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# Pronoun use in the prefield of Alzheimer's Dementia

# Language use changes over the life span

child hood

school time

professional education

family / business time

retirement / family

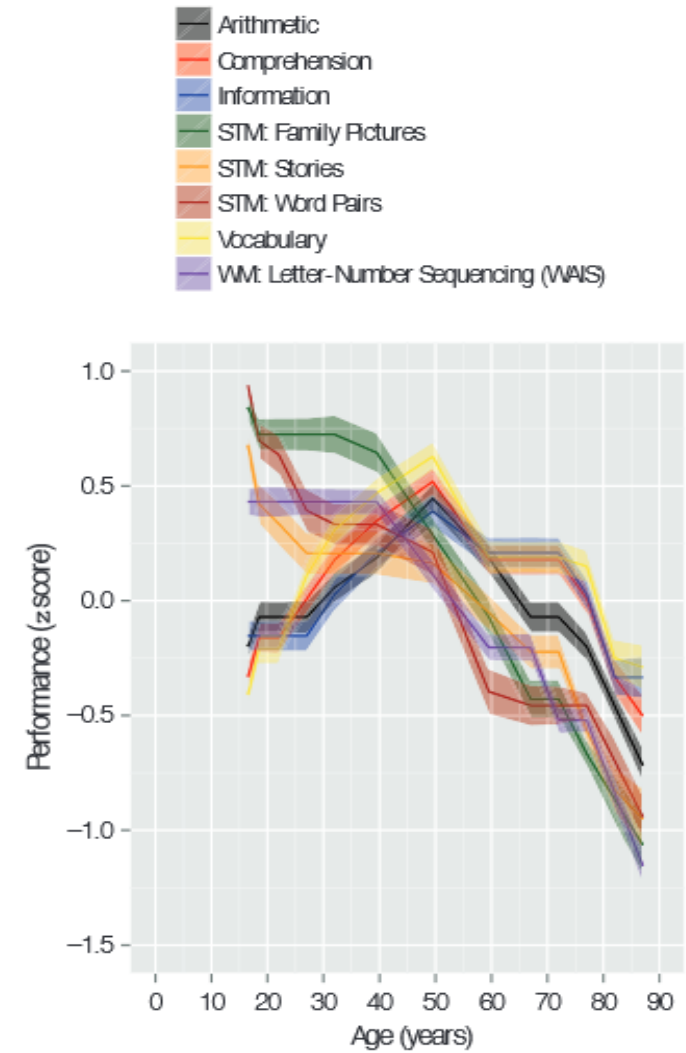
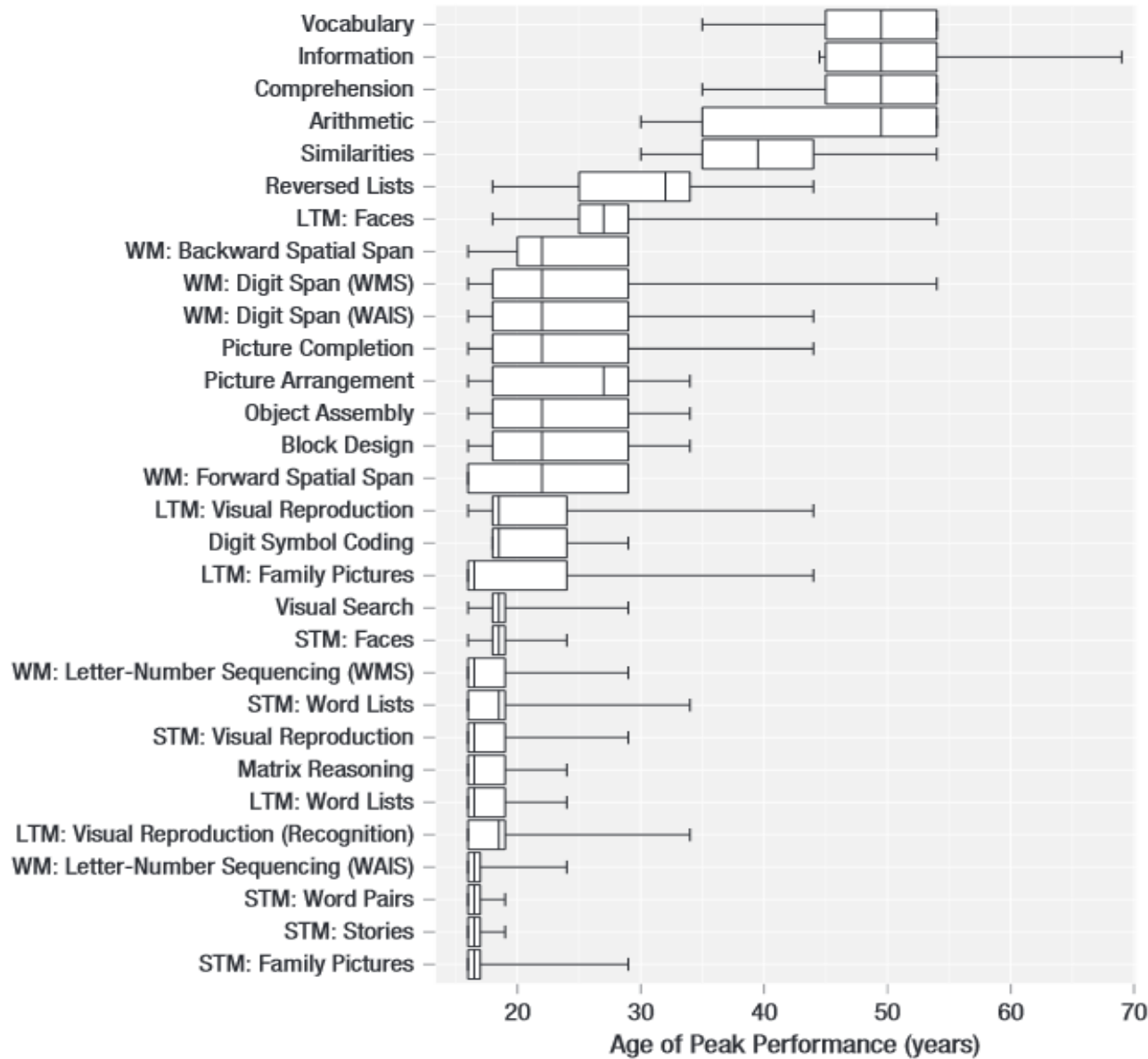
older age

