

Movement vs. tree-size as predictor of difficulty for agrammatics: Evidence from Northern Norwegian aphasics

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Thanks to

- Naama Friedmann

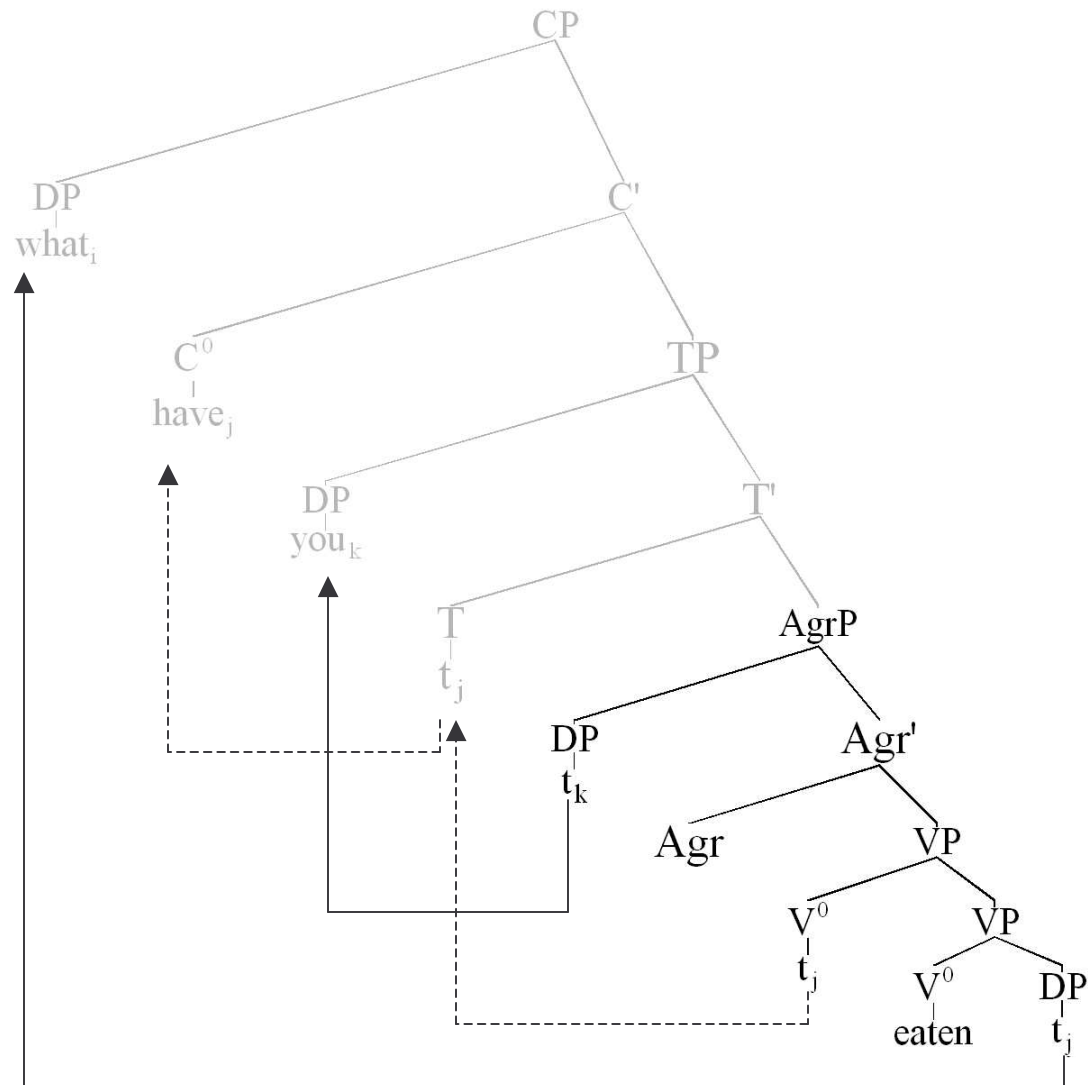
Tree-size

- Friedmann (2000, 2002) and Friedmann & Grodzinsky (1997, 2000):
 - Broca’s agrammatics’ have difficulties with certain sentence types because they fail to represent the higher part of the tree
 - Their trees are “pruned” above agreement projections
 - No CP or TP-projections
- This hypothesis concerns the “size” of the tree that the agrammatic speaker is able to project

Sentences that want large trees

- [_{AgP} I ate ice cream]
 - *That ice cream*, [_{AgP} I ate (it)]
 - *What have* [_{AgP} you eaten]?
 - *Did* [_{AgP} you eat ice cream]?

Sentences that want large trees



Evidence

Wh-question:

Ma Miri mecayeret t_i ?

What Miri paints

“What does Miri paint?”

Correct: 13/100

Yes/no-question (intonation):

Miri mecayeret kivsa?

Miri paints sheep

“Does Miri paint sheep?”

Correct: 81/84

$\chi^2=127.16; p \ll 0.0001$

(Friedmann, 2002)

Alternative: Number of movements

- Verb movement in combination with XP-movement to SpecCP is harder than just XP-movement to SpecCP
- Bastiaanse & Thompson (2002):
 - Compared English vs. Dutch agrammatic production
 - Found that sentences which required verb-movement were significantly more impaired than sentences not requiring verb movement
 - Tree-size was not a factor

Two general alternatives

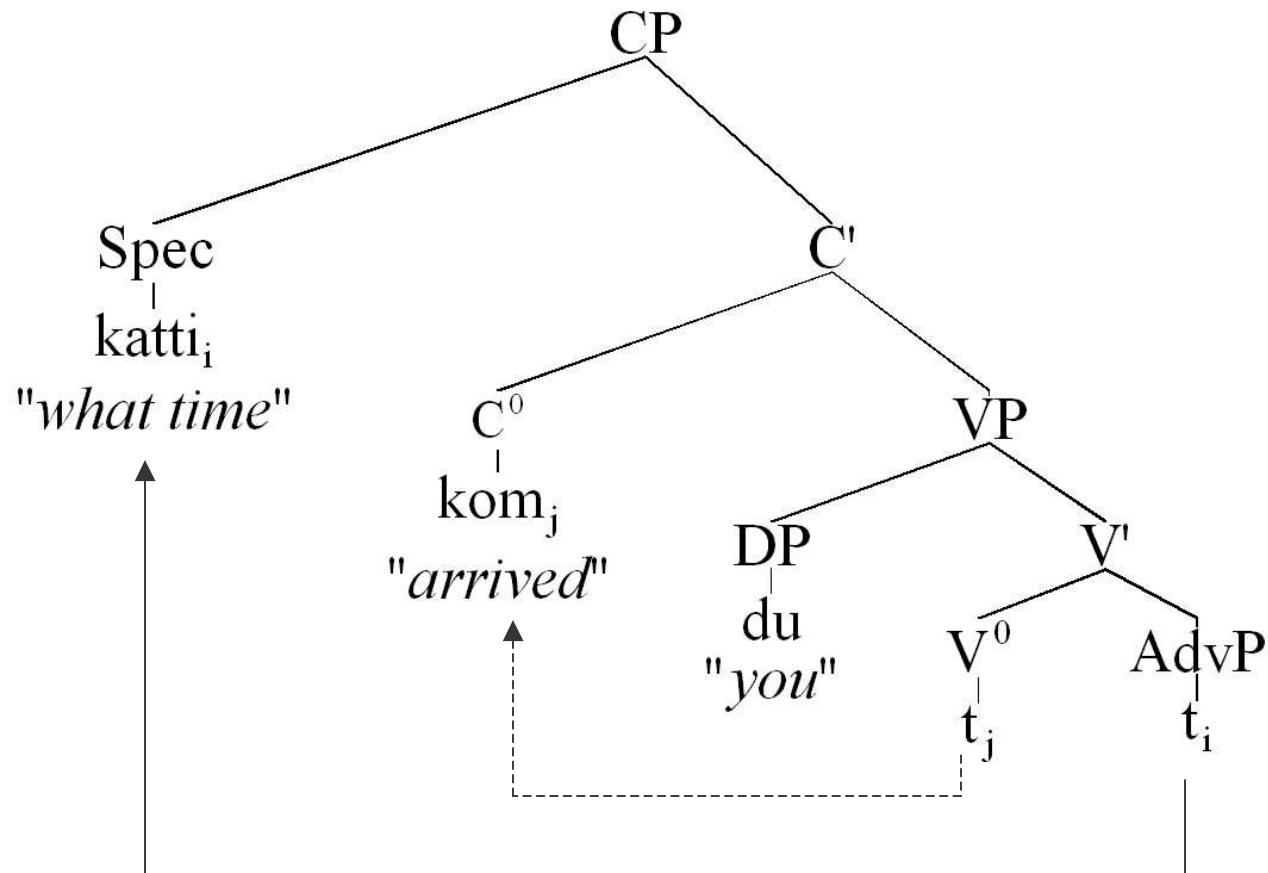
- Tree-size (generalization of Tree-Pruning)
 - Size of the tree matters and predicts production difficulties
 - E.g. sentences requiring CP harder than sentences requiring just TP, etc
- Movements
 - The number of movements required matters and predicts production difficulties
 - E.g. sentences requiring verb movement in addition to Wh-movement harder than just verb-movement sentences, etc

A test of the two theories

- Wh-questions in Northern Norwegian
 - differ along both tree size and the number-of-movements dimensions
 - 3 types: CP + V-movement; CP w/o V-movement, and C' w/o V-movement
- The two theories can therefore be compared within-subject (within-language)
 - greater statistical power than group comparisons (between-language)
 - better experimental control

