

Research questions

- Q1. Are individual differences in top-down lexical processing related to cognitive inhibition?
- Q2. Does the top-down effect occur at the stage of competitor inhibition or response bias?

Background

Top-down lexical effects in speech – Ganong effect, phoneme restoration, word frequency effects, etc.

- Individual differences in size of the effect are correlated across different tasks (Ishida, Samuel & Arai, 2016).
- Larger lexical effects in older adults (e.g. Matys & Scharenborg, 2014) may be related to inhibition-related functions that change with age (Sommers & Danielson, 1999)
- Individual differences within age-groups may also be related to inhibition (Colby, Coulton, Clayards, 2017).

Inhibition-related functions – the ability to suppress irrelevant information and responses and may have sub-components (Friedman & Miyake, 2004) :

- resistance to distractor interference (e.g. flanker task)
- prepotent response inhibition (e.g. go/no-go)

Methods

Participants

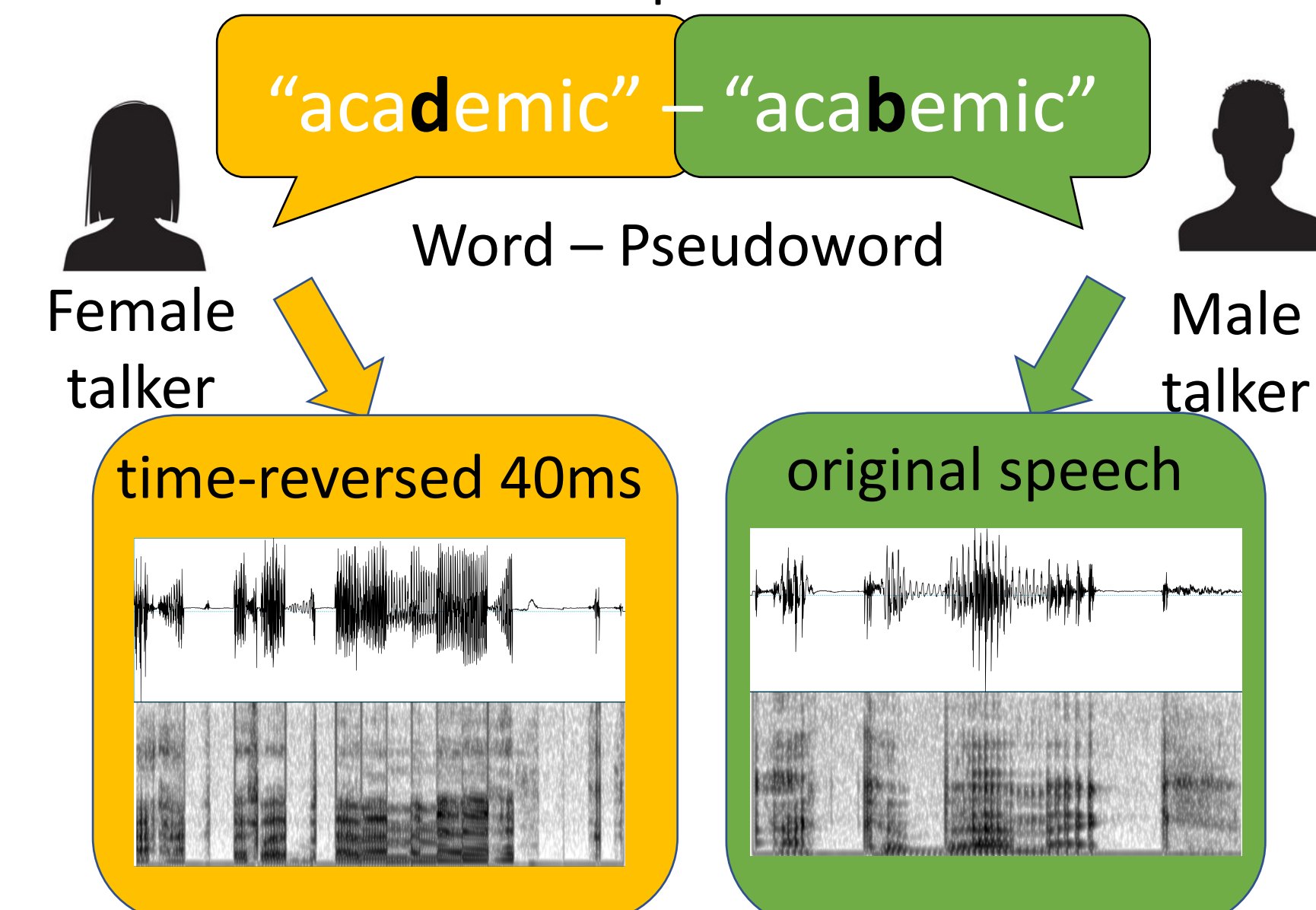
- 32 native English monolinguals
- ages 18-30, M = 21.8
- 2 lexical tasks, 2 cognitive tasks

