The relation between individual differences in speech-gesture behavior of 4-year-olds across three different experimental tasks

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ECOGest

Introduction

Spoken language and co-speech iconic gestures refer to the same cognitive representation [1]. They are systematically organized in relation to one another, but do not necessarily express identical aspects [2]. Rather, iconic gestures can complement speech highlighting different aspects of the referent [1]. Holler and Beatie [3] argue, however, that speech and gesture are more flexibly integrated, depending on the communicative intention of the speaker and they hypothesize that **semantic features (SF) in gesture and speech vary according to communicative demands.**

In addition, internal factors like age, cognitive skills, etc. can influence speech-gesture behavior. Given that the speech system of a 4-year old is still under development, **do differences in cognitive skills result in a different speech-gesture behavior?**
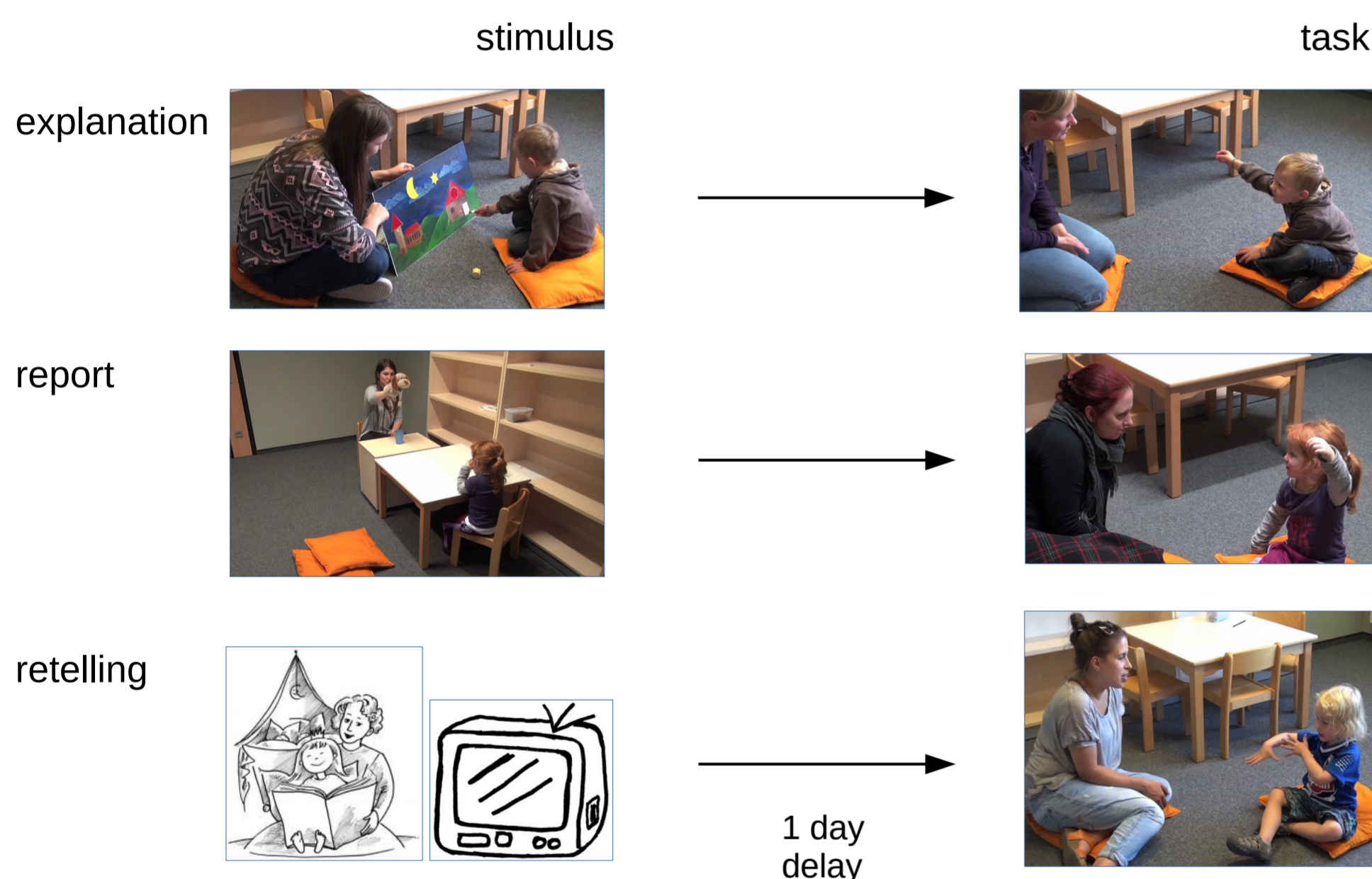
Here, we address the following questions:
- **How are semantic features distributed in children's speech and gesture?**
- **How does the distribution vary with different situational demands?**
- **How are children's cognitive skills related to the use of semantic features in speech and gesture?**
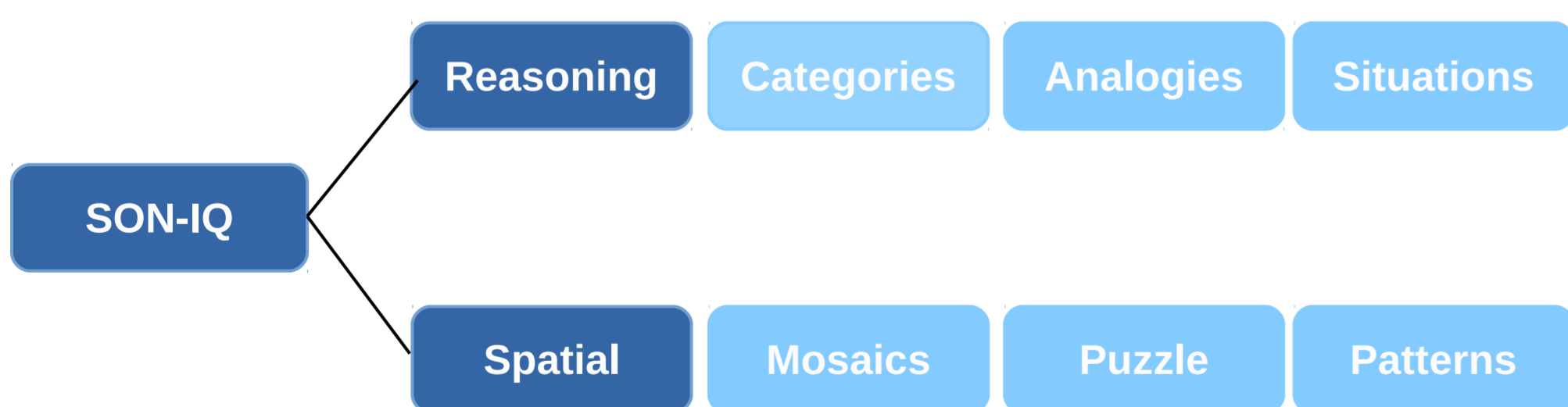
Procedure