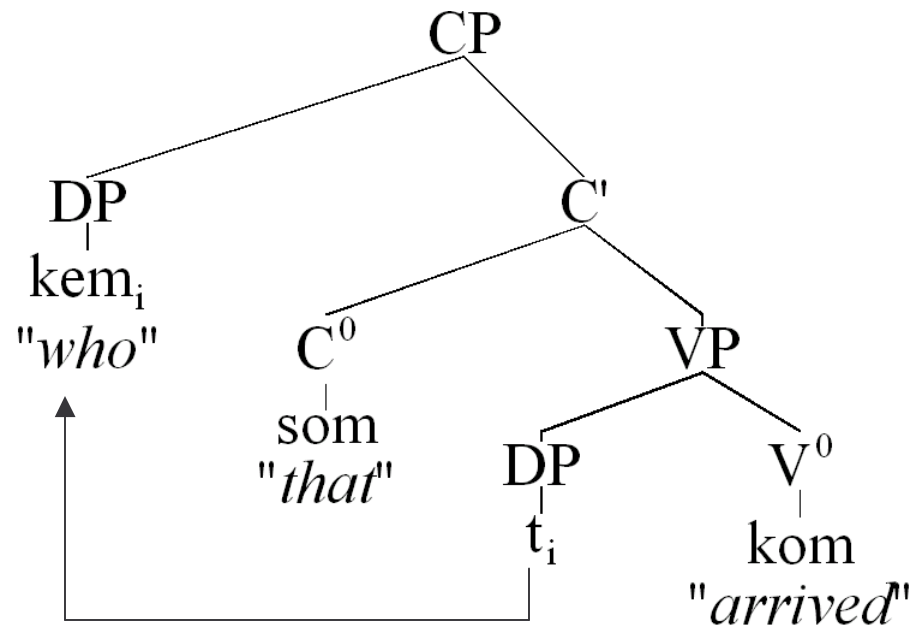
A. Large tree, 2 movements

- Adjunct questions and object questions with "heavy" Wh-phrases: "When did you arrive?"



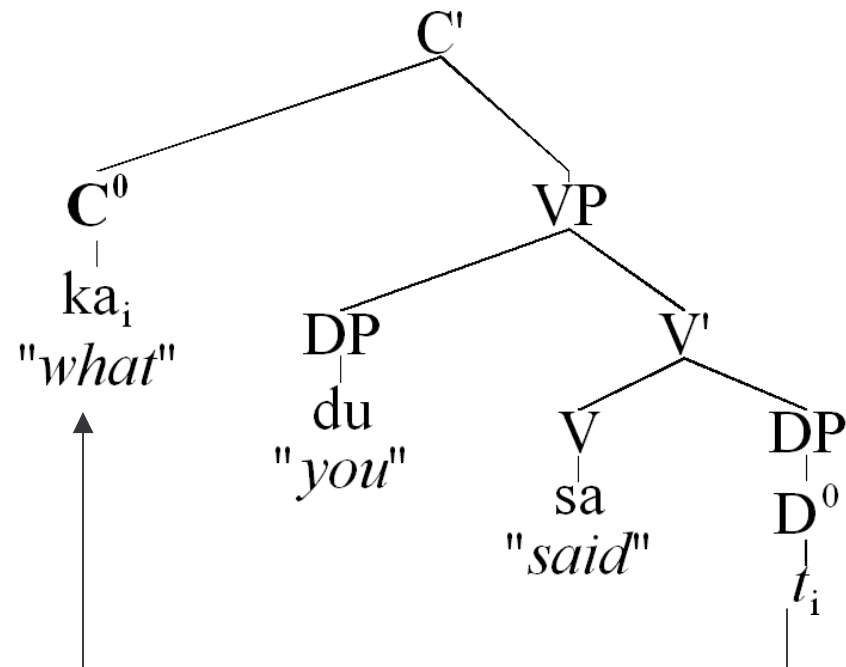
B. Large tree, 1 movement

- Subject Wh-question: “Who arrived?”



C. Small tree, 1 movement

- Morphologically simple object question: “What did you say?”

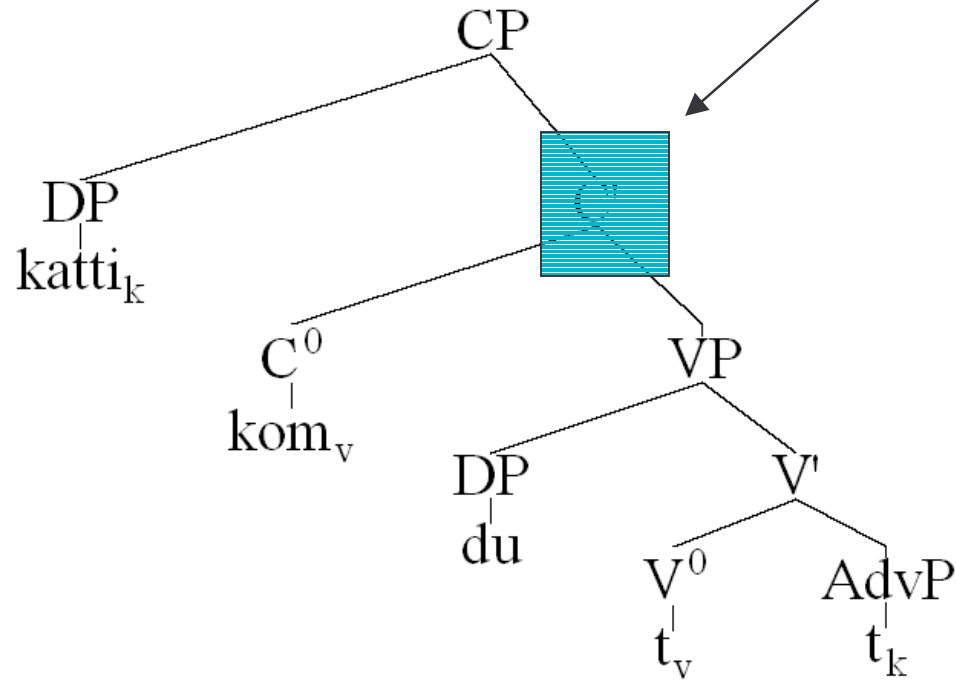


- Special construction: Wh-word undergoes head movement to C⁰ (Taraldsen, 1986)

The (small) size difference

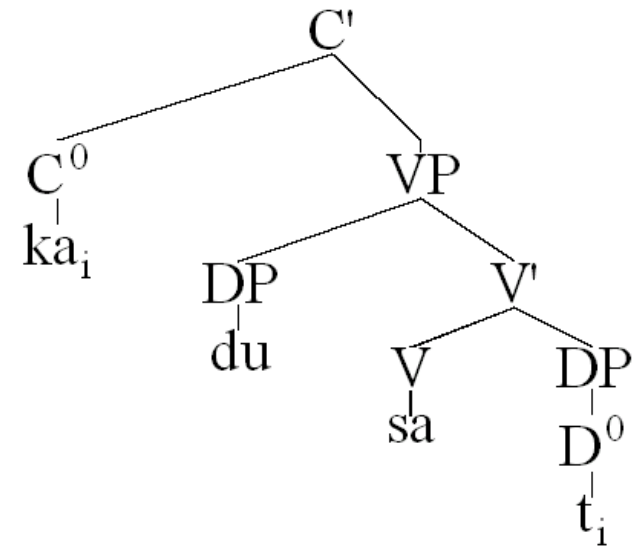
One extra node!

A:



Wh-movement + verb movement

C:



Only Wh-
movement

Predictions

- *Tree-size theory predicts*

A: 2 movements and a CP

– Adjunct questions and object questions with V2

B: 1 movement and a CP

– subject questions with overt complementizer

should be harder than:

C: 1 movement and a C'

– object questions without V2

Predictions

- *Movements theory predicts*

A: 2 movements and a CP

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should be harder than:

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Experiment

- Subjects

- 7 patients from rehabilitation center in Tromsø, Norway
- classified as Broca's by "Norsk Grunntest for Afasi" (Reinvang & Engvik)
- agrammatic speech
- under 75 years

<u>subject</u>	<u>sex</u>	<u>diagnosed</u>	<u>experiment</u>	<u>time diag --> exp</u>	<u>age at experiment</u>
1	Male	Nov-87	May-Aug 2001, Jan 2002	13 years	52
2	Male	Mar-86	May-Aug 2001, Jan 2002	14 years	54
3	Male	Mar-82	May-Aug 2001, Jan 2002	16 years	70
4	Male	May-96	May-Aug 2001	5 years	50
5	Male	1986	May-Aug 2001, Jan 2002	14 years	56
6	Male	Oct-80	May-Aug 2001, Jan 2002	22 years	58
7	Male	1996	May-Aug 2001, Jan 2002	5 years	60

Method

[Adapted from Friedmann (2000, 2002)]

- Elicitation task
 - Experimenter: “You want to ask what John had for dinner, so you ask:
 - Subject: “What did John have for dinner?”
- Repetition task
 - simple repetition of target sentence
- Dependent measure
 - success or failure on individual trials
 - % correct calculated for repeated measures conditions

Materials

A: 2 movements and a CP

- 12 elicitation/17 repetition trials of adjunct questions with V2
- 10/18 trials object questions with V2

B: 1 movement and a CP

- 20/18 trials of subject questions with overt complementizer

C: 1 movement and a C'

