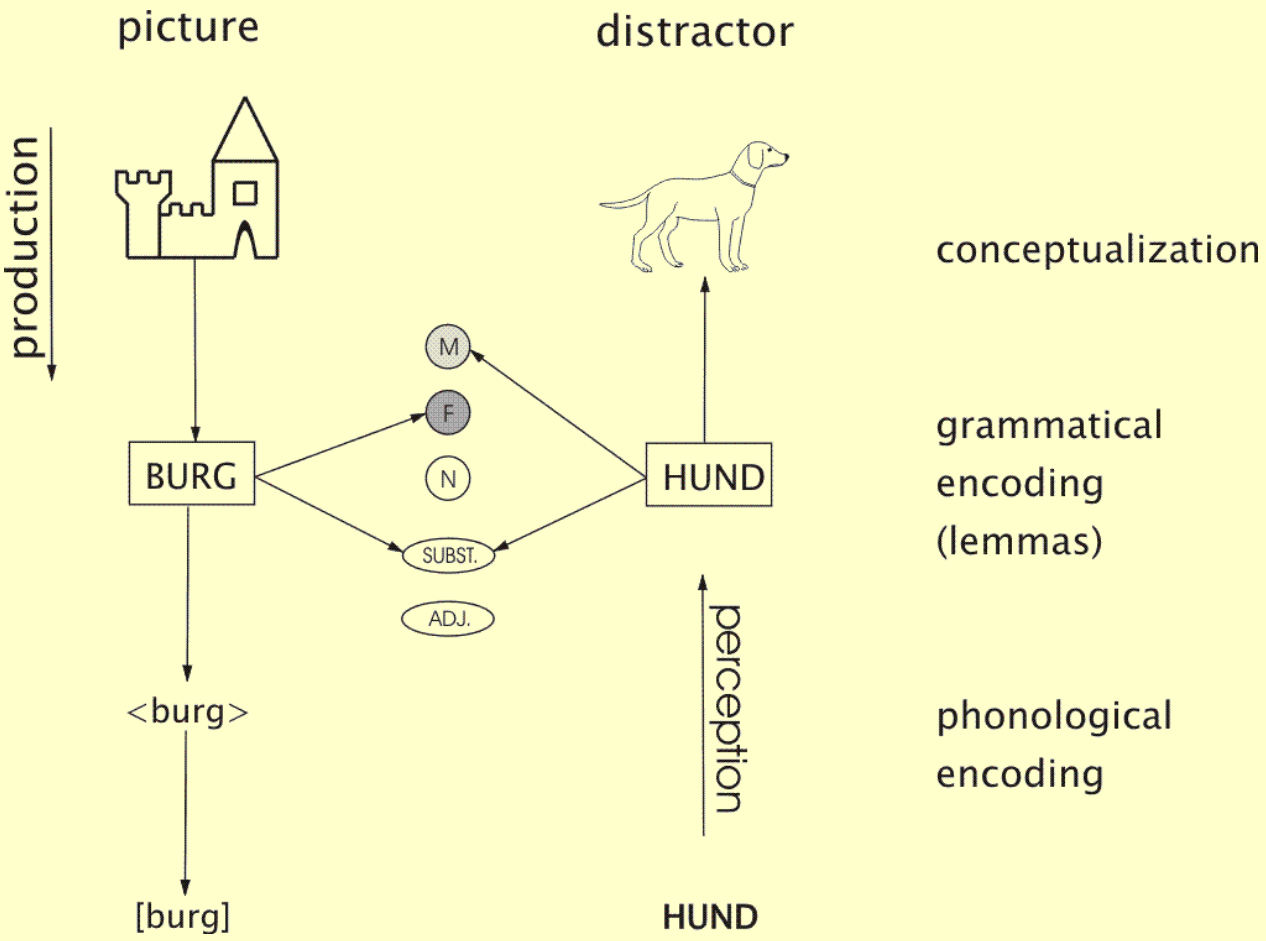
Gender congruency effect (1)

- In picture-word distractor naming tasks **slower reaction times** when the picture target and the distractor word had **different genders** than when their genders were congruent (only in production of gender marked nominal phrases).

→reflects a competition for selection in the gender-incongruent condition.