Psychology: each stage – a frame for certain psychological conditions

Linguistics: each stage – a frame for certain communicative requirements

# Cognitive abilities change over the life span

*Hartshorne, Germine*



# Linguistic research

child hood

school time

professional education

family / business time

retirement / family

older age

Changes in linguistic knowledge during adult life?  
What are the robust and the „weak“ parts of linguistic structure / knowledge?

# Language use and language knowledge **in older people**

- What are „normal“ changes?
- What are pathological changes?
- Where, in which linguistic subsystems do pathological changes occur?
- What are the underlying conditions for accessibility and processing of linguistic units/structures?

# Spoken language in Alzheimer's Dementia (AD)

Table 1

Language impairments in Alzheimer's dementia

	Early stage	Moderate-severe
Spontaneous speech	Fluent, grammatical	Nonfluent, echolalic neologisms
Paraphasic errors	Semantic	Semantic and phonemic
Repetition	Intact	Impaired
Naming	Impaired (mild)	Impaired
Comprehension of words	Intact	Impaired
Syntactic comprehension	Intact	Impaired
Reading	± intact	Impaired
Writing	± intact	Impaired
Word and object knowledge (semantic knowledge)	Intact for more frequently used words and objects; impaired for less frequently used words and objects	Impaired

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## Spoken language in moderate stages of AD

„... und da **haben wir ... äh äh ... gebaut ...**

**äh äh ... Baracken ge...baut**

und ... äh ...

**bald in Berlin ... äh ... äh ... Luftangriff...e waren**

...

**ich bin ... äh ... 12 Jahre ... äh ... weil der Krieg ausbrach, gell,**

**und ... äh ... 12 Jahre alt geworden.“**

(\* accessible content units in bold)

# Spoken language in AD

Table 1

Language impairments in Alzheimer's dementia

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## Spoken language in **early stages of AD**

- Interviewer asks about the father of A
- A:

*„na gut*

***der war betriebsleiter ... äh ...***

*also **gelernter dreher drehermeister, nicht***

*und **dann hat er seine weitere ausbildung gemacht, nicht***

***damals schon, ne***

*und das bis zum ... äh ... **betriebsleiter eines industrieunternehmens**“*

(\* accessible content units in bold)

# Findings on pronoun use in early AD

## - **English:** Almor et al. (1999)

experimental & spontaneous speech data of subjects with no and with AD

ADs' PRO-comprehension

affected

better with NP/DPs

ADs' PRO-production (he, she, (we, you?))

increased

increase of misleading reference

## - **German:** Tönjes (2012)

spontaneous speech data of 2 subjects with no AD + 9 with AD

increase: deictic D\_PRO (der, die, den etc.)

Wendelstein (2016)

spontaneous speech data of

8 subjects with no AD + 8 with AD

**3 time points** (first time point – all subjects no AD!)

increase: D\_PRO & personal PRO (not separated)

**increase already before AD is diagnosed**

## Pronouns in spoken language (example)

- Interviewer asks about the father of A
- A:

*„na gut*

***der** war betriebsleiter ... äh ...*

*also gelernter dreher drehermeister, nicht*

*und dann hat **er seine** weitere ausbildung gemacht, nicht*

***damals** schon, ne*

*und **das** bis zum ... äh ... betriebsleiter eines industrieunternehmens“*

# Findings on pronoun use in early AD

## Problem – low comparability of the studies

- Language-specific referential properties of pronoun types  
e.g. English: he/she – only humans + pets, it - inanimates  
→ other referential domain than German er/sie/es
- Variation in the sample of pronouns investigated  
e.g. inclusion/exclusion of 1st/2nd person pronouns  
→ Wendelstein inclusion – Tönjes exclusion
- Variation in the communicative settings  
→ the communicative setting affects the choice of pronoun types