Locally Time-Reversed Speech

(harder to detect changes in words)

“Did the two speakers say the same thing (i.e. were all of the vowels and consonant the same)”

72 stop-dominant word-pseudoword pairs
Example trial:



Analysis:
 $d' = p(\text{correct same}) - p(\text{incorrect same})$
 $\text{Diff} = d'(\text{original word}) - d'(\text{original pseudoword})$

Ganong Task

(bias to respond with words)

“Does the vowel in each sound file sound more like /ε/ as in bet or /i/ as in bit?”

10 continua
5 steps each
4 reps = 200 trials

Analysis:

$p(\text{/i/ responses})$ in /i/-word continua - /ε/ word continua

/ε/-word continua	/i/-word continua
depth-dipth	dish-desh
hen-hin	hitch-hetch
less-liss	kit-ket
vest-vist	lip-lep
wed-wid	stitch-stetch

Flanker Task

(Resistance to Distractor)

Erikson Flanker Task in PEBL

Incongruent trial



Congruent trial



Key Response



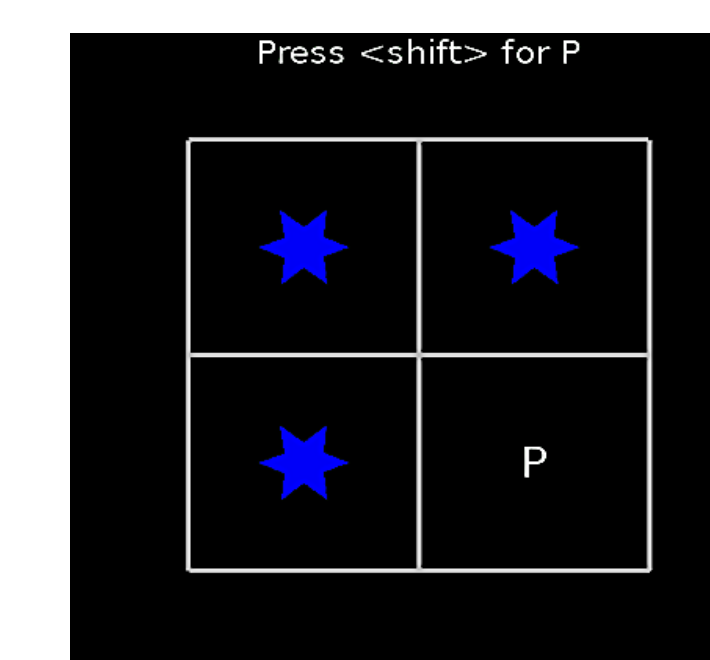
Analysis:

- $\text{Diff} = (\text{RT Incongruent}) - (\text{RT Congruent})$
- $\text{RT} = \text{Median log(RT) for correct trials}$

Go/No-go Task

(Prepotent Response Inhibition)

After Bezdijan, Baker, Lozano, and Raine (2009) in PEBL



80% go
20% no-go

Block 1
 $P = \text{go}, R = \text{no-go}$
Block 2
 $P = \text{no-go}, R = \text{go}$

Analysis:

- $d' = p(\text{respond on go}) - p(\text{respond on no-go})$
- $\text{RT} = \text{Median log(RT) for correct trials}$