The activated gender feature of the distractor interferes with the to be selected name of the picture. In the gender-congruent condition this is not the case, because the distractor´s gender is identical with that of the target noun. (Schriefers, 1993)

Gender congruency effect (2)



Locus of the congruency effect

- Does the congruency effect originate at the level of **grammatical** or **phonological encoding**?
- Original interpretation (Schriefers, 1993): competition for selection between the picture´s and distractor´s gender nodes at the level of grammatical encoding.
- Schiller and Caramazza (2002) locate the effect at the level of phonological encoding
  - singular and plural NPs in German: the effect only in singular, where the determiners are overtly marked for gender (*der, die, das*), but not in plural, where the definite article form is invariant for all three genders (*die*)
  - the phonological forms of the determiners and not the abstract gender features that compete for selection.

Early vs. late selection hypothesis

- Miozzo & Caramazza (1999): the effect is present only in the so called **early selection languages**
  - the determiner form depends solely on the grammatical gender of the head noun (as it is the case in German and Dutch).
- The effect was not observed the so called **late selection languages**
  - the determiner form depends on the phonological context (e.g. *a giraffe* vs. *an elephant*, *ma table* vs. *mon ampoule* in French) and where the determiner selection can thus occur rather late in the NP production process (Romance languages)
- Accordingly, we should expect a gender congruency effect in Czech, because phonological context information has no effect on the selection of gender marked forms.

Scope of the congruency effect: Bound vs. free morpheme hypothesis

- Does the competition for selection apply only to **freestanding morphemes** like determiners or is the retrieval of gender-marked **inflections** governed by the same principles?
- Schriefers (1993) obtained a congruency effect when subjects produced NPs in the form of a *definite article* + adjective + noun as well as in the form *adjective* + noun

  → either the gender features compete for selection, or there is a competition for selection of the bound morphemes associated with the gender inflection of the adjective.

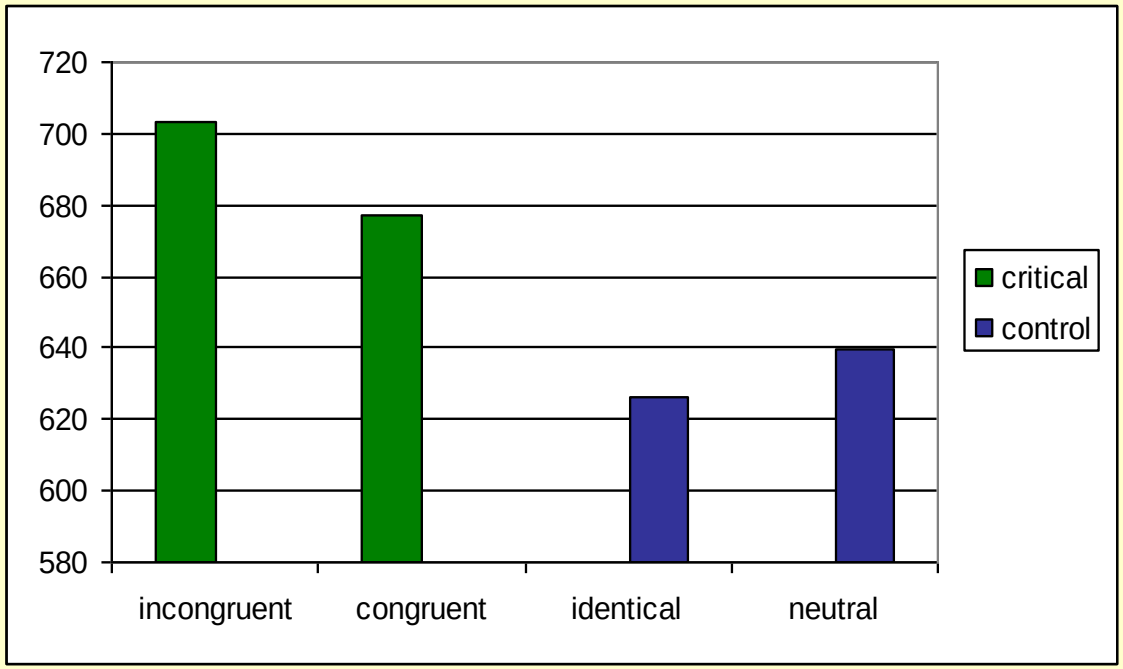
However

- Schiller & Caramazza (2003) failed to replicate this experiment in both German and Dutch.
- Costa, Kovacic, Fedorenko & Caramazza (2003) could not observe the effect in *adjective* + noun phrases in Croatian,
  - but they found the effect with personal pronouns in accusative case, that is with free morphemes.

Experiment 1: Is there a gender congruency effect in Czech?