# Pronouns in AD – state of the art

- something happens with pronoun use in early and preclinic AD
  - Which referential relations are affected? When?
  - What causes the pathological changes?
- Hypotheses on source of increased pronoun use
  - problems with lexical/semantic access (Hier et al., 1985)
  - reduced working memory capacity (Almor et al. 1999)
  - pragmatic problems (Wendelstein 2016)

# The Study

DATA origin: **ILSE-Corpus**

(ILSE: Interdisciplinary Longitudinal Study on Adult Development and Aging, Uni Heidelberg)

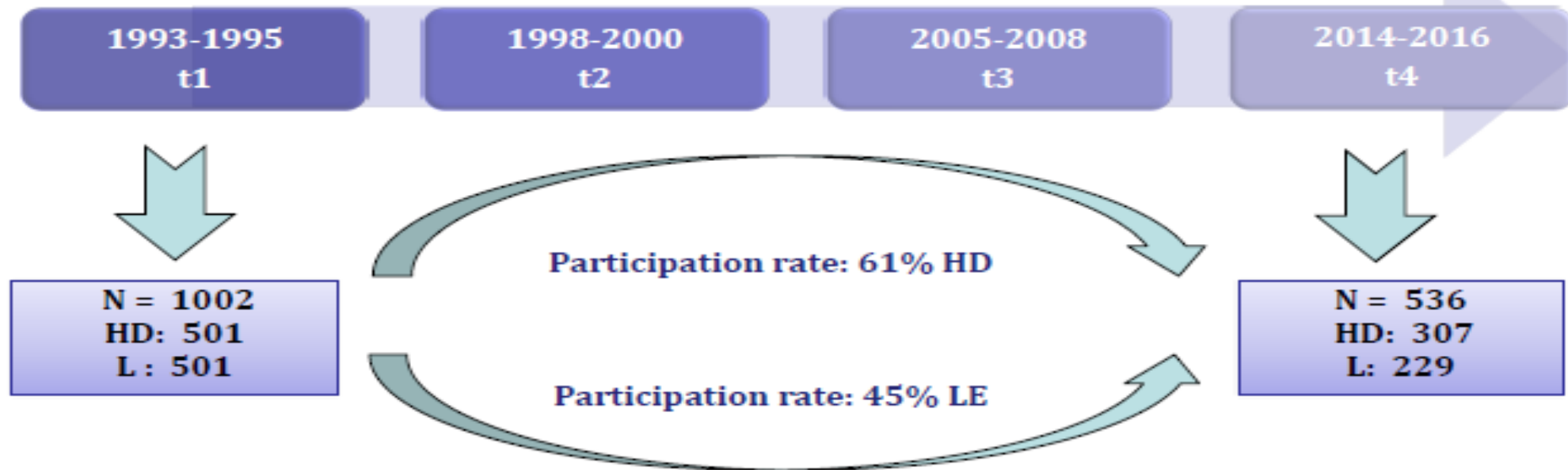
# The ILSE-Corpus (U Heidelberg)

**Design of the study:** The main objective of the Interdisciplinary Longitudinal Study on Adult Development and Aging (ILSE) is to investigate the longitudinal course of aging with respect to the potential risk and protective factors involved [1]. ILSE is designed as a multidisciplinary longitudinal study and involves **two birth cohorts in two regions** Leipzig (Saxony; former east) and Heidelberg (former west) Germany

500 participants from the 1930/32 cohort

502 participants from the 1950/52 cohort

**Observation periods:** Subjects were investigated in four examination waves (t1-t4) at age 40 vs. 60; 45 vs. 65; and 55 vs. 75. At the current fourth examination wave subjects are 63 vs. 83 years old [2,3].



# The Study

semi-structured biographical interviews  
taken from the ILSE-corpus

Selection of 2 interviews / subject  
interview 1 - at age 62-64 (T1)  
interview 3 - at age 73-75 (T3)

10 subjects

- 5 no AD at T1 - mild AD at T3 (AD-group)
- 5 no AD at T1 and T3 (CTR-group)

