Repeated-measures ANOVA for RT and Accuracy data

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Overview

- An example
- Some background
- Methodology
- Results
- Conclusion

Let's start with an example

- Make a lexicality judgment, as accurately as possible, and as fast as possible.

xxxxxxxx

airborne

syltorne

airborne

xxxxxxxx

dospirse

irse

dospirse

END

Let’s break down a trial

xxxxxxxx

A visual mask

airborne

A pre-prime

syltorne

A prime

airborne

A target

A blank page

Background (1): previous research

- Hollander (2014) and Brink (2013) found that, for native Dutch speakers, one can significantly facilitate the recognition of a Dutch word (such as '**dringend**')
  - With a 5678 prime
  - Not with a dddd5678 prime

gend

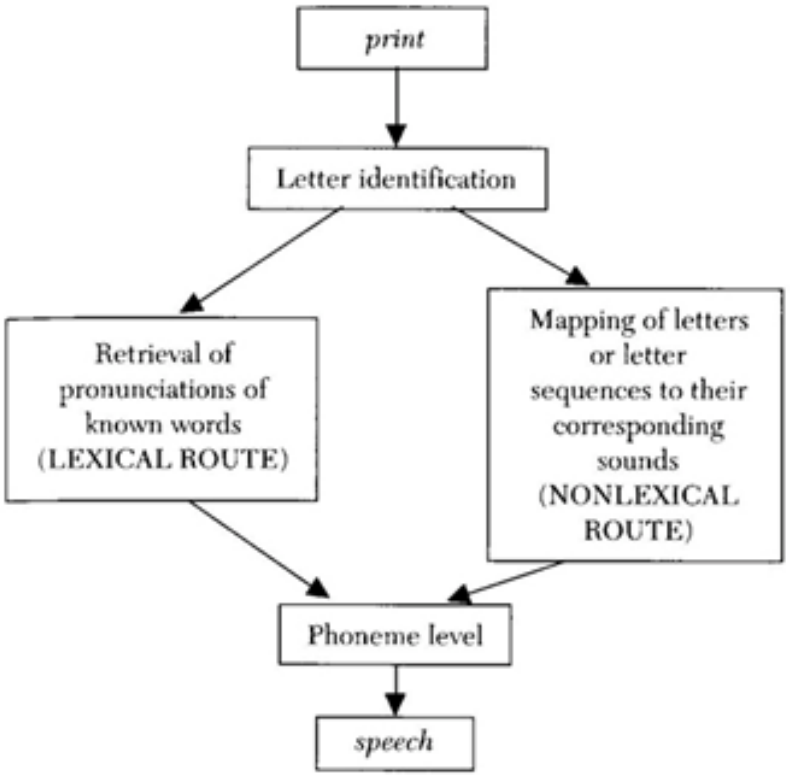
kotogend

Background (2): previous research

- Hollander (2014) explained this finding by means of incomplete serial binding of letter identities and letter positions. Not enough activation in the neural network to cause priming results. (**Conceptual Network**)

Back udy

- Can her lang deep ortho his findi profi



Background (4): Hypotheses

- 1: 5678 prime significant, dddd5678 prime not (for all groups)
- 2: 5678 prime significant, dddd5678 prime as well (for HP and lP groups)
- 3:
  - lP group: hypothesis 1
  - HP group: hypothesis 2
- 4: ND>HP>lP (faster & more accurate)

Method: participants

- Intermediate Proficiency group (IP)
  - 21 participants. Native Dutch. First-year Psychology students
- High Proficiency group (HP)
  - 21 participants. Native Dutch. Third year + students of English.
- Native Dutch group (ND)
  - 21 participants. Native Dutch. First-year Psychology students

Method: design

- Two within-subjects independent variables:
  - Word (2 levels)
    - Word
    - Non-word
  - Prime (3 levels)
    - ddddddddd
    - dddd5678
    - 5678