- 32 Czech native subjects named 36 (12 m, 12 f, 12 n) pictures with an NP consisting of an overtly gender marked demonstrative pronoun *ten* (m), *ta* (f), *to* (n) [this, the] + noun
- Subjects learned the names of the pictures in two learning phases
- Subjects saw each picture 4 times, once in each condition
  - Critical: gender congruent, gender incongruent
  - Control: identical (distractor was the name of the picture), neutral (distractor was a row of xxxxx).
- The names of pictures were also used as distractors.

Experiment 1: Results



F1 (3, 93) = 52.64
p < 0.001,
F2 (3, 105) = 72.63
p < 0.001

Congr. vs. incongr.

t1(31) = 4.585, p < 0.001, t2(35) = 3.909, p < 0.001

	incongruent	congruent	identical	neutral
rt	708.47 (11.1%)	677.45 (8.1%)	626.38 (2.4%)	639.95 (3.7%)

Experiment 2

In this experiment we addressed two questions:

1. **Scope:** Is the congruency effect in Czech only present when **freestanding** gender marked morphemes are produced, or does it also appear in the production of NPs, in which the gender is marked on an **inflectional suffix**?
2. **Locus:** Does the inflection have to be formally marked for gender, or will the congruency effect also be observable with a formally invariant inflection? (level of phonological vs. grammatical encoding)

Hard vs. soft adjectival declension in Czech

There are two types of adjectival declension in Czech:

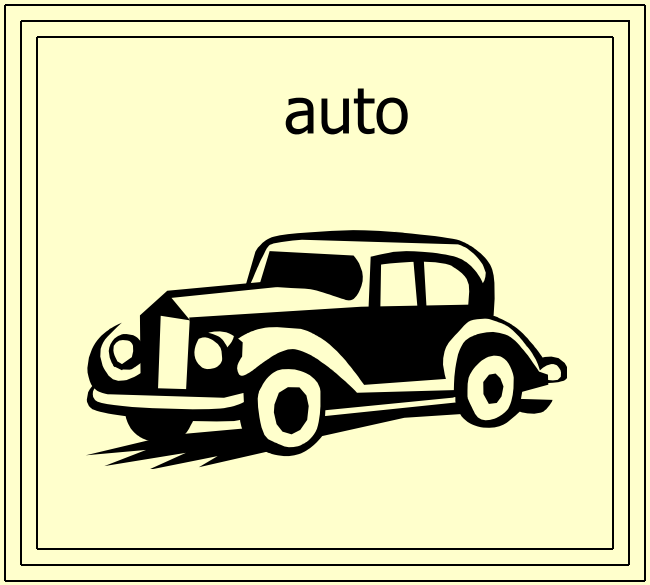
- **Hard declension**: has 3 different endings for the three genders in nom. sg. e.g. *druh-ý, -á, -é* (second), ***pát-ý, -á, -é*** (fifth).
- **Soft declension**: has only one invariant ending *–í* for all three genders in nom. sg., e.g. ***prvn-í*** (first) and *třet-í* (third).

Subjects named pictures with these ordinals in two blocks: soft vs. hard.