- 20/18 trials of object questions without V2

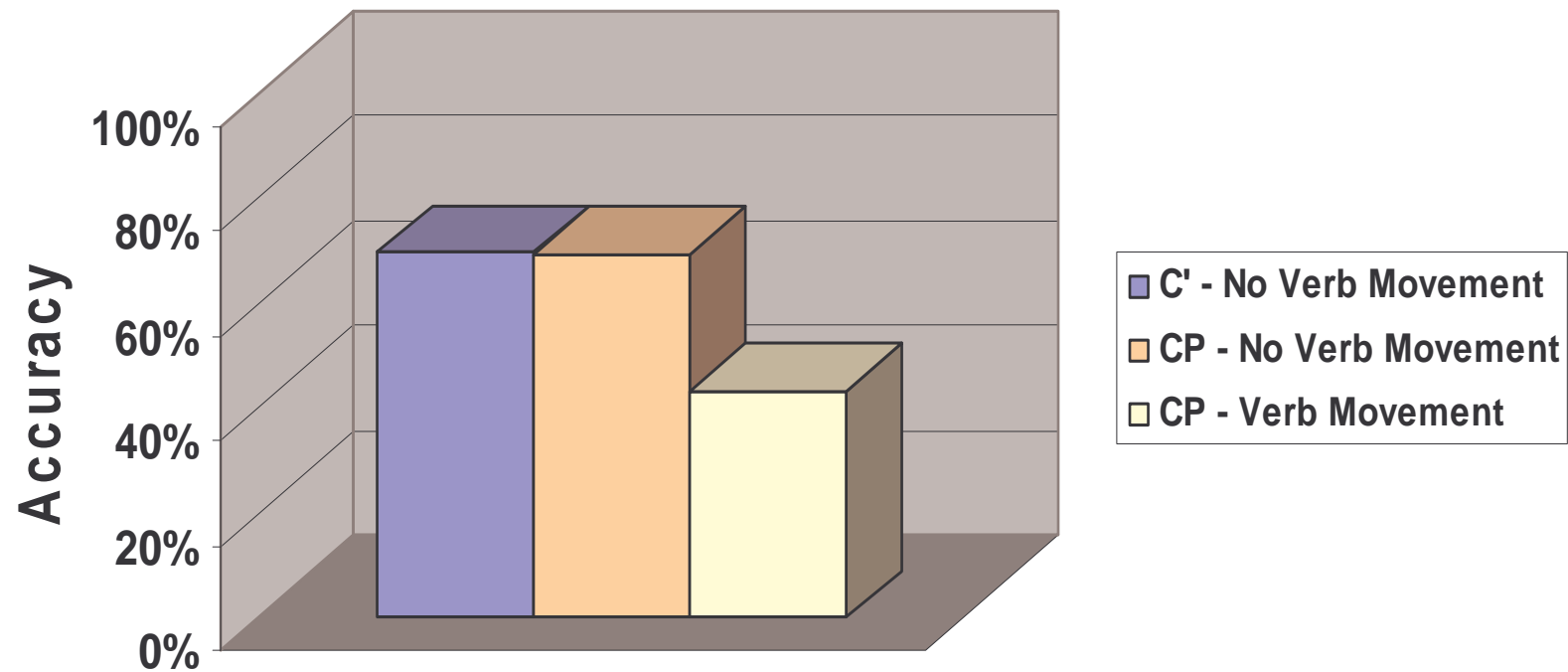
Inferential statistics

- For ANOVA:
 - Data contains near-ceiling/floor effects for some conditions/subjects
 - percent correct data were transformed to “continuous” data scale
 - log-odds: take the natural logarithm of the odds of the percentages
 - Odds = $\text{percentage}/(1-\text{percentage})$

Results

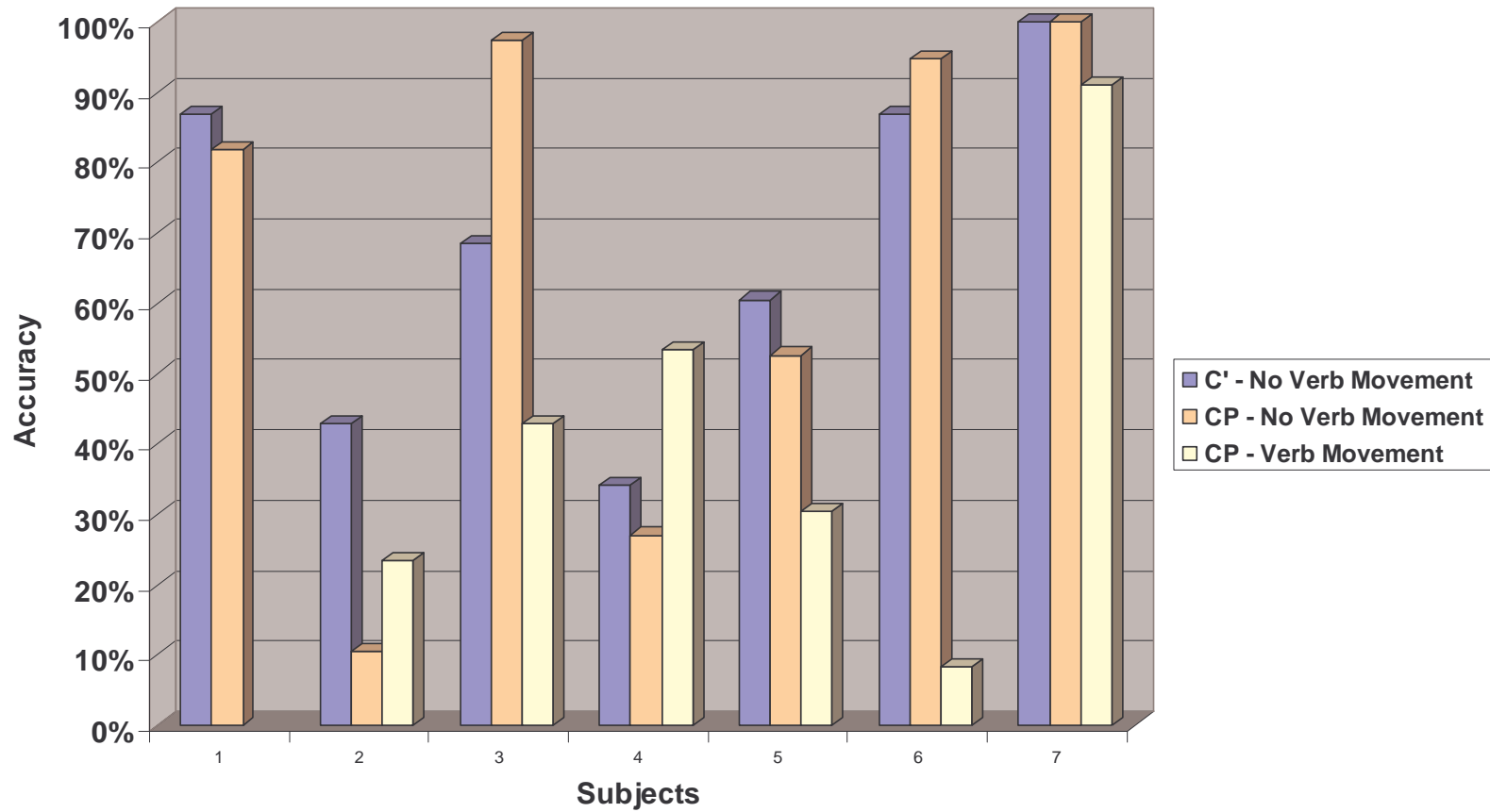
- ANOVA
 - Main effect of CONDITION
 - Main effect of TASK
 - Interaction TASK + CONDITION