Method: design

- One between-subjects variable:
  - Proficiency (3 levels)
    - Intermediate Proficiency (IP)
    - High Proficiency (HP)
    - Native Dutch (ND)
- Two dependent variables:
  - Reaction Time (median RT for correct response)
  - Accuracy (proportion of trials)

Method: stimuli

- 312 8-letter English words.
  - Half converted to non-words
- No cognates or Dutch-English homographs.
- Freq: 7-175 occurances per million (COBUILD)
- Close Neighbors (within English language) minimized. No significant difference with median Dutch Close Neighbors Hollander (2014), $p = .734$

Method: Stimuli

Condition		Example	
Prime	Target	Prime	Target
dddddddd	Word target	syltutuf	airborne
5678	Word target	orne	airborne
dddd5678	Word target	syltorne	airborne
dddddddd	Non-word target	yactulaf	dospirse
5678	Non-word target	irse	dospirse
dddd5678	Non-word target	yactirse	dospirse

Method: procedure

- Lexical decision task
- Sandwich priming
  - pre-prime (=target)
  - prime
  - target
  - response
- E-prime

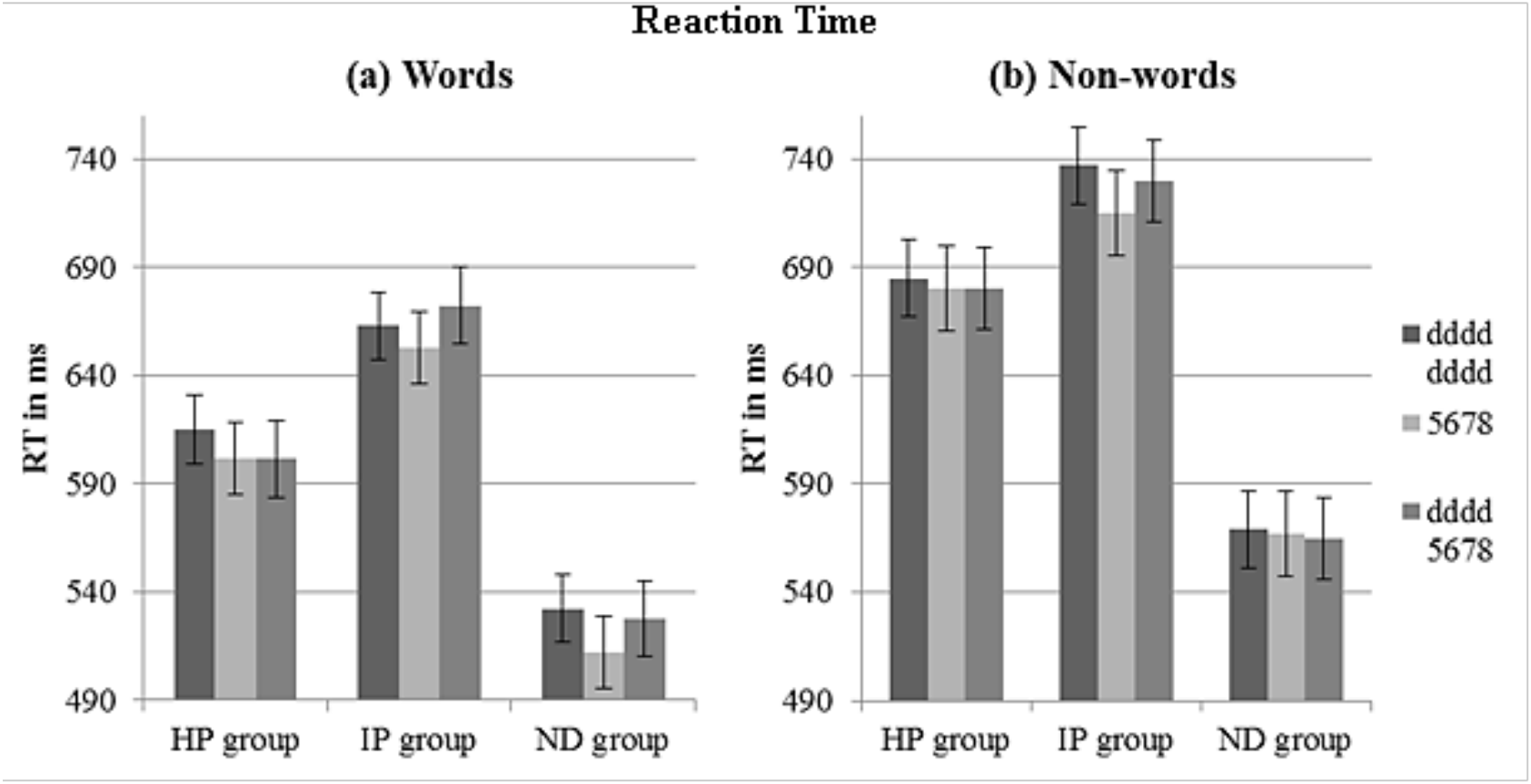
Method: procedure

- 2 practice blocks (feedback every time)
- 4 experimental blocks (feedback after each block)
- First 2 responses of each experimental block: start-up effects. Excluded.
- Order of presentation targets randomnized within each block.
- Priming conditions randomnized across participants.