Examples: soft declension

(congruent)
*„**prvn-í** auto“*

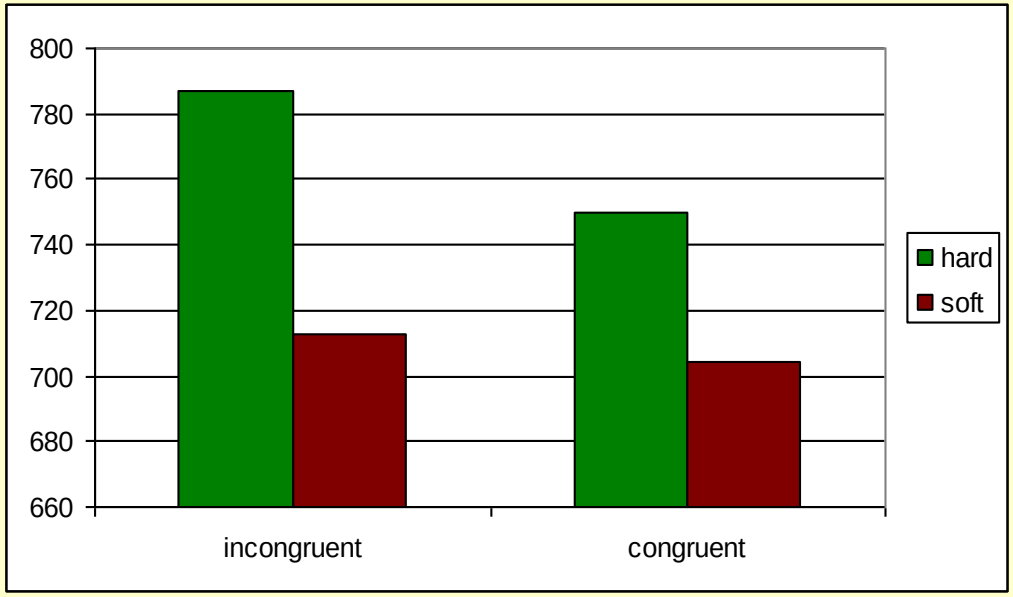
(identical)
„třet-í auto“



Method

- 16 subjects named 36 pictures (the same as in Experiment 1)
- Half of the subjects named the pictures in the „soft block“ first (first vs. third), the other half of the subjects named the pictures in the „hard block“ first (second vs. fifth)

Experiment 2: Results



Congruency: F1 (1, 15) = 11,035, $p < 0.01$, F2 (1, 35) = 12,346, $p < 0.001$ **Type of Declension** (soft vs. hard): F1 (1, 15) = 14.501, $p < 0.01$, F2 (1, 35) = 103,106, $p < 0.001$, **Interaction:** F1 (1, 15) = 5.939, $p < 0.05$, F2 (1, 35) = 6,581, $p<0.05$.

	incongruent	congruent	
hard	786.78 (15.6%)	749.76 (11.5%)	**-37 ms**
soft	712.90 (6.4%)	704.09 (8.3%)	**-9 ms**

Experiment 2: Summary

- The naming latencies were shorter in the soft than in the hard condition
- The reaction times were faster in the gender congruent than in the gender incongruent condition,
  - but only in the hard condition, where the inflections were overtly gender marked
  - in the soft condition with one invariant ending for all three genders, the reaction times were statistically the same in the gender congruent and incongruent condition.

Why no effect in the soft condition?

- **Automatic processes**: no competition for selection between the ending(s) (phonological level) or the abstract gender nodes (grammatical encoding, implies feedback) because the ending –í is the same for all three genders
- **A task strategy:** In the soft block the same ending –í was produced all the time. After several soft ordinals were produced, the production system noticed that always one and the same ending is needed and accommodated to this situation by bypassing the gender selection (and maybe even the complete grammatical encoding) and simply retrieved the ending –*í* all the time.

Experiment 3

- The same design as Experiment 2
- Reorganisation of the ordinals in the two blocks, so that in each block both soft and hard ordinals were produced. If the congruency effect in the soft condition is absent in this design as well, then it cannot be attributed to a task strategy.

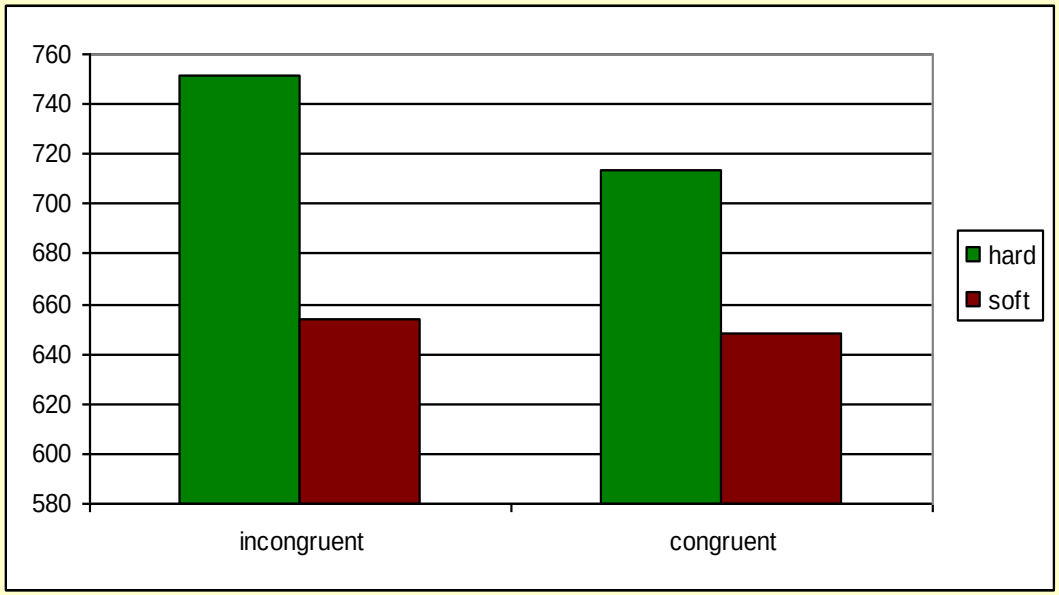
Experiment 3: Ordinals in blocks

BLOCK A: gi, gc – soft (prvn–í); id, xx - hard (druh-ý, -á, -é)