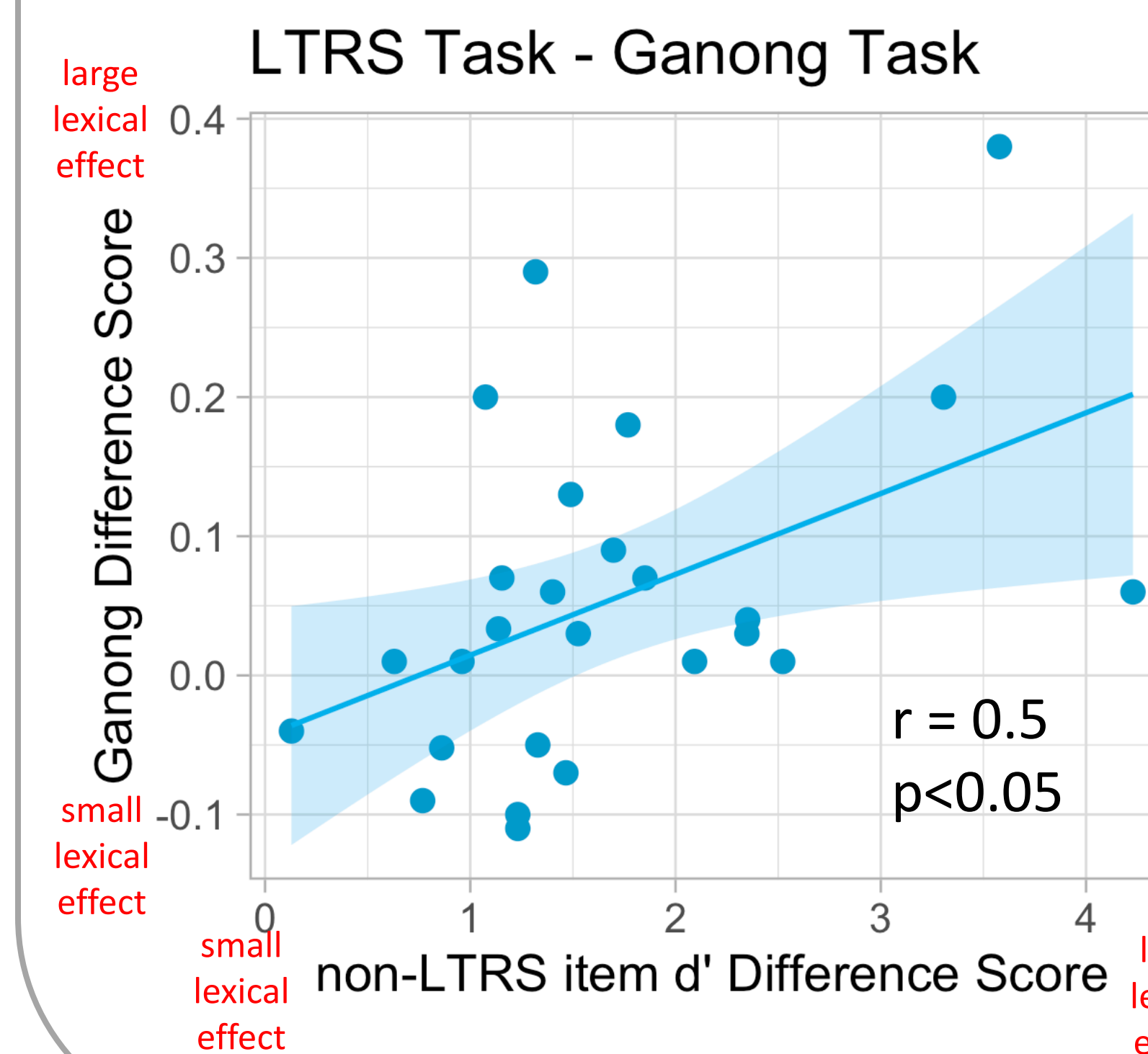
Correlations of Tasks

Flanker RT	0.3	0.3	0.2	0.2	0.1
Flanker Diff	0	0	0	0.4	
Go/No-go RT	-0.1	-0.1	0.3		
Go/No-go d'	0.2	-0.1			
LTRS	0.5				