German preschool children (n=40) at the age of 4 participated in our study. During the first session children completed three different communicative tasks. At the second session they completed the non-verbal Intelligence Test SON-R 2.5-7 (SON-IQ).
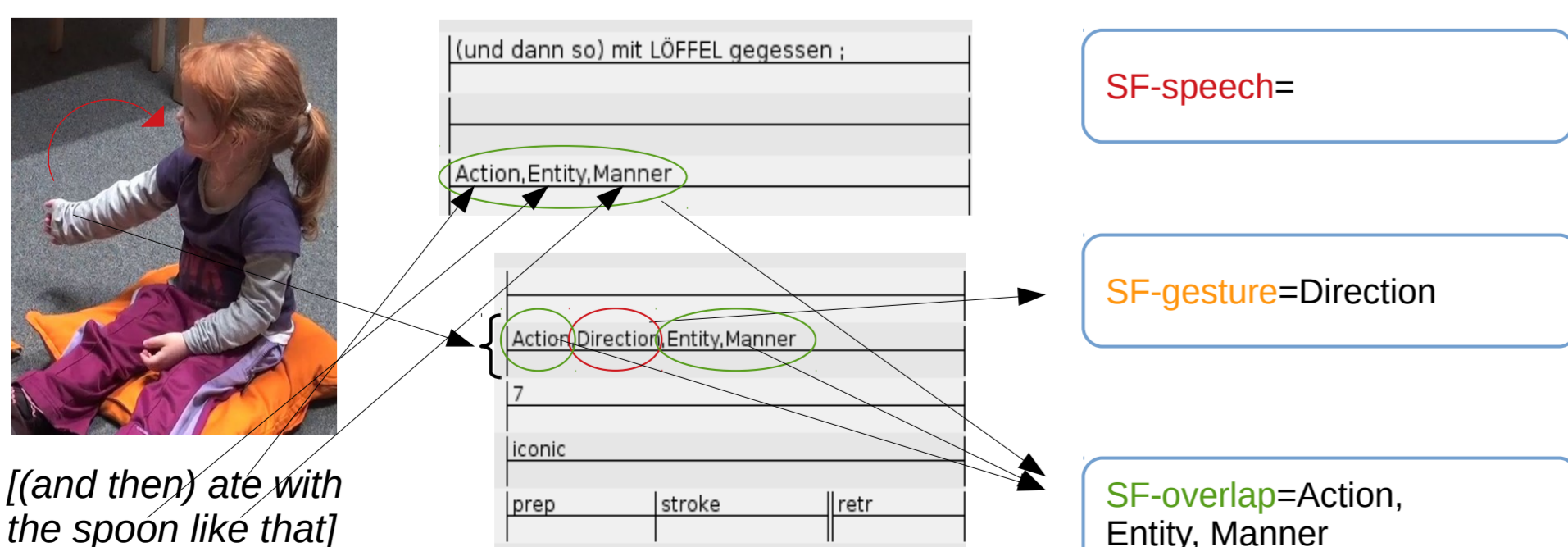
Communicative Tasks