ordinal	picture	distractor	cond
Prvn-í	Katze	Hund	gi, soft
Prvn-í	Katze	Gänse	gc, soft
Druh-é	Auto	Auto	id, hard
Prvn-í	Hund	Gänse	gi, soft
Druh-á	Gänse	xxxxx	xx, hard
Druh-ý	Hund	Hund	id, hard

BLOCK B: gc, gi - hard (pát-ý, -á, -é) ; id, xx – soft (třet–í)

Experiment 3: Results



Congruency: F1 (1, 13) = 18.45, $p < 0.001$, F2 (1, 35) = 11.08, $p < 0.01$ **Type of Declension** (soft vs. hard): F1 (1, 13) = 10.92, $p < 0.01$, F2 (1, 35) = 206.98, $p < 0.001$, **Interaction:** F1 (1, 13) = 21.38, $p < 0.05$, F2 (1, 35) = 5.2, $p<0.05$.

	incongruent	congruent	
hard	751.16 (14.3 %)	713.70 (13.0 %)	**-37 ms**
soft	654.25 (8.9 %)	647.91 (7.7 %)	**-6 ms**

Experiments 1 - 3: Conclusions (1)

- The congruency effect was observed in Czech as expected by the **early selection hypothesis**.
- The data from Czech clearly show that the competition for selection occurs not only with **free standing morphemes**, but also between gender marked inflectional **bound morphemes**, suggesting that the processes of gender production are identical in both cases.
  - The presence of the congruency effect for ordinal + noun NPs is in accordance with the results reported by Schriefers (1993) and contrasts with those of Schiller and Caramazza (2003) and Costa, Kovacic, Fedorenko, & Caramazza (2003).

Experiments 1 & 2: Conclusions (2)

- The effect appeared only in the hard condition (Experiment 2 & 3), i.e. when subjects produced utterances where gender overtly surfaced as an inflection. In the soft condition, where the inflection has the same form *–í* for all three genders, the congruency effect was not observed.
  According to Schiller and Caramazza (2002) this indicates that it is the **phonological forms** of the inflections (by Schiller and Caramazza of the determiners) that compete for selection, **not the abstract gender features** of the head nouns as argued by Schriefers (1993).

  → **Most likely interpretation also of our data**

Implications for modeling (1)

- If the locus of the congruency effect is at the level of phonological encoding, as the data suggest, then **cascaded processing** must be involved.
- Discrete serial processing, as proposed by Levelt (1989) and Levelt et al. (1999), does not allow that other than the **selected** phonological forms are activated. Clearly, if the two gender marked forms (inflections or determiners of the picture and of the distractor) can compete for selection, they both must be activated at the same time.

Implications for modeling (2)

- Can we find an explanation why the congruency effect only emerges when overtly gender marked forms are produced (hard condition), maintaining the idea of competition between abstract gender features?
- The selection of the gender feature is bypassed in the soft condition, because this information is not needed for further production (invariant ending for all genders)
  - Problem: How does the system „know“ that this information can be bypassed??

Possible answer: hierarchical feature selection

- the feature “declensional class of the modifier” (hard or soft) and the feature “case” (because in e.g. genitive or dative singular the inflection for the three genders in the soft condition is no longer invariant) would have to be selected before the gender feature.
  - If the declensional class of the modifier was soft and if the case was nominative, then the selection of the gender feature and probably even number (the inflection *–í* appears in all three genders also in nominative plural) would be bypassed.