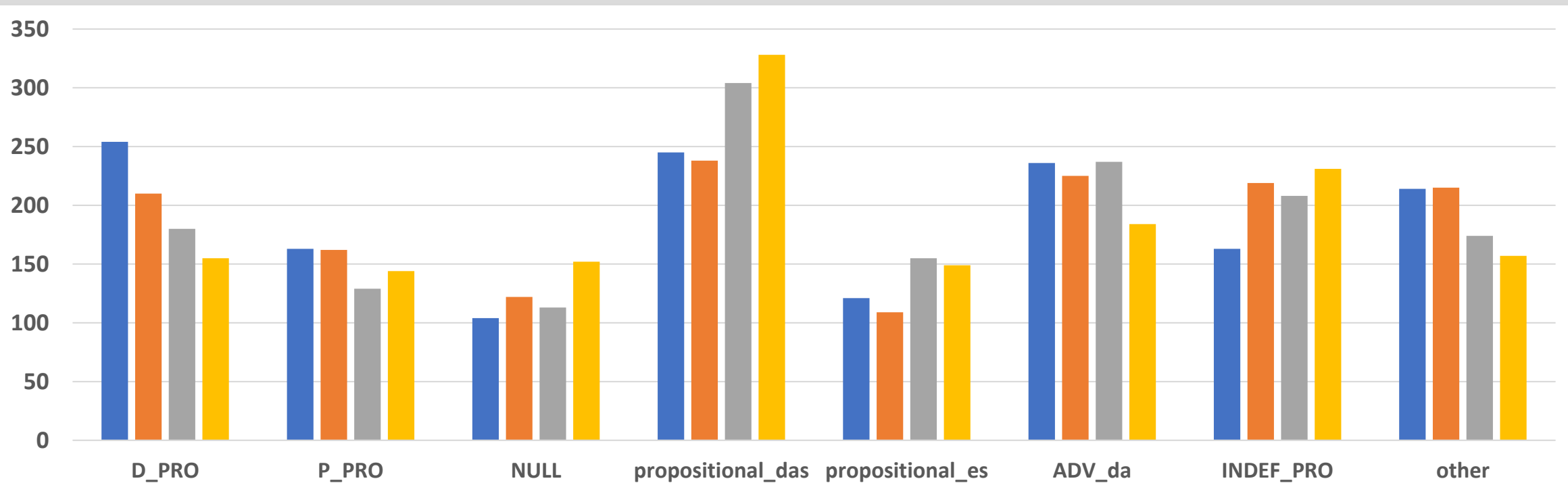


5 pairs of one AD / one CTR  
matched by Wendelstein (2016)

Method: **proportional analysis** of the  
first 300 3rd person pronouns / interview (n=20)  
= **6000 data points**



# Analysed pronoun types



Der  
war Lehrer.  
'He was  
a teacher.'

Er  
war Lehrer.  
'He was  
a teacher.'

... und  $\emptyset$   
war Lehrer.  
'... and was  
a teacher.'

Das war  
schlecht.  
'This was  
bad.'

Es war  
schlecht.  
'It was  
bad.'

- local
- temporal
- condit.
- causal

- everybody
- some/one
- each
- *man* 'one'
- many

...

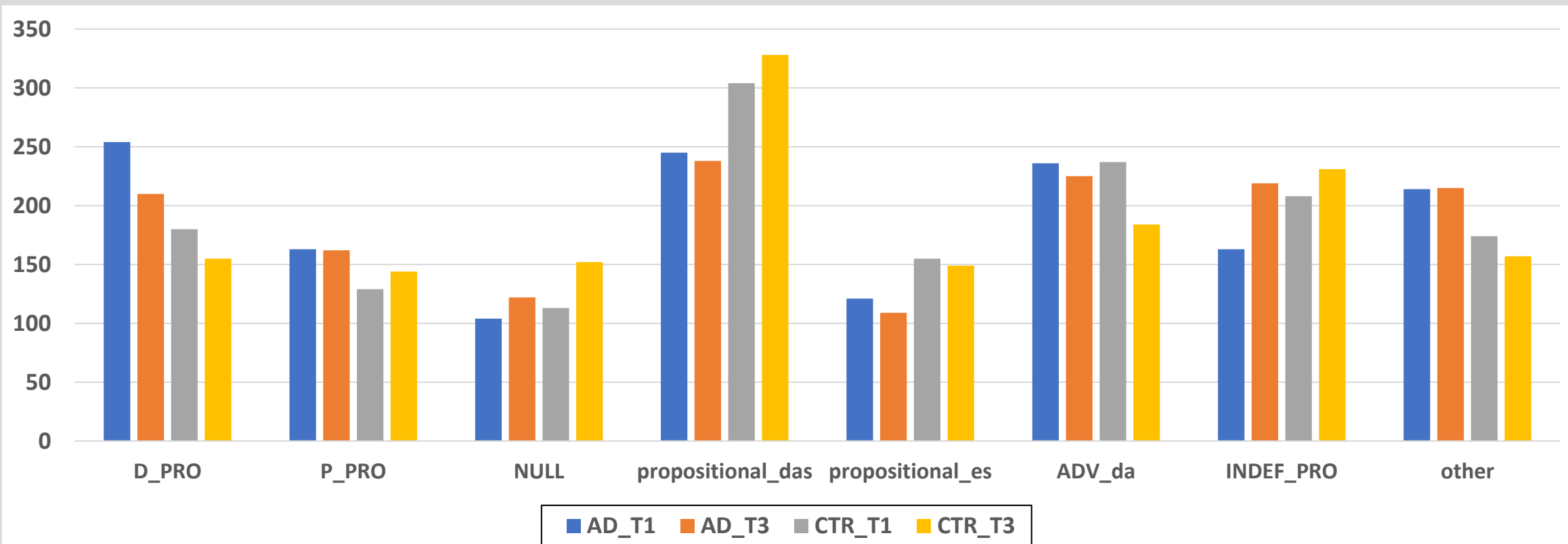
- relative
- interrog.
- adverbial
- *Sie* 'You'
- ...