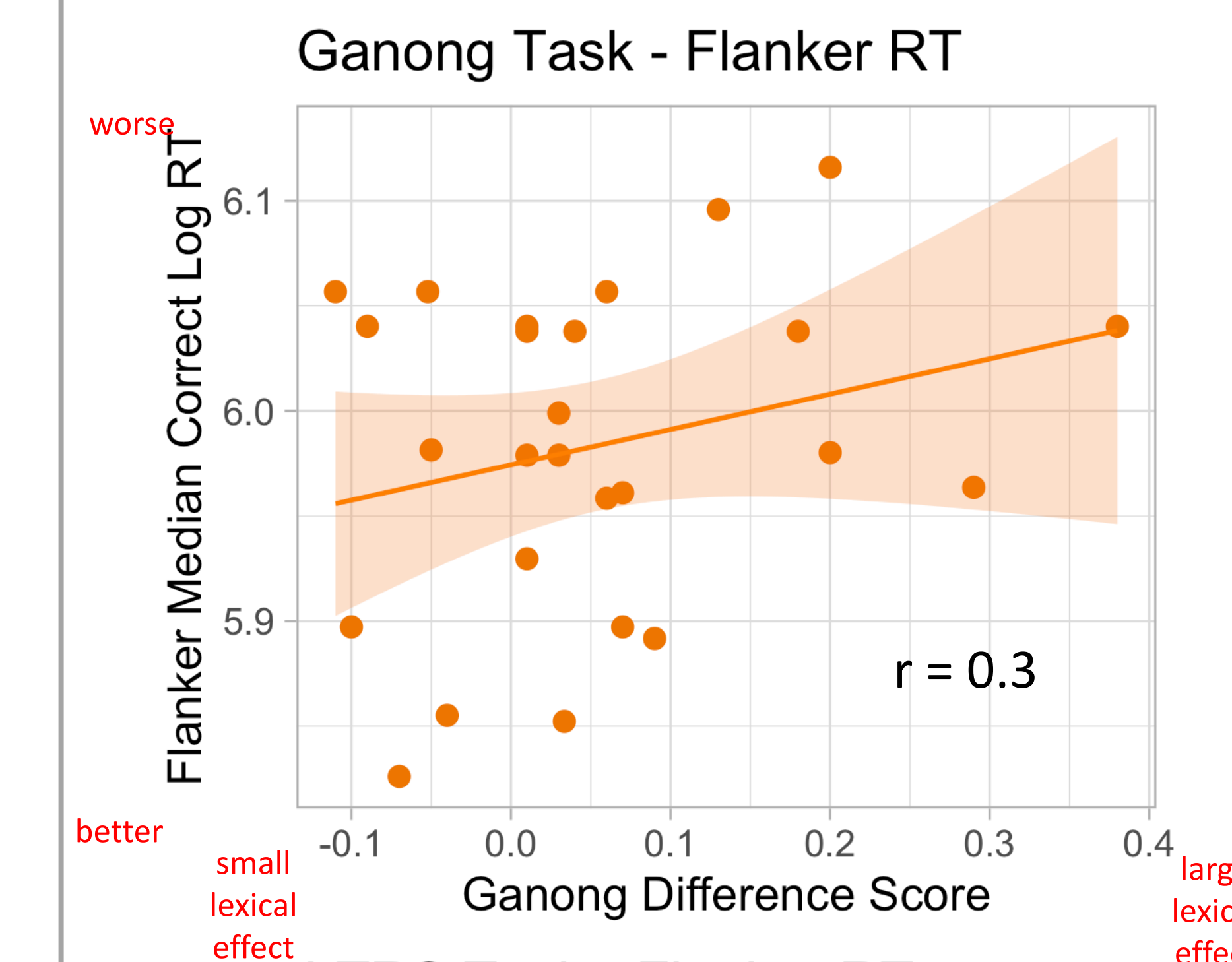
Corr
1.0
0.5
0.0
-0.5
-1.0
R = 0.35 is
p = 0.049