stimulus   task

explanation

report

retelling

1 day delay

Intelligence Test

| Reasoning | Categories | Analogies | Situations |

SON-IQ

| Spatial | Mosaics | Puzzle | Patterns |

Coding

(und dann so) mit LÖFFEL gegessen ;

Action,Entity,Manner

SF-speech=

Action,Direction Entity,Manner

7

iconic

prep | stroke | retr

[(and then) ate with the spoon like that]

SF-gesture=Direction

SF-overlap=Action, Entity, Manner

Semantic features

Approach: assessing semantic features [4] in speech, gesture and overlap per utterance, per child and task (report, retelling and explanation).

|	
Entity:	refers to objects
Action:	any kind of action
Manner:	the manner of an action
Direction:	directions
Shape:	object forms
Property:	properties of objects
Amount:	numerals, > 2 objects
Relative Position:	spatial relation between >1 objects

Results

| task	# SF-speech	# SF-gesture	# SF-overlap
RETELLING	$M = 0.86, SD = 0.13$	$M = 0.05, SD = 0.05$	$M = 0.07, SD = 0.12$
REPORT	$M = 0.39, SD = 0.22$	$M = 0.26, SD = 0.15$	$M = 0.26, SD = 0.15$
EXPLANATION	$M = 0.84, SD = 0.12$	$M = 0.08, SD = 0.07$	$M = 0.09, SD = 0.08$

Strategies

report: significantly differs from other tasks with respect to all strategies (Wilcoxon test: p<0.001)