→ **complicated and ad hoc solution**

Summary of the gender experiments

- The data support the competition of phonological forms at the level of phonological encoding, but they do not exclude the existence of generic gender nodes at the level of grammatical encoding: Their selection can be an automatic, non-selective process (suggested by Caramazza)

Declensional class of nouns (and conjugational class of verbs)

Czech noun declension

- Linguists differentiate between ca 14 noun declensional classes in Czech
  - 6 masculine, 4 feminine, 4 neuter classes
  - Nouns in each declension are inflected differently, i.e. they take different inflectional endings in the 7 cases Czech has
  - However, there is strong homonymy (one ending has different functions within and across the declensional classes) and synonymy (the same function is expressed by several endings across – and sometimes within - the declensional classes) among the endings

Representation of declensional class

- Is it psychologically real, or is it a linguistic construct?
- If real, how is it mentally represented?
  - Similarly like other grammatical features (e.g. gender): there are abstract generic declensional class nodes at the level of grammatical encoding

Declensional class congruency effect in Czech

- Two experiments using the picture – word distractor paradigm
- Noun and distractor have always identical gender, but are either from the same (congruent condition) or from a different (incongruent condition) declensional class
- Identical and neutral (xxxxx) conditions were also included
- The experiments had the same structure like the gender experiments

Experiment 4

- 22 subjects named 36 pictures in dative sg.:
  - 12 m (6 from DC *hrad*, 6 from DC *stroj*),
  - 12 f (6 from DC *růže*, 6 from DC *žena*),
  - 12 n (6 from DC *město*, 6 from DC *moře*)

Trial:

[...] - subjects produce the preposition „kvůli“ (*because of, due to*), which takes dative

Fixation disappears

Picture and distractor word appear on the screen, subjects complete the PP

Overview: Items

		masculine		feminine		neuter	
		pic	dis	pic	dis	pic	dis
congr.	*kvůli*	hrad-**u**	nos (nos-**u**)*	žen-**ě**	hlav-a (hlav-**ě**)	měst-**u**	oko (ok-**u**)
incongr.	*kvůli*	hrad-**u**	stroj (stroj-**i**)	žen-**ě**	růž-e (růž-**i**)	měst-**u**	moře (moř-**i**)

- Subjects named pictures in dative singular
- Distractor was presented in nominative singular
- The ending of the picture name and of the distractor word were in dat. sg. different in the incongruent condition and formaly identical in the congruent condition

Experiment 4: Results

	incongruent	congruent	identical	neutral
rt	**697,73**	**680,88**	618,19	641,76

• Subjects were slower when naming pictures in the presence of a declensional class incongruent distractor than in the presence of a declensional class congruent distractor ($t1(21) = 3.89$, $p < 0.001$, $t2(47) = 2.60$, $p < 0.01$).

Conjugational class

- The Czech verbal system is guided by the following features: person (first, second, third), number (singular, plural), tense (present, past, future), mood (indicative, conditional, imperative), voice (active, passive), aspect (perfective, imperfective), and conjugational class (and paradigm).
- There are **five main conjugational classes** (CC). Verbs from each class take the same set of final inflectional suffixes (endings) and have other common features.
- Within each CC one or more paradigms are usually distinguished, which differ e.g. in the stem suffix, morphophonological alternations, etc. (Mluvnice češtiny 2, 1986 p. 415-416).

Experiment 5

- 16 subjects named 36 pictures
- The word distractors were always presented in the infinitive; pictures were named in the third person singular present tense

	I		IV		V	
	pic	dis	pic	dis	pic	dis
congr.	nes-**e**	plést (plet-**e**)	pros-**í**	žehlit (žehl-**í**)	zpív-**á**	foukat (fouk-**á**)
incongr.	nes-**e**	žehlit (žehl-**í**)	pros-**í**	foukat (fouk-**á**)	zpív-**á**	nést (nes-**e)**

- The verbs were selected from three CCs: I, IV, V.
  - CC I three paradigms (*nést – nes-e, brát – ber-e, mazat – maž-e*);
  - CC IV three paradigms (*prosit – pros-í, trpět – trp-í, sázet – sáz-í*);
  - CC V has only one paradigm (*dělat – děl-á*), thus all verbs of this CC were from one paradigm.
- The selection criteria (depictable action, etc.) did not allow the selection of verbs of one CC from one paradigm only. In the congruent condition, the target verb and the distractor were always from the same CC and the same paradigm. In the incongruent condition, the target verb and the distractor were from different CCs (and consequently also paradigms).

Experiment 5: Results

	incongruent	congruent	identical	neutral
rt	**809**	**789**	763	766

- An analysis of variance (ANOVA) was performed in the same way as in Experiment 4.
- A significant difference between the four conditions (congruent, incongruent, identical, and neutral): $F1(3, 45) = 9.01$, $p < 0.001$, $F2(3, 105) = 15.64$, $p < 0.001$. A paired-samples t-test comparing only the CC-congruent and CC-incongruent conditions revealed that the effect of 20 ms was significant: $t1(15) = 2.30$, $p < 0.05$, $t2(35) = 2.50$, $p < 0.05$.