Results

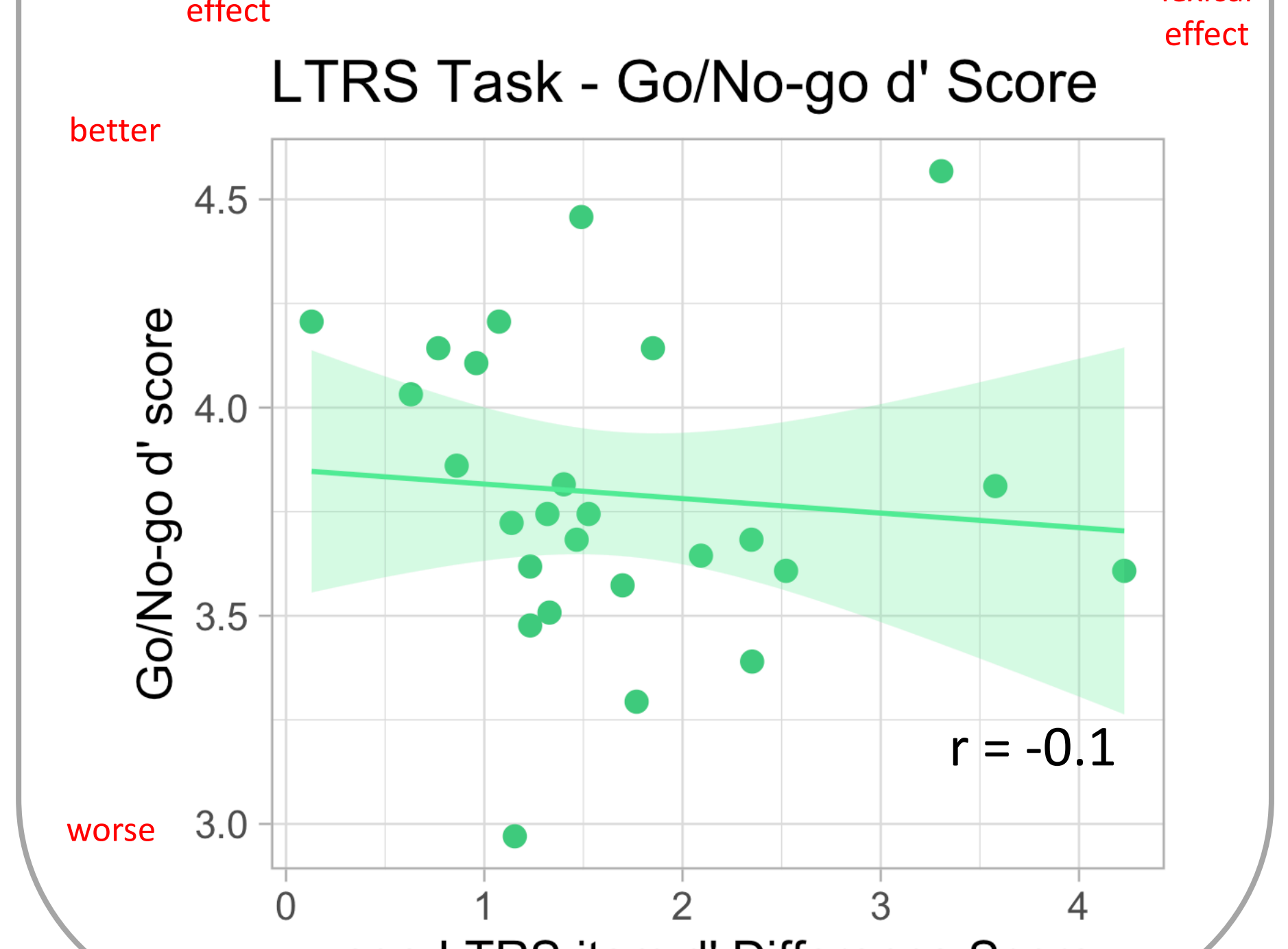
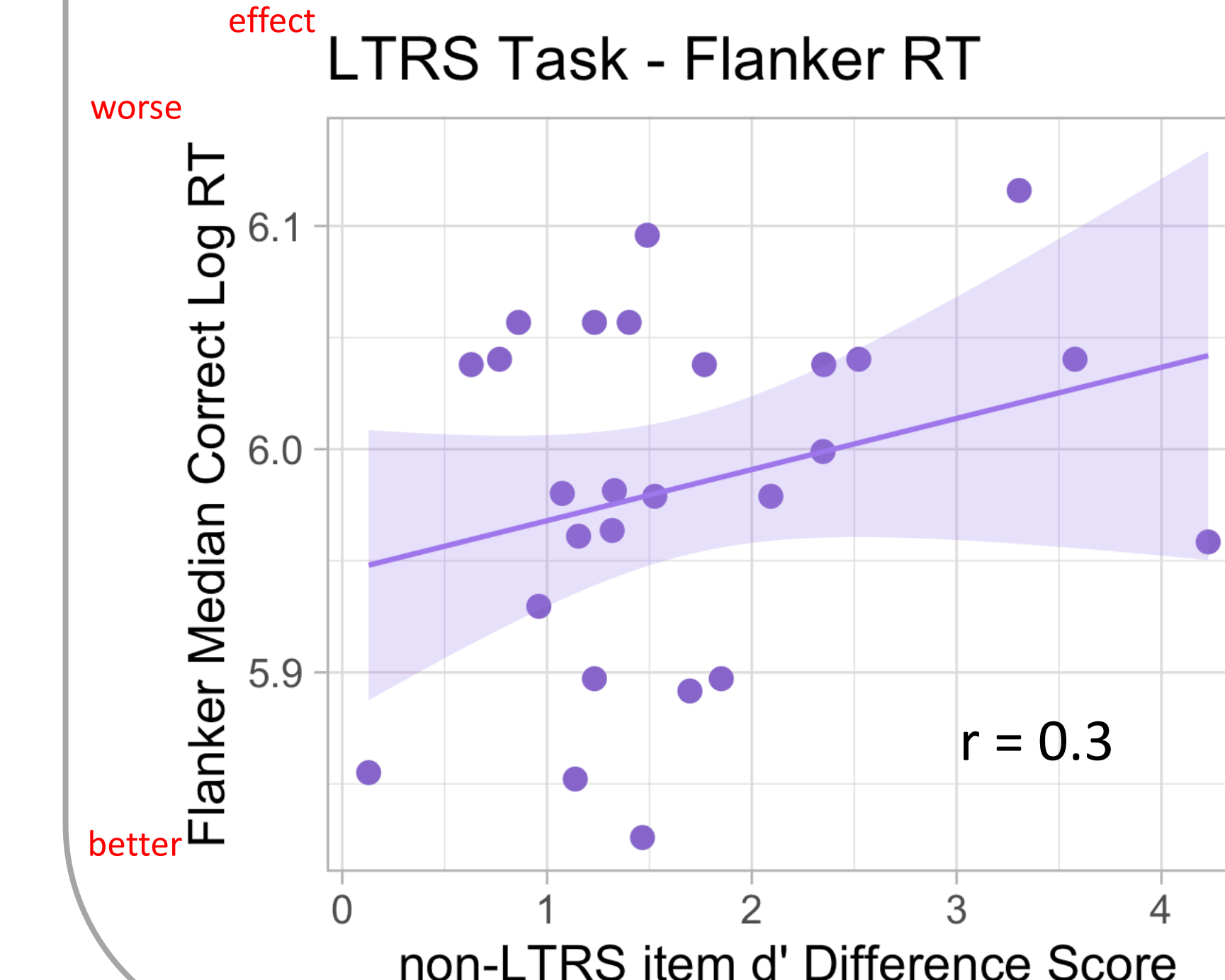
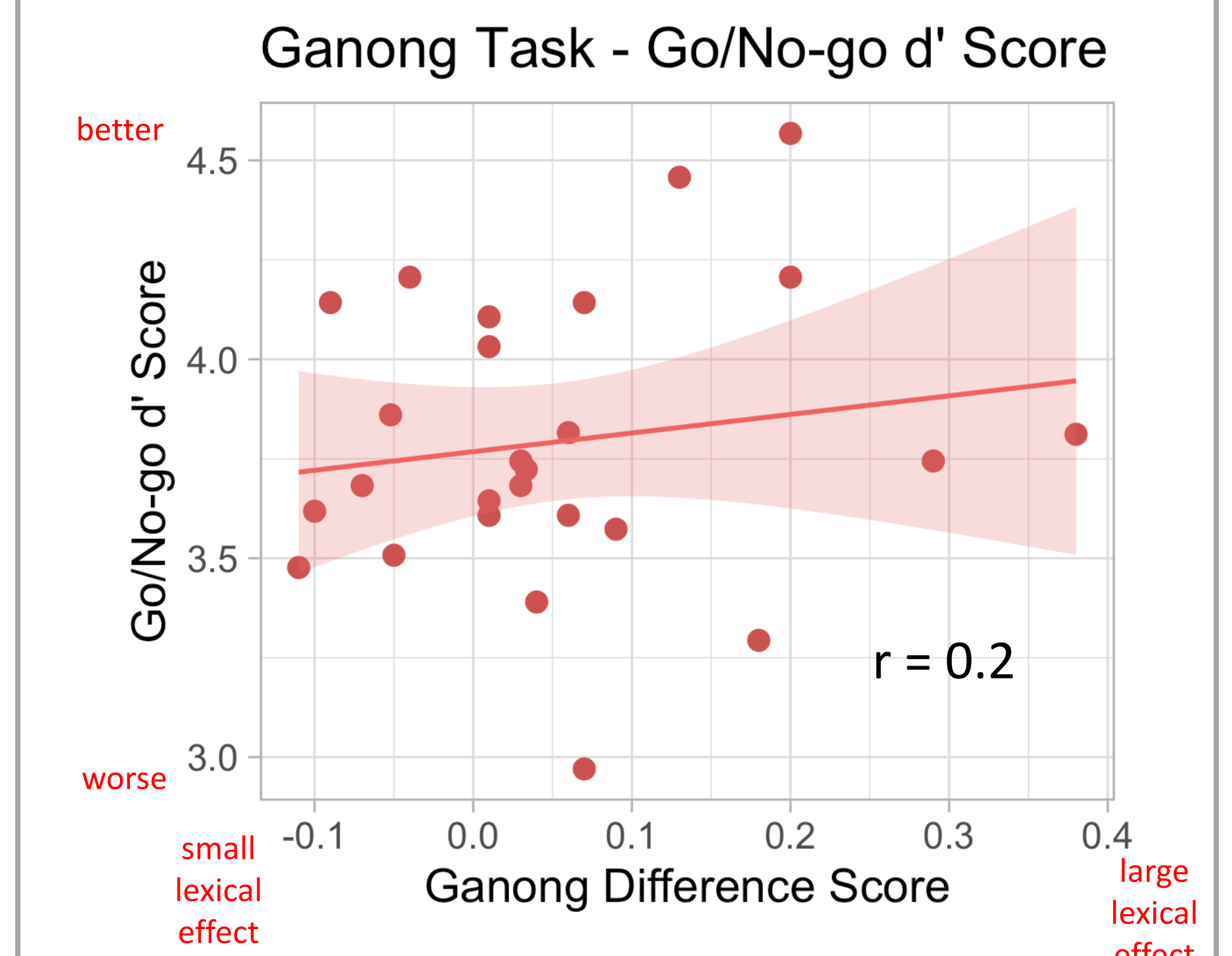
Performance on lexical tasks is correlated



Poorer distractor interference mean stronger lexical effects



Poorer response inhibition means stronger lexical effects



Mixed effects models for each lexical task

- Lexical tasks are good predictors of each other
- Flanker RT and Go/No-go d' predict LTRS task performance (slower RT in flanker, $\beta = 0.10$, $p < 0.001$; smaller go/no-go d', $\beta = 0.16$, $p < 0.001$). , Go/No-go RT too correlated with others to be included
- No significant cognitive predictors for Ganong task

Conclusion

Size of the lexical effect reflects stable perceptual style
Q1: Stronger lexical bias may be due to weaker cognitive inhibition

Q2: Some evidence for an effect at the stage of competitor inhibition but inconclusive