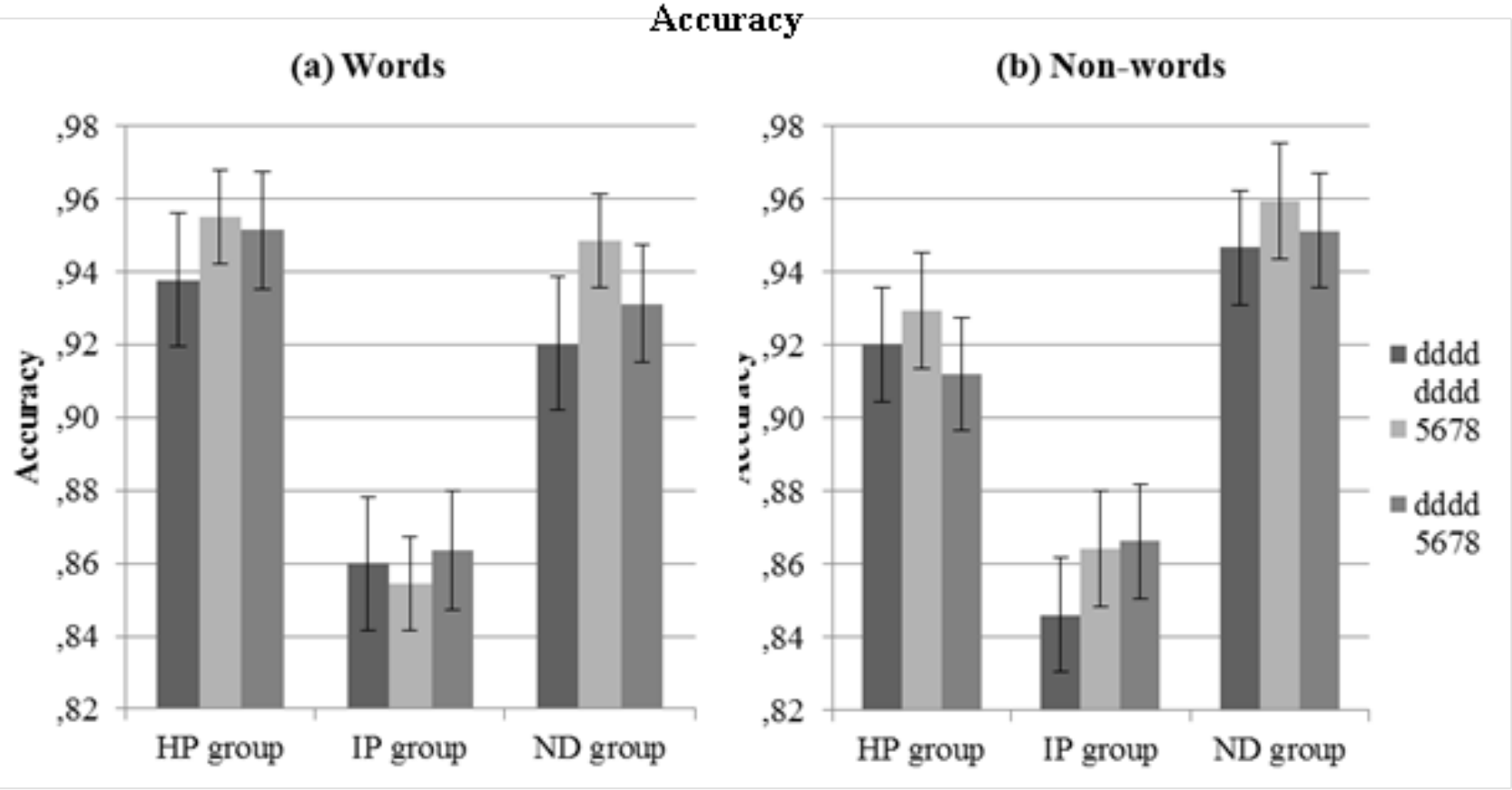
Results: general remarks

- Data with RT < 300 ms excluded (less than 1% of data)
- Today: focus on Prime and Group
- Only significant results reported
- When sphericity was violated: avarage of Greenhouse-Geisser epsilon and Huyn-Feldt epsilon ➔ above .7? Huyn-Feldt correction. Below .7? Greenhouse-Geisser correction.
- Other assumptions: not on slides
- Post-hoc comparisons: Bonferroni

Results: RT data



Results: Accuracy data



Main Effects **PRIME**

	RT/ACC	variable	F-statistic	df	p-value	$\eta_p 2$
IP	RT	Prime	4.35	2,40	= .020	.178
		Word	47.71	1,20	<.001	.705
HP	RT	Word	50.85	1,20	<.001	.718
	ACC	Word	4.73	1,20	= .042	.191
ND	RT	Prime	4.43	2,40	=.018	.181
		Word	35.65	1,20	<.001	.641
		WordxPrime	5.03	2,40	=.011	.201
	ACC	Prime	3.70	2,40	=.045	.156
IP+HP	RT	Prime	4.78	2,80	<.001	.107
		Group	4.19	1,40	= .047	.095
		Word	98.34	1,40	<.001	.711
	ACC	Group	19.94	1,40	<.001	.333
IP+HP+ND	RT	Prime	8.12	2,120	= .001	.119
		Group	20.71	2,60	<.001	.408
		Word	133.29	1,60	<.001	.690
		GroupxWord	3.33	2,60	=.043	.100
	ACC	Group	17.17	2,60	<.001	.364