no differences between retelling and explanation
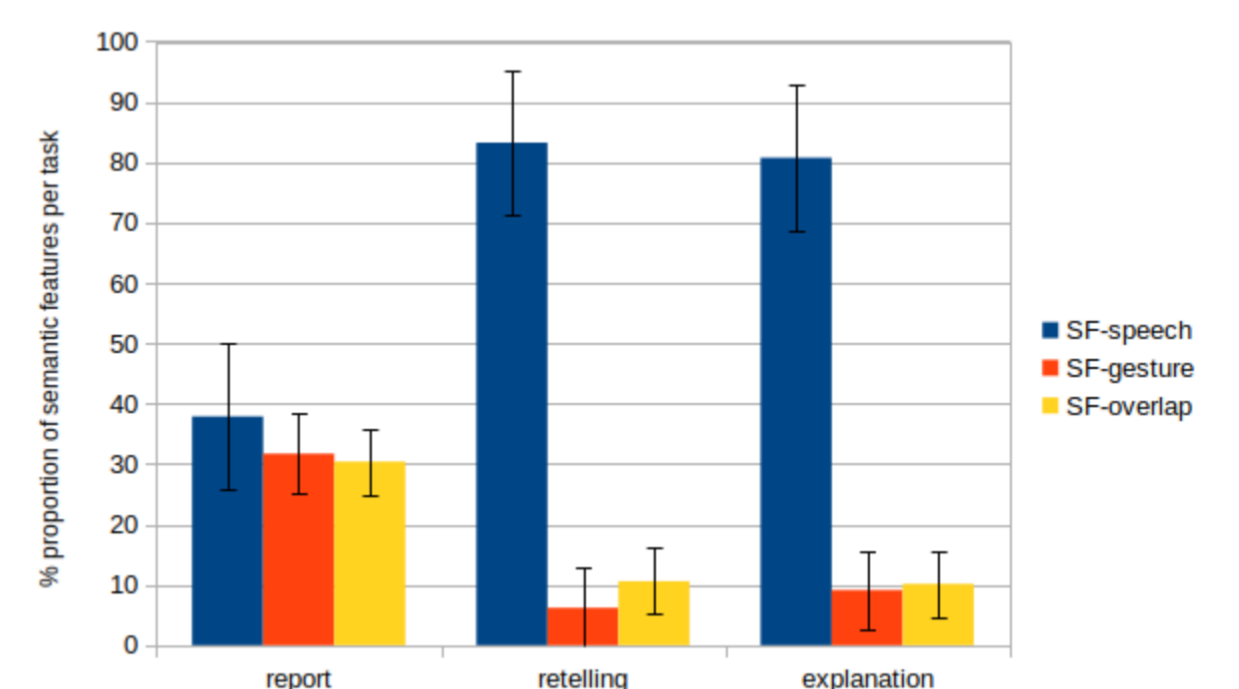
Cognitive Skills