# The Study

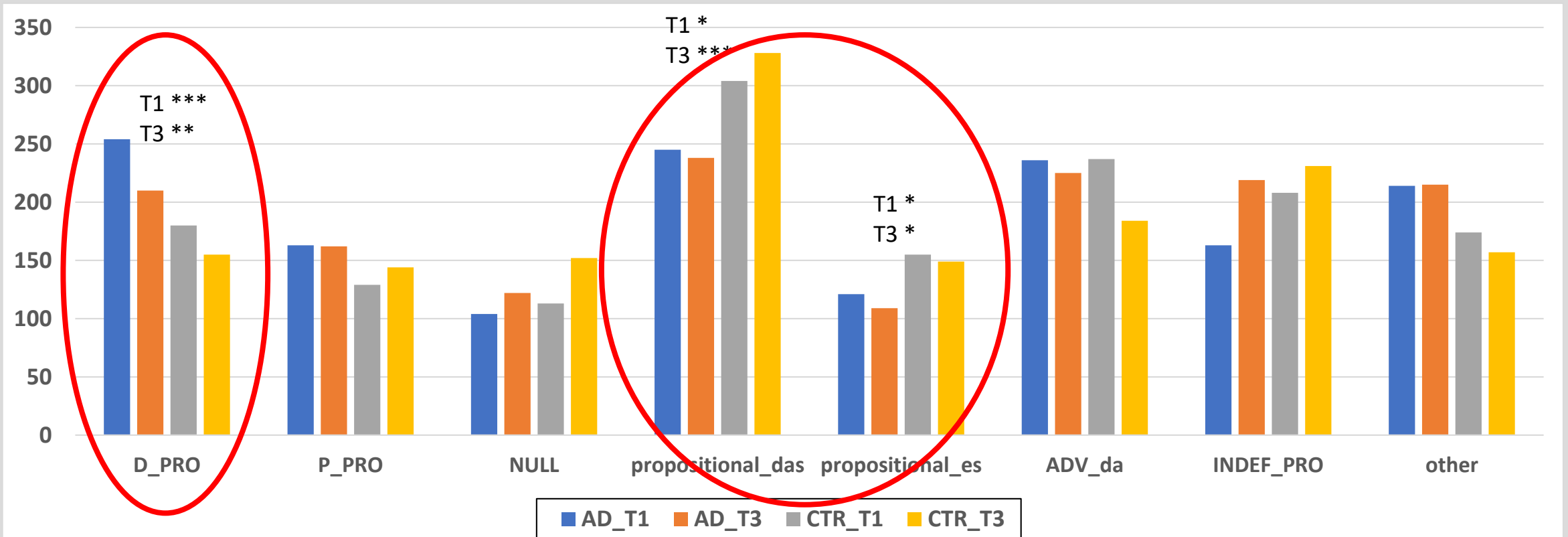
**1. Are there differences in the proportional distribution of pronoun types ?**

- **between AD vs. CTR ?**
- **between T1 vs. T3 ?**

# Proportions of pronoun types (T1: n=1500 AD + n=1500 CTR / same for T3)



# Proportions of pronoun types (T1: n=1500 AD + n=1500 CTR / same for T3)



1. Differences in the proportion of 3rd person pronouns already in the prefield of AD
2. No dramatic changes from T1 to T3.

# The Study

## 2. Domains of increase in D\_PRO in AD ?

### Analyses

- a. syntactic contexts
- b. semantic-pragmatic context

# 1. Position of D\_PRO in main-clauses

intact grammar → pre-verbal position preferred (Topic / Vorfeld)

... Dann kam ein Arzt herein.

a. **Der** schaute sich die Wunde  
sorgfältig an und sagte ...

b. Sorgfältig schaute **der** sich  
die Wunde an und sagte ... (= > marked use of D\_PRO)

... Then a doctor came in.

a. **He**<sub>D-RO</sub> was thoroughly looking  
at the wound and said ...

b. Thoroughly was **he**<sub>D\_PRO</sub>  
looking at the wound an said ...