Main effect CONDITION



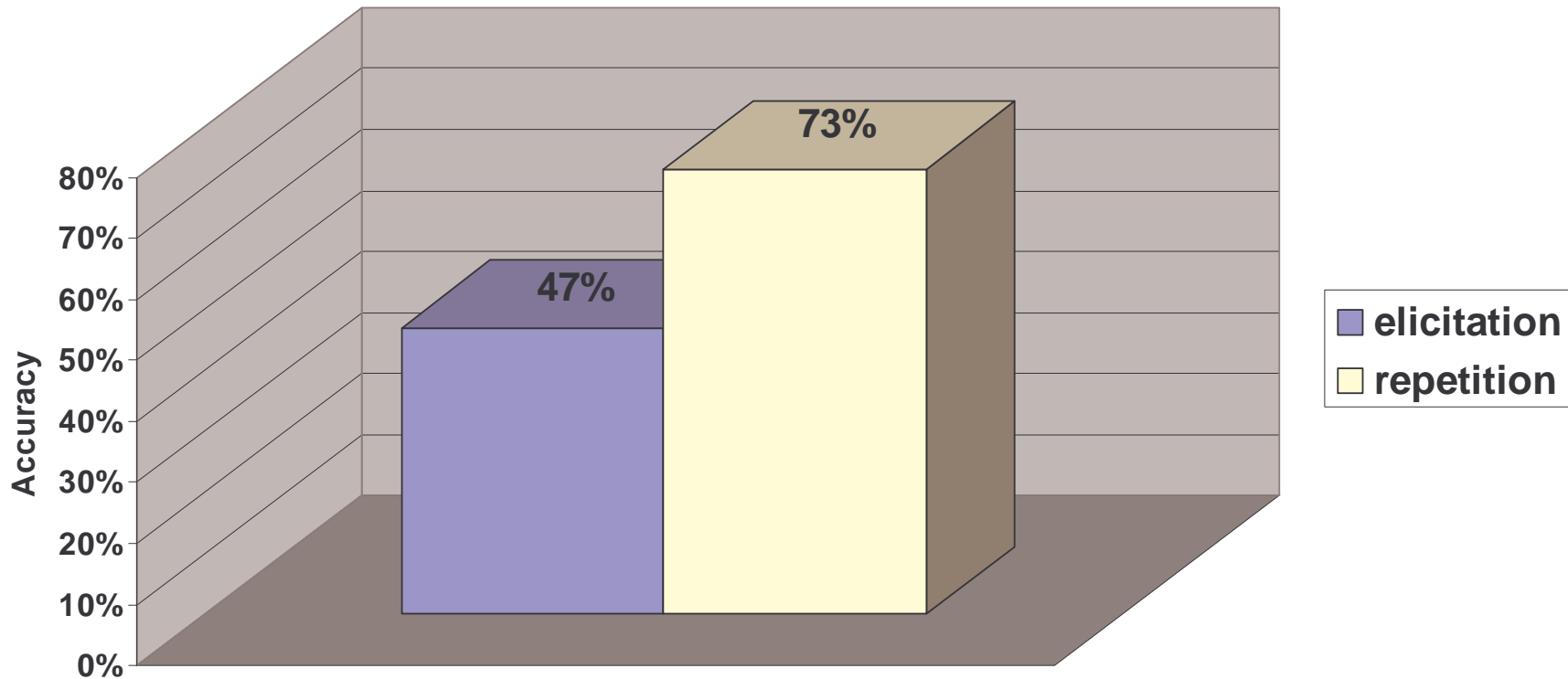
ANOVA: $F(2,10)=5.3$, $p = .026$

Main effect CONDITION



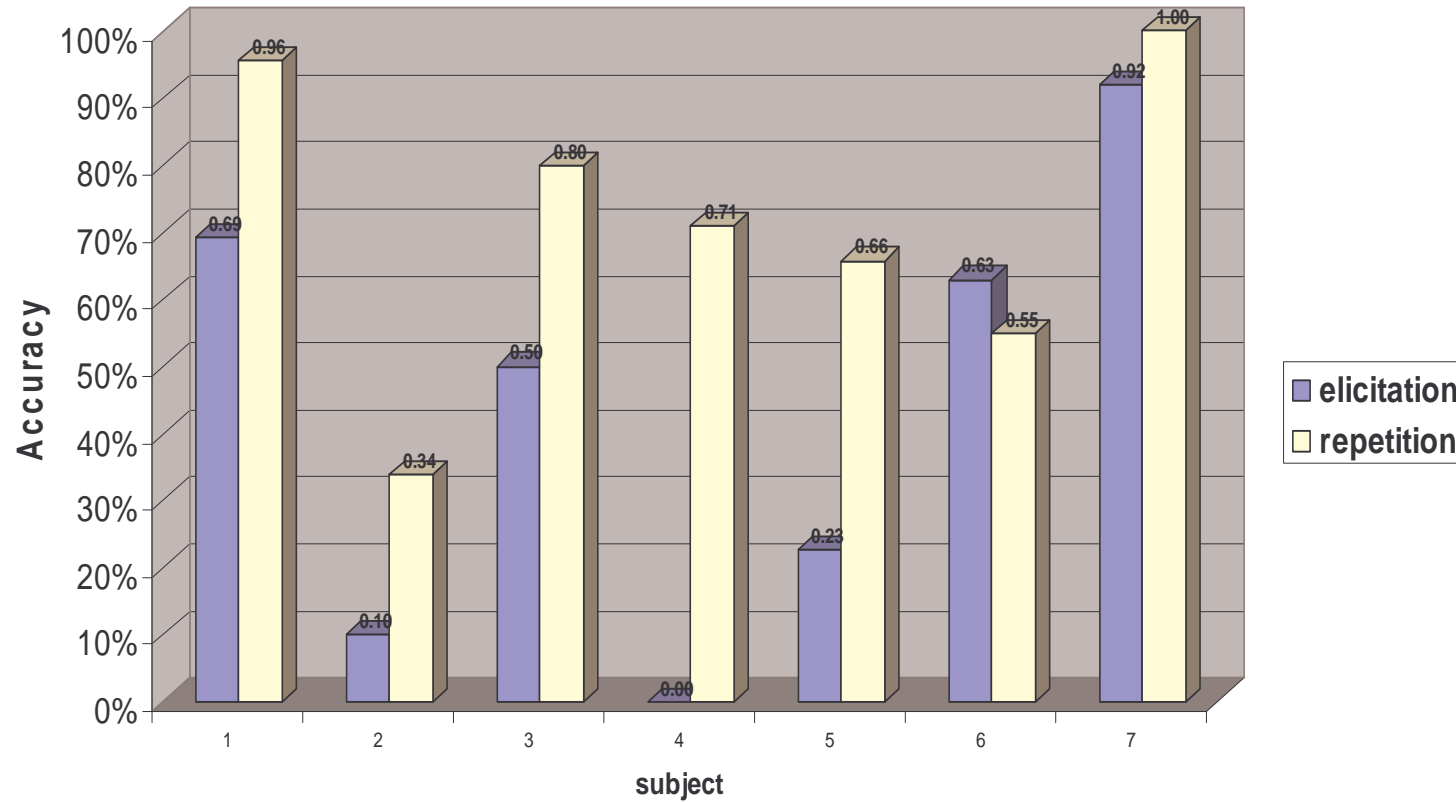
ANOVA: $F(2,10)=5.3$, $p = .026$

Main effect of TASK



ANOVA: $F(1,5)=7.85$, $p<.037$

Main effect of TASK

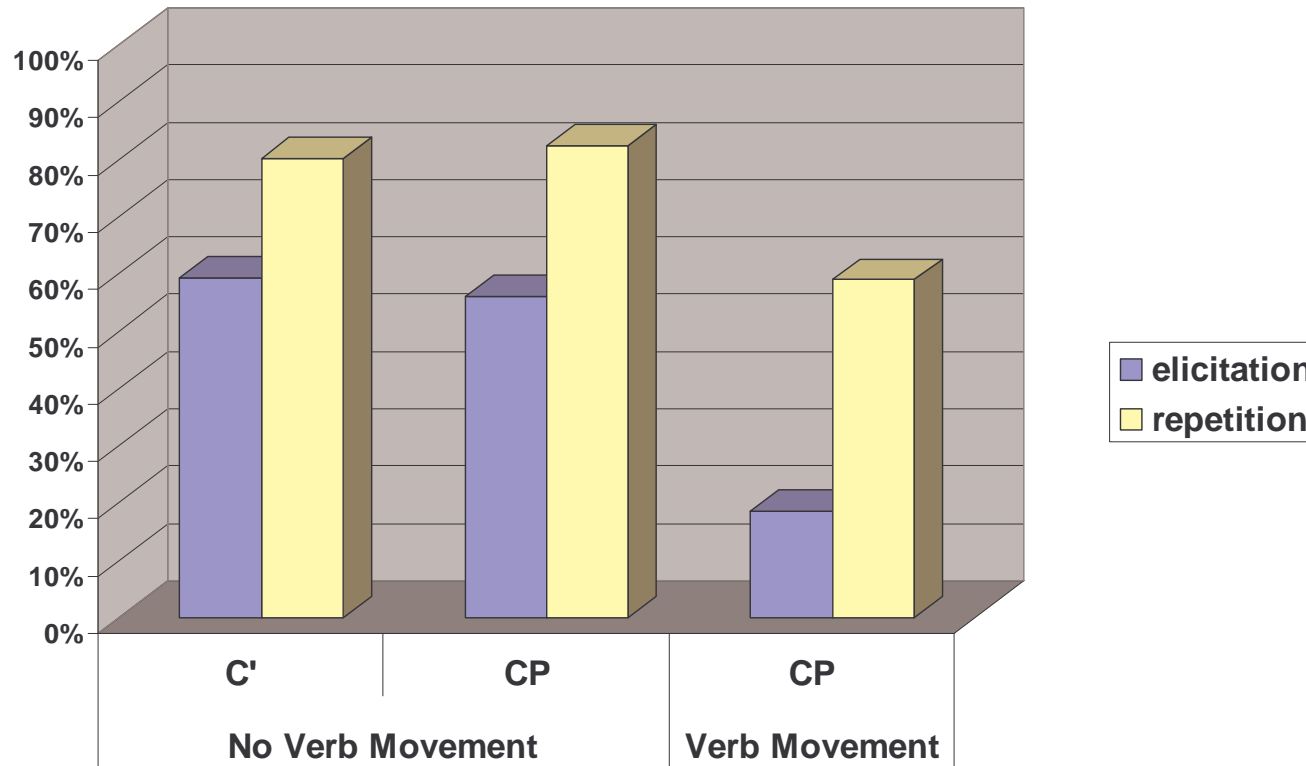


ANOVA: $F(1,5)=7.85$, $p<.037$

Main effect of TASK

- Discussion
 - increased performance in repetition task probably means that subjects repeat a *string*
 - elicitation is probably a better test of their “creative” *syntactic* abilities
 - Is there is interaction between task and condition?