task/strategy		SON-IQ	SON-RS	SON-PS
retelling	SF-sp	$p = 0.367, SE = 10.74$	$p = 0.964, SE = 12.11$	$p = 0.248, SE = 13.73$
	SF-ge	$p = 0.798, SE = 28.35$	$p = 0.782, SE = 31.49$	$p = 0.587, SE = 36.44$
	SF-ov	$p = 0.308, SE = 25.723$	$p = 0.589, SE = 28.97$	$p = 0.353, SE = 33.31$
report	SF-sp	$p = 0.118, SE = 6.79$	$p = 0.782, SE = 7.88$	**p=0.0551, SE=8.575**
	SF-ge	**p=0.0217, SE=10.08**	**p=0.037, SE=11.39**	$p = 0.183, SE = 13.87$
	SF-ov	$p = 0.209, SE = 11.28$	$p = 0.834, SE = 12.89$	$p = 0.13, SE = 14.38$
explanation	SF-sp	**p=0.0561, SE=11.10**	$p = 0.284, SE = 12.91$	$p = 0.0906, SE = 14.54$
	SF-ge	$p = 0.12, SE = 21.71$	$p = 0.261, SE = 24.63$	$p = 0.222, SE = 28.49$
	SF-ov	**p=0.06, SE=19.25**	$p = 0.404, SE = 22.52$	**p=0.0697, SE=24.96**
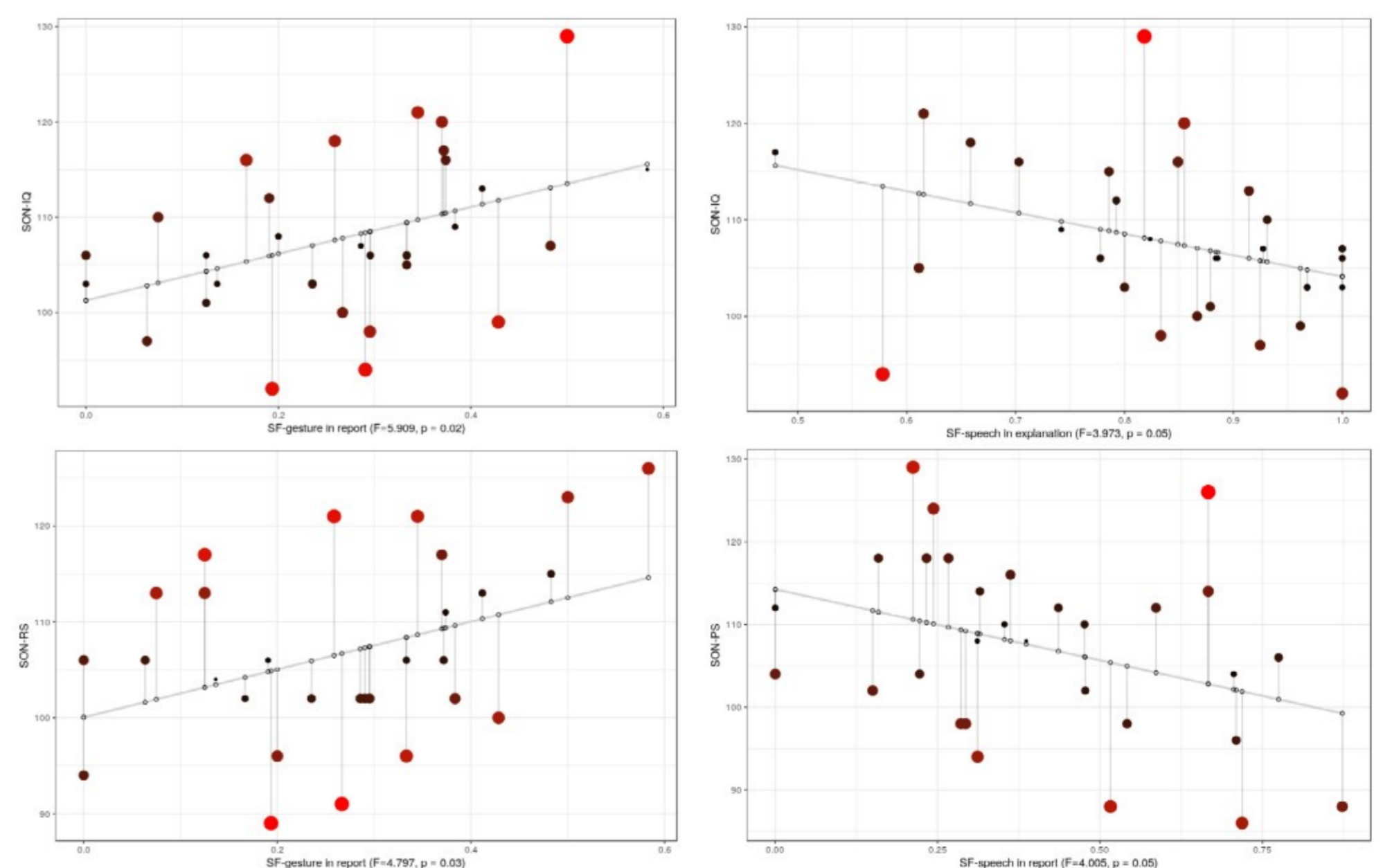
References

[1] McNeill, David (1992). Hand and Mind: What Gestures reveal about thought. University of Chicago Press, [2] McNeill and Duncan, "Growth points in thinking for speaking," in Language and gesture, D. McNeill, Ed. Cambridge, UK: Cambridge University Press, 2000, pp. 141–161, [3] Holler, Judith & Beattie, Geoffrey. (2003). How iconic gestures and speech interact in the representation of meaning: Are both aspects really integral to the process?. Semiotica. 146. 81-116, [4] Bergmann, Kirsten & Kopp, Stefan. (2006). Verbal or visual? How information is distributed across speech and gesture in spatial dialog.