**Question:**

**Do the AD-subjects extend D\_PRO to post-verbal position?**

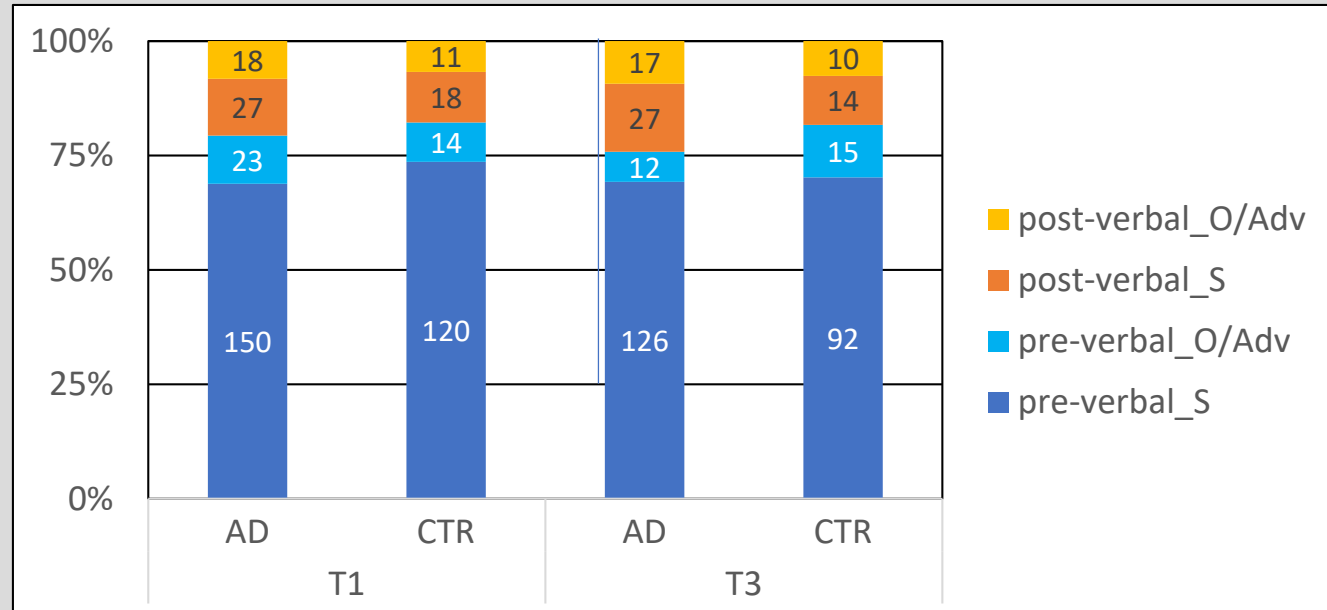
**Question for analysis:**

**higher proportion of D\_PRO in post-verbal position  
in the AD-group than in the CTR-group?**

# 1. Position of D\_PRO in main-clauses: analysis

intact grammar - preference for pre-verbal position (Topic / Vorfeld position)  
**under AD** → **extension to post-verbal position ?**

**NO !**



## 2. D\_PRO in main clauses vs. sub-clauses

intact grammar → preference for main-clause (Topic re/activation)

... Dann wurde der Arzt gerufen.  
**Der** schaute sich die Wunde  
sorgfältig an, obwohl **der** keine Zeit hatte.

↓  
marked use of D\_PRO

... Then it was called for the doctor.  
**He**<sub>D\_PRO</sub> was looking thoroughly at the  
wound though **he**<sub>D\_PRO</sub> had no time.

**Question:**

**Do the AD-subjects extend D\_PRO to sub-clauses?**

**Question for analysis:**

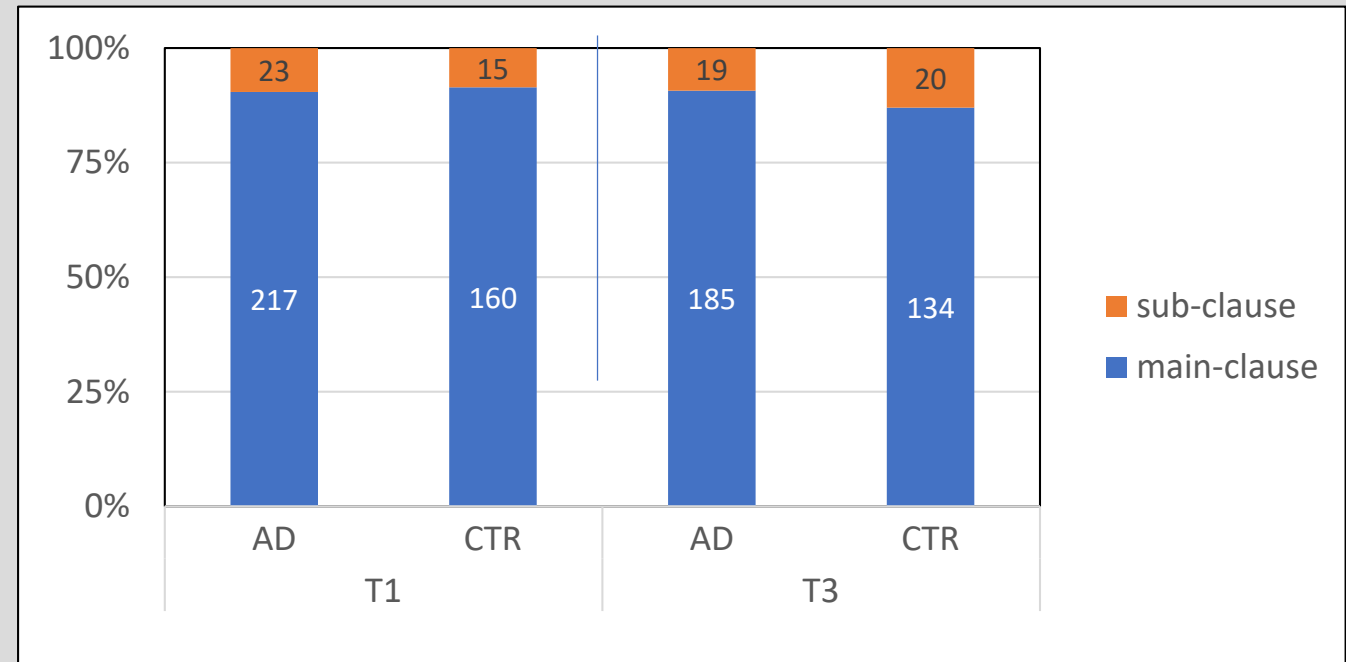
**higher proportion of D\_PRO in sub-clauses  
in the AD-group than in the CTR-group?**