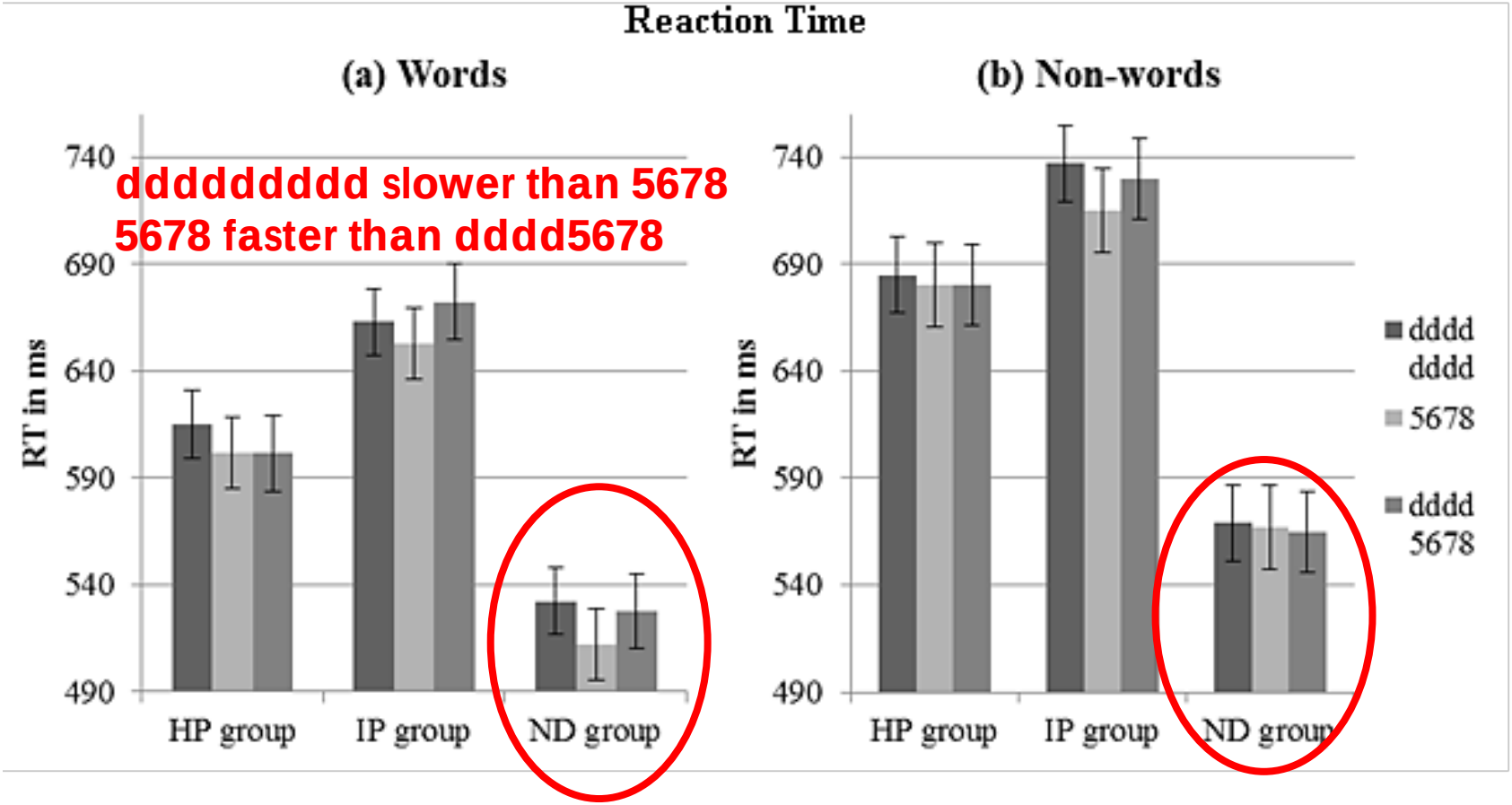
Found in IP and ND, not in HP

Pairwise comparisons

- Intermediate Proficiency
  - RT
    - ddddddddd slower than 5678
    - dddd5678 slower than 5678
- Native Dutch
  - RT
    - ddddddddd slower than 5678
  - ACC
    - ddddddddd less accurate than 5678

Interaction

Interaction WordxPrime for ND group



Main Effects **GROUP**

	RT/ACC	variable	F-statistic	df	p-value	$\eta_p 2$
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Pairwise Comparisons

RT:

- ND<HP
- ND<IP
- HP<IP

ACC:

- HP>IP
- ND>IP

Hypotheses

- 1: 5678 prime significant, dddd5678 prime not (for all groups)
- 2: 5678 prime significant, dddd5678 prime as well (for IP and HP groups)
- 3:
  - IP group: hypothesis 1
  - HP group: hypothesis 2
- 4: ND>HP>IP (faster & more accurate)

ACC: ND=HP

Discussion

- dddd5678 – 5678 difference not replicated across languages and across proficiency groups
- Accuracy- Speed trade-off. HP group knew their English skills were important.
- Further research needed.

Questions?