TASK x CONDITION



$F(2,10)=4,5$, $p=.039$

Discussion

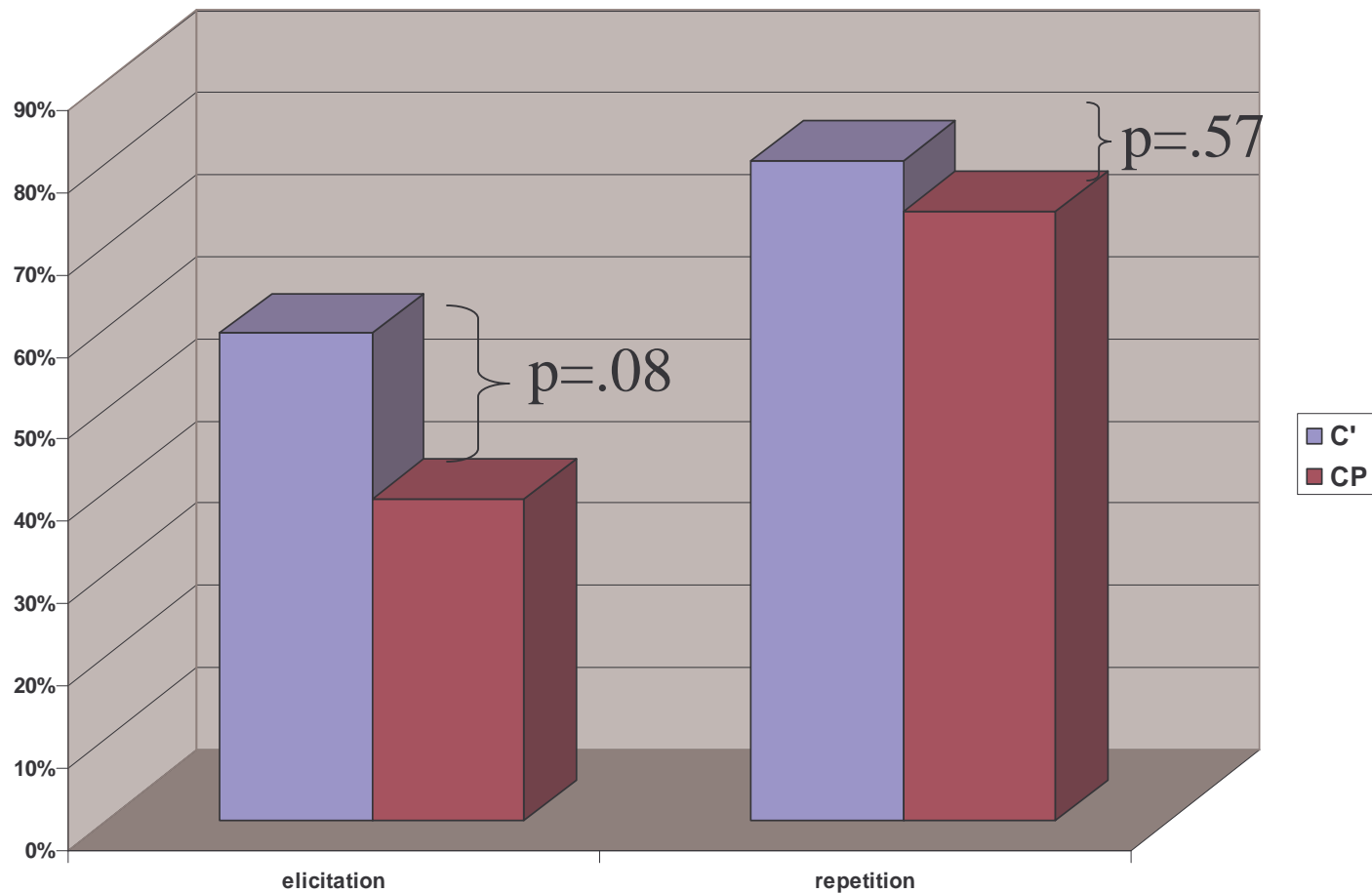
- Given the interaction between task and condition, it is justifiable to analyze the two data sets separately.

Testing predictions

- A: 2 movements (Wh + V-mvt) and a CP
 - Adjunct questions and object questions with V2
- B: 1 (XP-) Wh-movement and a CP
 - subject questions without V2
- C: 1 (X^0 -) Wh-movement and a C'
 - object questions without V2
- Hypotheses expressed as orthogonal contrasts:
 - $H_{A\text{-treesize}}: (A+B)/2 < C$
 - $H_{A\text{-movements}}: A < (B+C)/2$

Tree-size?

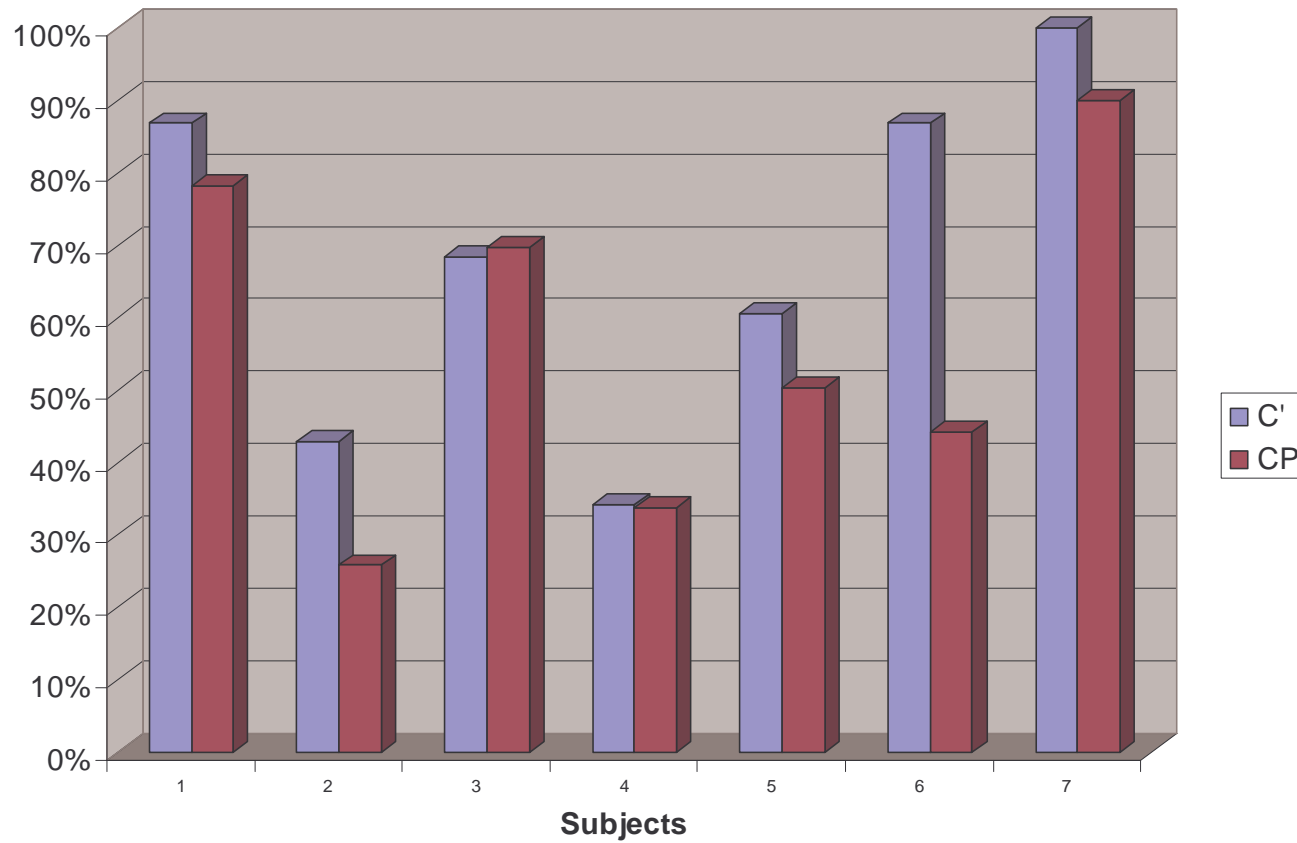
- Is performance on CP-questions (A + B) worse than on C'-questions (“what you said”)?



Tree-size?

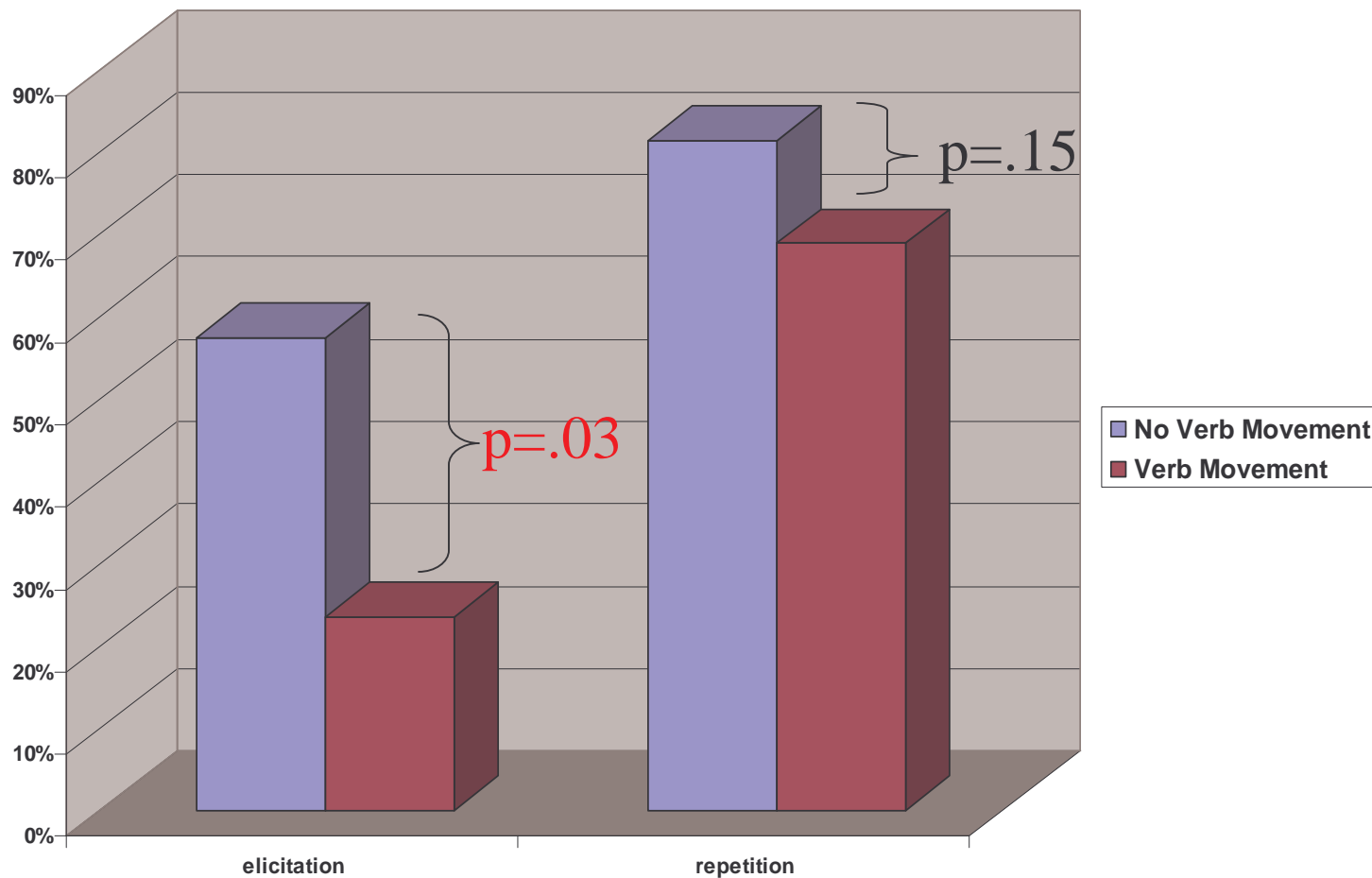
- Both tasks together:

- $F(1,5)=4.37, p=0.09$



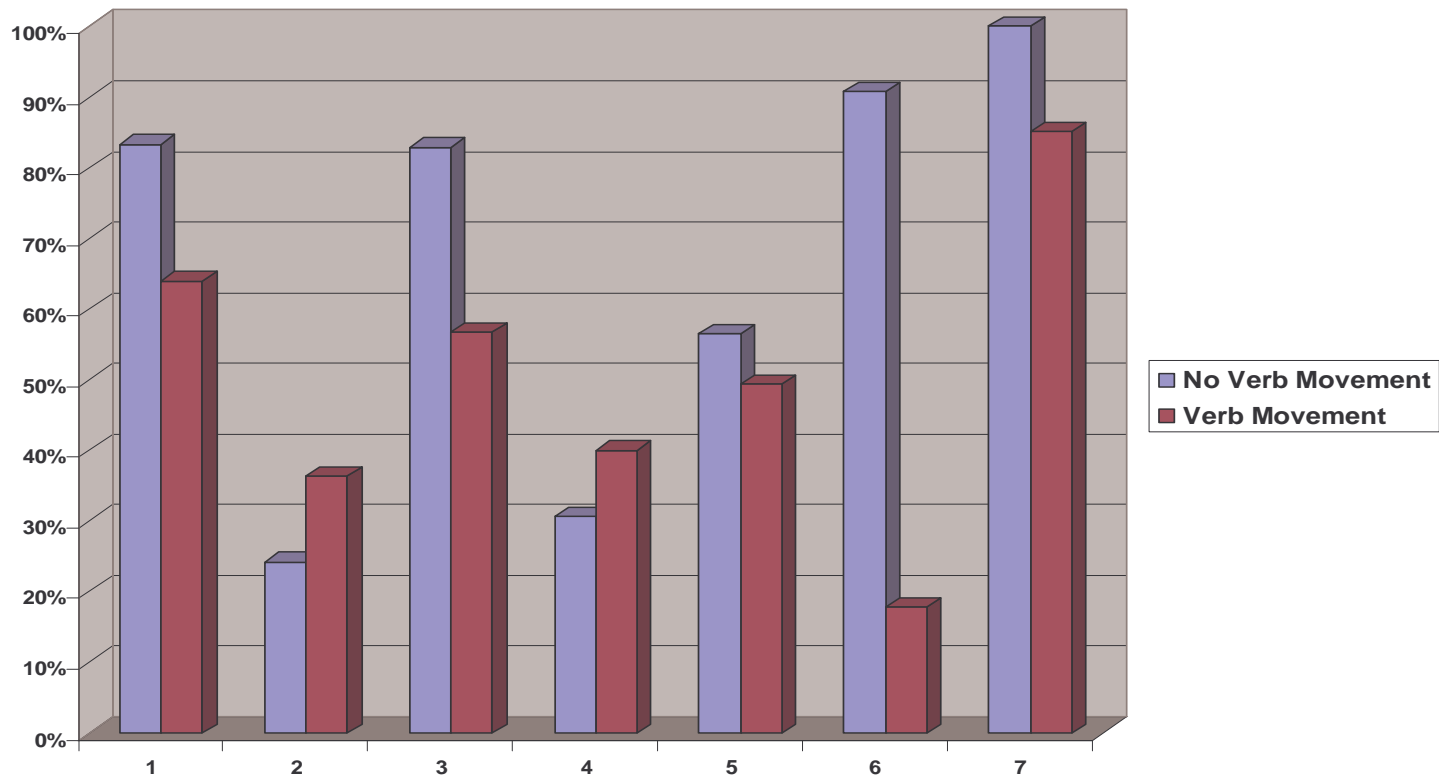
Number-of-movements?

- Is performance on questions with two movements (A) worse than questions with one movement (B & C)?



Number-of-movements?

- both tasks together:
 - $F(1,5)=6.96$, $p=0.045$



Discussion

- verb movement (in combination with Wh-movement) seems to have greater negative impact on production than mere tree size
- Caveat: statistical effects probably too dependent on individual subject effects
- Larger N?
 - More in-depth analysis of each subject (logistic regression models and HLM)

Further orthogonal contrasts

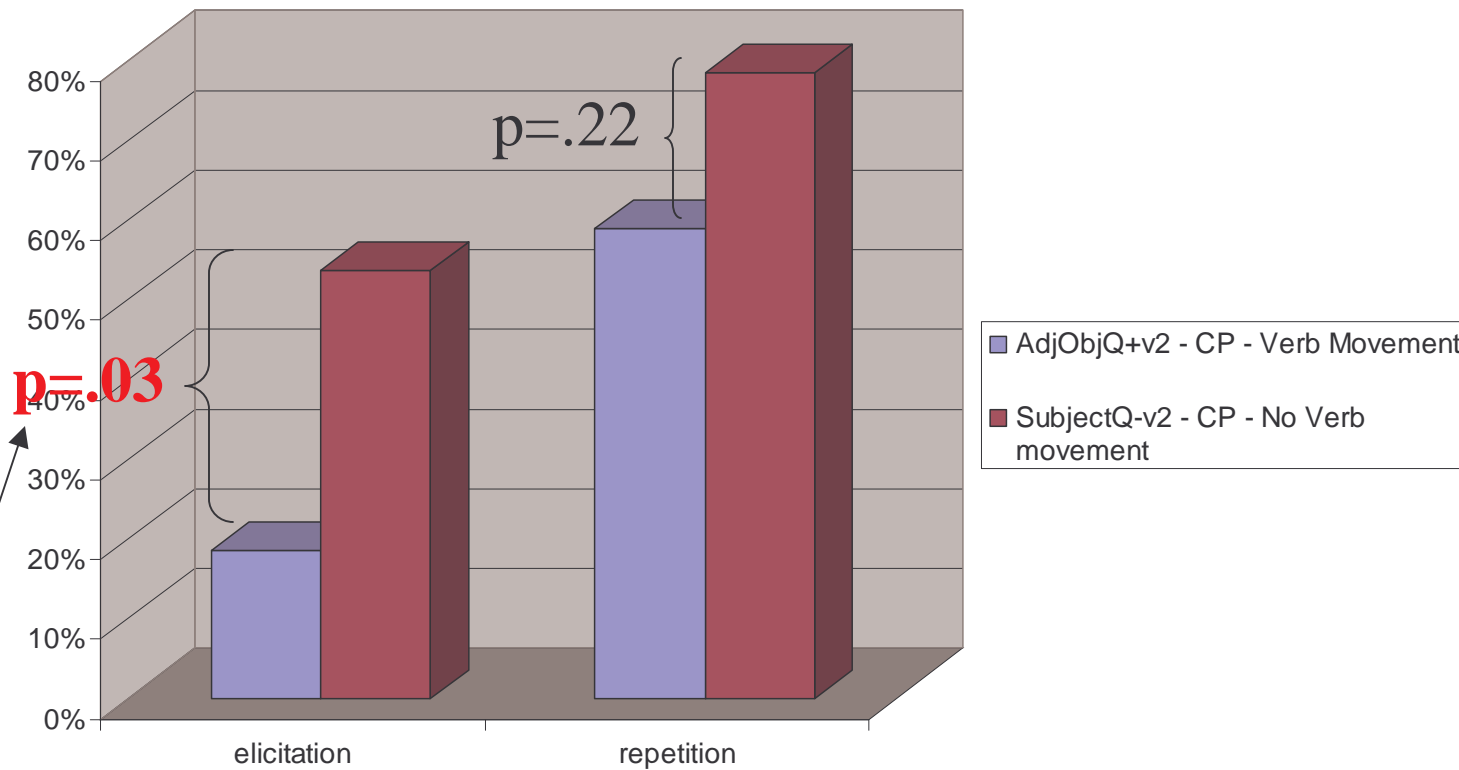
1. Vary just verb movement:

Are CP+V2 harder than CP-V2?

- Heavy object question vs subject questions
- treesize: predicts no difference
- movements: predicts a difference

1. Tree-size constant, vary V-mvt

CP subject questions without V2 vs.
CP adj/obj questions with V2



Supports Movements theory!