## 2. D\_PRO in main clauses vs. sub-clauses: analysis

intact grammar - preference for main-clause (Topic re/activation)  
**under AD** → **extension to sub-clauses?**

**NO !**



### 3. Referents of D\_PRO and P\_PRO - semantic-pragmatic properties

intact language: difference in emotional connotation

#### **P\_PRO**

less distant  
more intimate

#### **D\_PRO**

more distant  
less intimate

#### **preferred referents:**

- humans

**emotionally  
close to**

- humans

**emotionally  
not close to**  
- animals & inanimates

**Question:**

**Do AD-subjects extend D\_PRO to referential domains of P\_PRO ?**

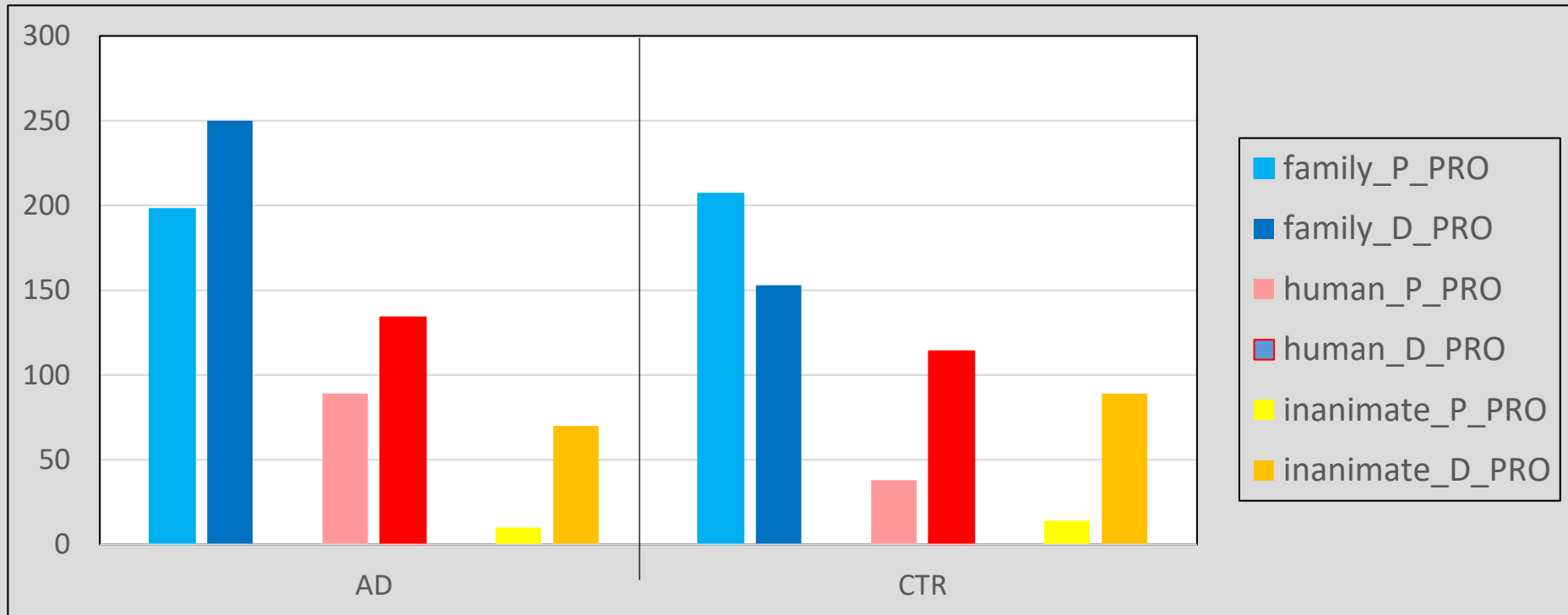
### 3. Referents of D\_PRO and P\_PRO - semantic-pragmatic properties