The locus of the DC/CC effects?

- The congruency effect emerged either due to the competition between abstract DC/CC nodes, or due to the competition for selection between the inflectional endings (they were different in the incongruent condition).

Experiment 6: Declensional class – grammatical or phonological competition?

- 16 subjects named 36 pictures (the same as in Experiment 3, but 6 fem. nouns from DC *žena* were replaced with 6 fem. nouns from DC *kost* to be able to construct the intended conditions)

- **Trial**:

[...] - subjects produce the sentential fragment „Sedím vedle...“ (I am sitting next to...) in the **genitive sg. condition** and „Sedím před...“(I am sitting in front of...) in **instrumental sg. condition**

Fixation disappears

Picture and distractor word appear on the screen – subjects complete the sentence

- Half of the subjects named the pictures in gen.sg. first, the other half in inst.sg. first

Items: Overview

- **Genitiv sg.:** Nouns from different DCs (incongruent) have different endings
- **Instrumental sg.:** Nouns (the same) from different DCs (incongruent) have formally identical endings
- In the congruent condition nouns have always formally identical ending in both genitive and instrumental

Incongruent condition (pic and dis are from different DC)

		masculine		feminine		neuter	
		pic	dis	pic	dis	pic	dis
Gen.sg. *vedle*	*sedím*	hrad-**u**	stroj-**e**	růž-**e**	kost-**i**	měst-**a**	moř-**e**
Inst.sg. *před*	*sedím*	hrad-**em**	stroj-**em**	růž-**í**	kost-**í**	měst-**em**	moř-**em**

Experiment 6: Results

	incongruent	congruent	effect
před (inst.)	702,78	680,37	**22 ms**
vedle (gen.)	699,13	672,85	**26 ms**

- Subjects were slower when naming pictures in the presence of a declensional class incongruent distractor than in the presence of a declensional class congruent distractor in both the genitive **and instrumental** condition. (F1: $p<0.001$, F2: $p<0.001$, no interaction).

- The congruency effect cannot be explined by competition between inflection endings in the incongruent condition, because in instrumental the endings are formally identical for the two DCs.

Experiments 4, 5, & 6: Summary

- The DC congruency effect cannot be due to competition for selection between the inflectional endings of the picture and distractor at the level of phonological encoding: The instrumental condition yielded the effect as well, though the endings of the picture and distractor were formally identical. (With CC we cannot say.)
- Most likely interpretation: The abstract declensional class features at the level of grammatical encoding compete for selection.
- BUT: Why should the encoding of grammatical gender and declensional class procede differently?

Gender vs. declensional class

- Both **grammatical gender** and **declensional class** are inherent properties of nouns, **but:**
- **Declensional class**: surfaces as an inflection on the noun itself
  - we examine its role in **noun production**
- **Grammatical gender:** surfaces as an inflection of noun ‘s modifier or as its article
  - in the picture-word interference paradigm we examine gender primarily as **an agreement feature** of determiners or adjectives/numerals

Corbett - the only reliable gender cue is agreement

LFG, Processability theory – feature unification

Gender of modifiers in the Levelt model

- Gender value of the head noun must be „copied“ into the gender diacritic of the modifier, which stands in agreement with the noun
- In the Levelt model this is done by **subroutines – functional procedures** for handling the complements, modifiers, and parameter values
  - The functional procedure MOD calls the lemma of the modifier, inspects the diacritic parameters of the NP-head and inserts their values in the list of diacritic parameters of the modifier ‘s lemma.

Same and different

- Both gender and DC are stored as fixed values at a noun ‘s lemma
- To produce a **gender** marked ending on a modifier, an appropriate gender value must be **copied** from the head noun
- To produce an inflectional ending of a noun, no copying of parameter values is necessary
- **Subroutines (functional procedures)** are responsible for the copying, are they responsible also for the differences in the gender and DC congruency effects?
  - Are subroutines really so clever that they fetch only values of those parameters, which are necessary for the determination of the modifier ‘s ending? How would they do it?

How do the subroutines know, which parameter values are necessary for the unique determination of the ending?

- Possible solution: a **hierarchical feature selection.** Is it so unlikely?
  - Subroutines fetch values for some parameters first.
  - If the information is sufficient to select one unique ending, they stop setting the other parameter values.