Further orthogonal contrasts

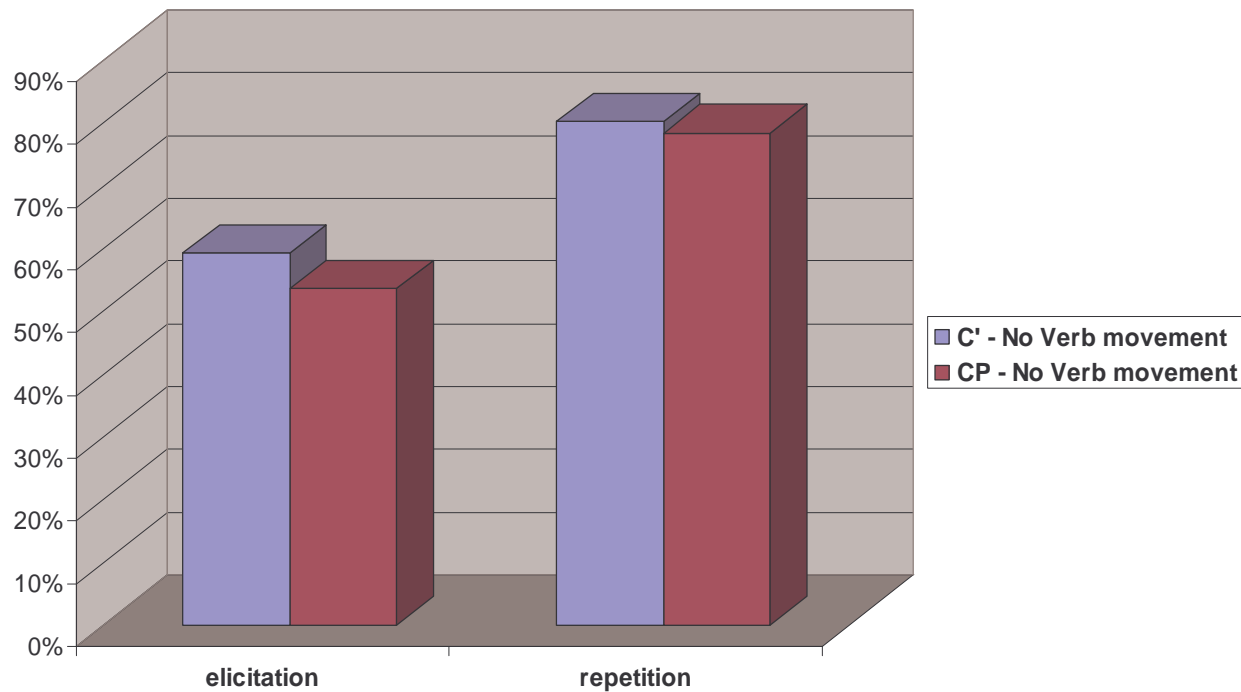
2. Vary just tree-size:

Are CPs without V2 harder than C' without V2?

- Subject questions vs light object questions
- treesize: predicts a difference
- movements: predicts no difference

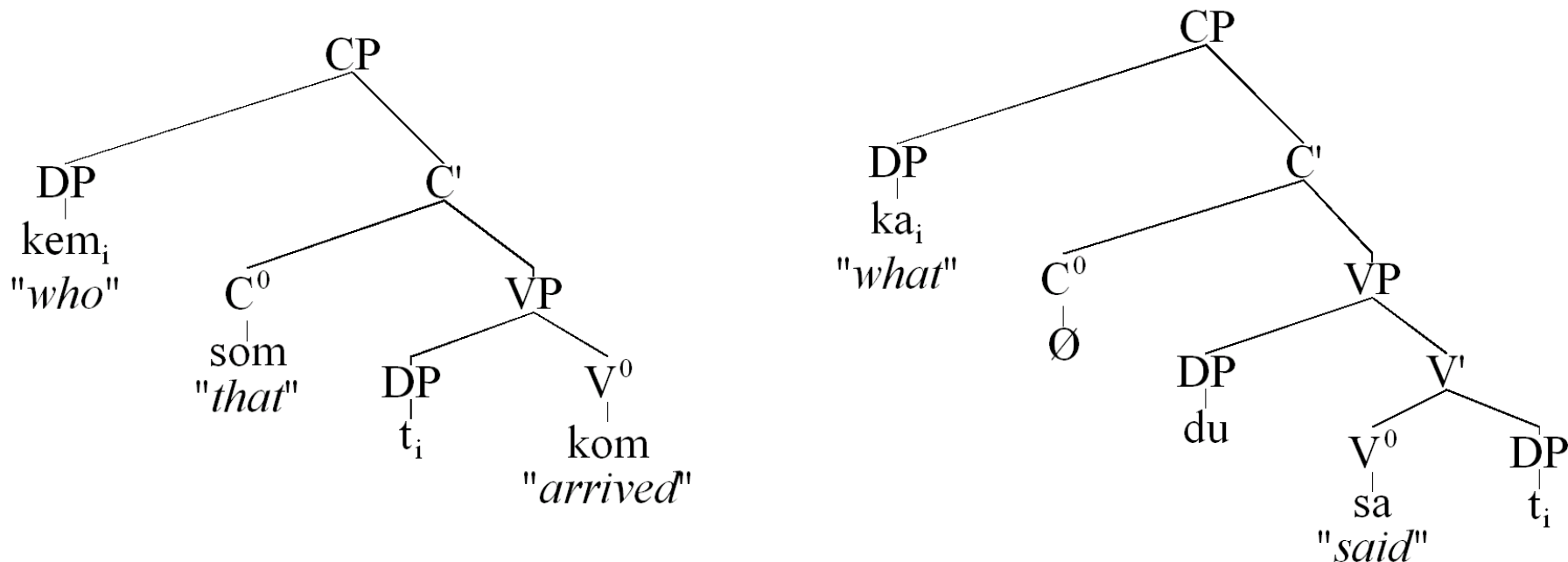
2. V2 constant, vary tree-size

- subject (CP) vs light object questions (C')
- No significant difference



2. Alternative interpretation

- tree size is in fact identical; Taraldsen-analysis of light object questions wrong (cf. Åfarli, 2000)
 - but this analysis is not allowed by e.g. Optimality theory

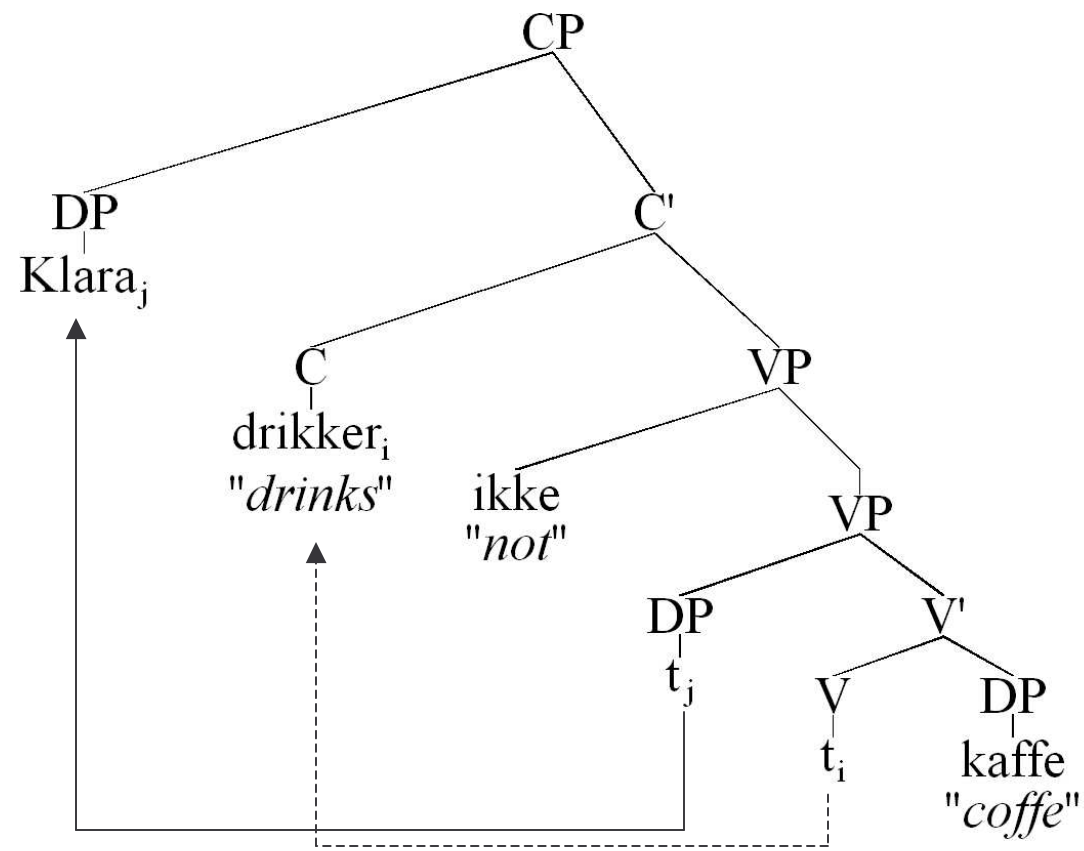


Conclusions

- For Wh-questions
 - tree-size matters less for predicting agrammaticic speakers production problems
 - But both properties could be relevant—results here could be related to low power
 - but verb movement, in particular in combination with XP-movement, is a significant factor