Method of analysis: „emotional closeness scale“

1. close/intimate: **family** member (category: *family*)
2. more distant: other **human** + (higher) animal (category: *human*)
3. distant: **inanimate** object (category: *inanimate*)

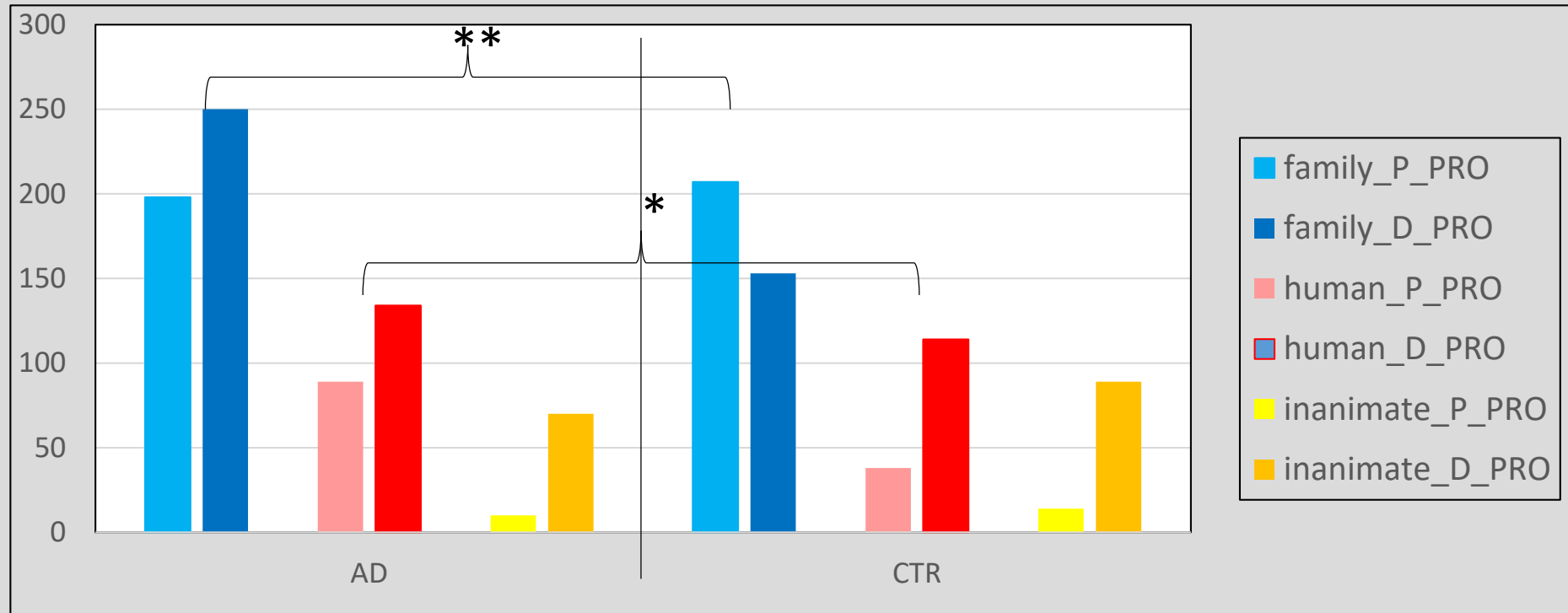
### 3. Referents of D\_PRO and P\_PRO: analysis

(T1 and T3 taken together; data base n=3000 ADs / n=3000 CTRs)



### 3. Referents of D\_PRO and P\_PRO: analysis

(T1 and T3 taken together; data base n=3000 ADs / n=3000 CTRs)



**Losses in the emotional connotation of D\_PRO and P\_PRO**  
(supported by some AD's use of D\_PRO in prepositional phrases!)

# Summary results

- Increased use of D\_PRO in preclinic and early stages of AD (in German!)
- Domains of pathological change
  - CHANGES in semantic-pragmatic properties: emotional connotation of D\_PRO **and** P\_PRO
  - NO changes in structurally constrained domains  
analysed structures:
    - pre- vs. post-verbal position of subject D\_PRO in main-clauses
    - subject D\_PRO in main- vs. sub-clauses

# Conclusions

- Pathological changes in language use start years before AD can be diagnosed in terms of MMSE.  
(considerable individual variation)
- In preclinic and mild AD, structurally constrained domains of language are less affected than semantic-pragmatic domains.
- Neither the **Semantic-Deficit-Hypothesis** (Hier et al. 1985) nor the **Working-Memory-Deficit- Hypothesis** (Almor et al. 1999) can fully explain the observed pattern. Both hypotheses would propose a less specific pattern of changes.
- **Alternative Hypothesis:** The observed changes in pronoun use are caused by emerging deficits in aspects of THEORY OF MIND.  
(supporting evidence: decreasing use of *propositional das/es* (*das/es war ein dorf bei Berlin* `It was a village near Berlin`. s. slide 20 ) → lack of information the hearer would need in establishing the discourse model)

# Thank You!

Please, don't hesitate asking us for further information.

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