Subroutines check the fixed values of the modifier (e.g. type of declension: hard vs. soft) and inspect which other parameter values must be set to select the appropriate ending. In the soft condition, only setting of the case value would be the necessary to determine the ending -> no gender selection necessary.

How do the subroutines know, which parameter values are necessary for the unique determination of the ending?

- Possible solution: a **hierarchical feature selection.** Is it so unlikely?
  - Subroutines fetch values **for SOME parameters first**. If the information is sufficient to select one unique ending, they stop setting the other parameter values.

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Scenario 1: Set order of parameters

- the order of fetching the parameter values of the modifier is set and probably language specific (Czech: 1. case, 2. number, 3. gender)
- as soon as there is only one ending that satisfies the requirements, the setting of values stops (implies feedback between grammatical and phonological encoding)
  - soft adjectives: case is nominative – one and only one ending satisfies the conditions

    → gender (and number) parameter value is not necessary, subroutines do not try to fetch it, thus it is not selected and nothing competes for selection

Scenario 2: Priority of external parameters I.

- By the activation of a noun‘s lemma, its parameter values are set (if needed for production):

EXTERNAL

- **Number**: NP categorial procedure inspects the **concept** of the head for number and comes up with the parameter „singular“ or „plural“
- **Case:** the lemma for the **preposition** (*kvůli, před, vedle*) specifies the grammatical function, which becomes expressed as a case feature on the subcategorizied NP

INTERNAL

- **Declensional class:** is **stored** directly at the lemma of a noun and it is indispensable information for the selection of the right infl. ending of the noun
- **Grammatical gender:** is **stored** directly at the lemma of a noun and it is indispensable for the selection of the inflectional ending of a modifier in SOME cases (depends e.g. on the declensional class of a modifying adjective, case, number etc.)

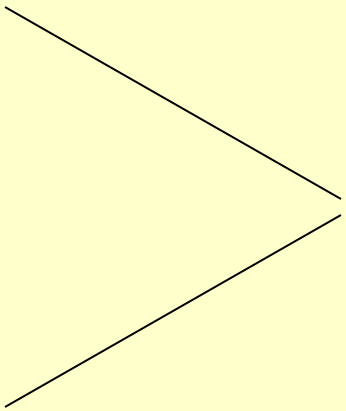
Scenario 2: Priority of external parameters II.

- non-inherent = not fixed = external parameters (case, number*), which have to be copied from the head, have priority to inherent = fixed = internal parameters of the head (grammatical gender).
- when the information they deliver is sufficient to choose the inflectional ending, no internal parameter values are fetched (again implies feedback)
- Why?
  - External values can be available already before the internal values are set (case is determined by a verb or a preposition, which may be selected before the head noun; number of a noun is usually determined by the concept, which is always selected before the lemma)

*sometimes fixed (mass nouns etc.)

Set order of values (Scenario 1), or priority of external diacritics (Scenario 2): advantages

- The hypothesis about **competition** for selection **between abstract gender features** holds
- The hypothesis that gender is **selected only when needed** for production holds as well
- **Practical**: e.g. to determine the inflectional ending of soft adjectives (or German definite articles) in plural, gender is NEVER needed (syncretism), so why not to define, when to retrieve it?
  - Nom. prvn-í
  - Gen. prvn-ích
  - Dat. prvn-ím
  - Acc. prvn-í
  - Voc. prvn-í
  - Loc. prvn-ích
  - Inst. prvn-ími



m, f, n

Conclusions

- Gender congruency effect

Constrained by gender (in)variability of the ending

→ the effect originates at the level of phonological encoding (competition between endings)

- Declensional class congruency effect

Independent of declensional class (in)variability of the ending

→ the effect originates at the level of grammatical encoding (competition between abstract nodes)

The discrepancy can be reconciled by a hypothesis assuming **ordered selection of grammatical features** (e.g. external first) and **cascaded processing with feedback**.

Thank you!

Why is soft faster than hard?

1. The same ending *–í* is retrieved all the time, thus its slection is easier than that of its competitors **(competition at the level of phonological encoding)**
2. Case and Number are all the time the same (nom.sg.) -> their values are set „permanently“ as soon as the production system notices it.
   - Soft condition: the pre-set Case and Number values are sufficient to define one unique ending *–í*; gender is not slected, therefore no competition
   - Hard condition: the pre-set values are not sufficient, gender value has to be set as well; gender is selected
   – Soft condition is faster than hard condition, because only 2 (pre-set) values are necessary compared to 3 in the hard condition

   (competition at the level of grammatical encoding)