Declaratives

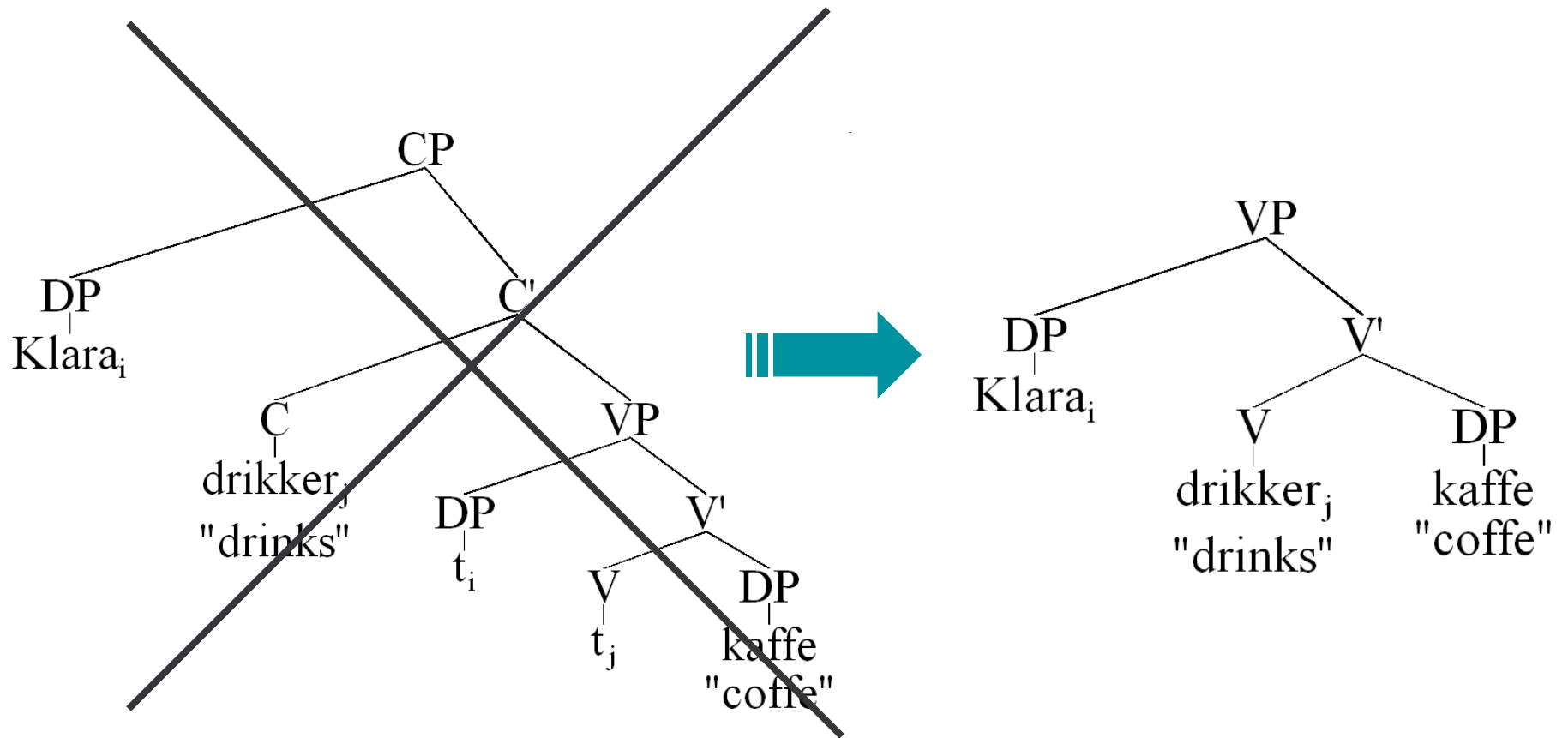
- Declaratives in Scandinavian: CP+V2!?



Declaratives

- Declaratives should be just as hard as the hardest Wh-questions
- However:
 - OT-like theories would postulate smaller structure for declaratives (Grimshaw)

Declaratives

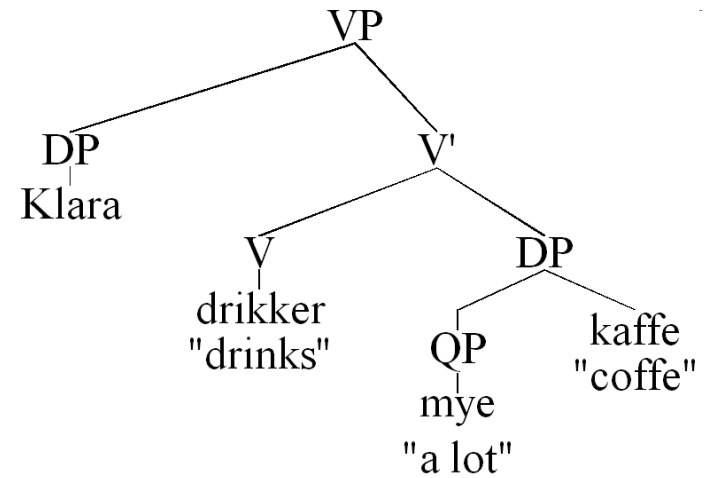
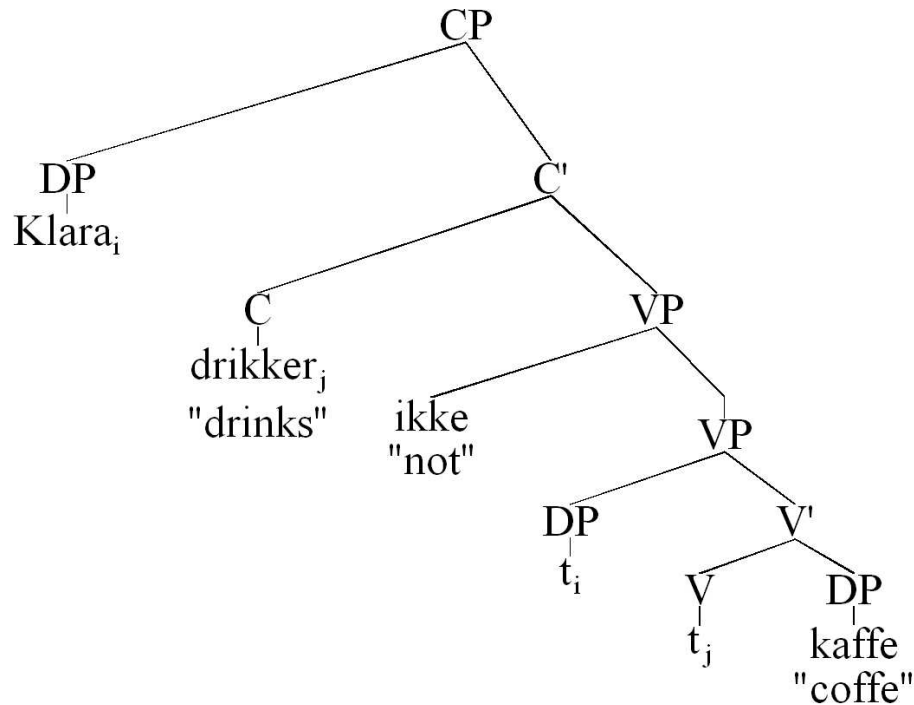


Two different size declaratives?

- Big declarative

- Small declarative

- Same size string/types of words



Movement in nominals

- NPs in Scandinavian:
 - Definite article is a suffix, N moves
 - Indefinite article is a word, no movement

jent+a

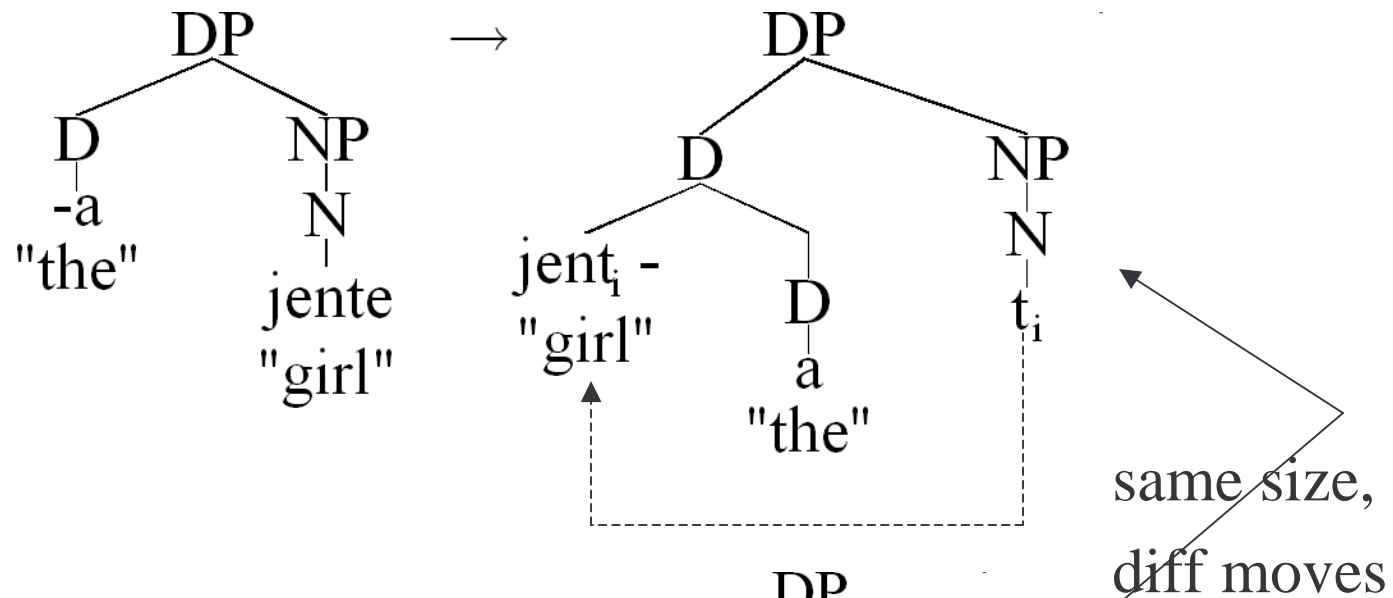
“girl+DEF” = “the girl”

ei jente

“a girl”

Movement in nominals

- DP+movement:



- DP – movement:

