

Referential vs. conceptual meaning in psychosis

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Outline

1. Conceptual and referential meaning.
2. A study of referential meaning.
3. From referential to conceptual meaning.
4. Semantic similarity measures in Chilean-Spanish.
5. Relation between referentiality and lexical-conceptual meaning.
6. Semantic similarity measures in a larger German dataset.

Conceptual and referential meaning

Two distinct components in the meaning of any utterance:

- ❖ Lexical-conceptual meaning: used for describing entities. Relies on our semantic knowledge (e.g., *CAT*).
- ❖ Referential meaning: how conceptual meaning is related to entities in the real world. Depends on grammar and the distinctions it mediates, e.g. specificity (*A cat, that cat, the cat*), or co-reference (*her, it*), or both (*her cat*).

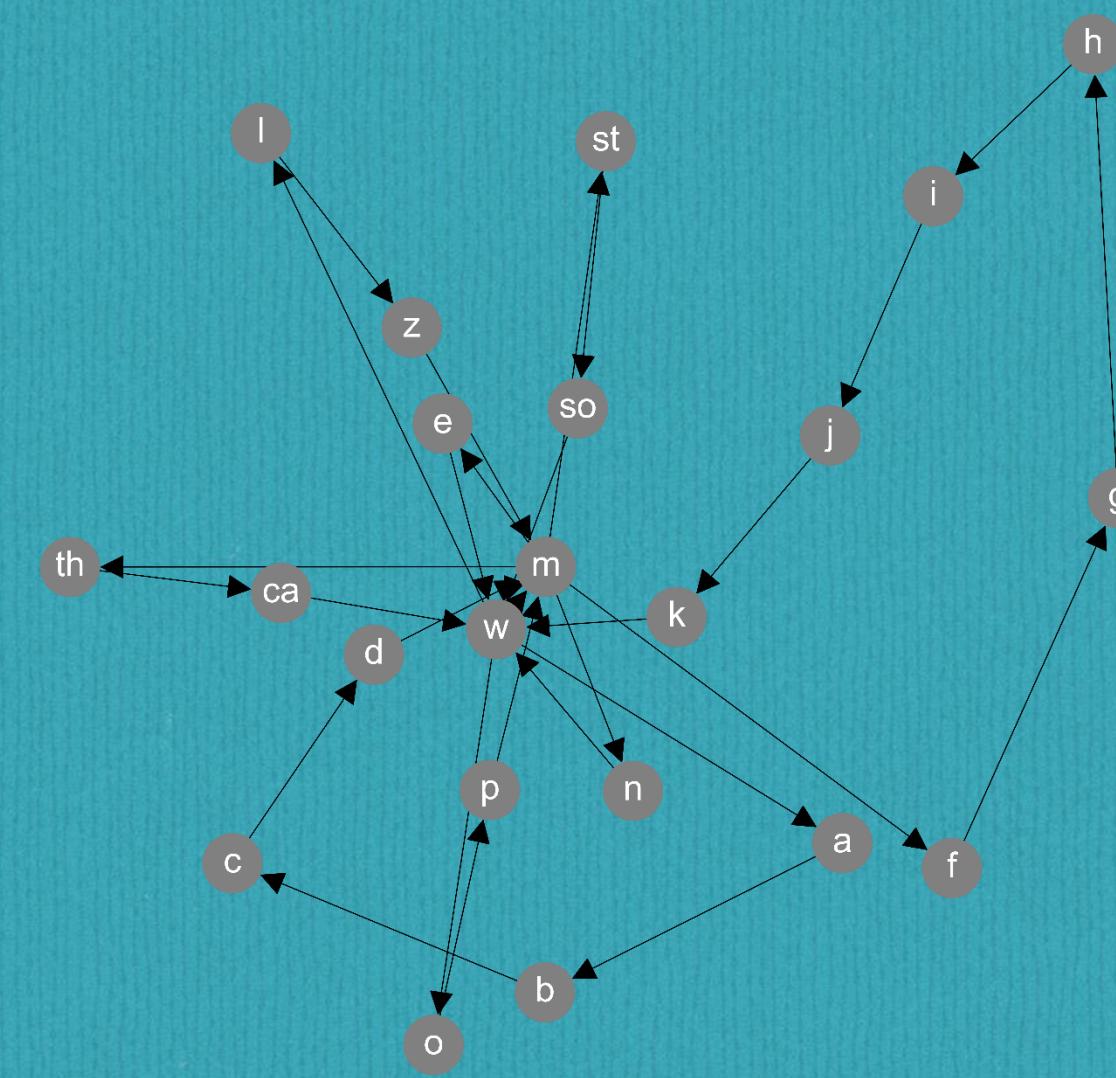
How could these two components be related in psychotic discourse? (if they are)

Referential meaning

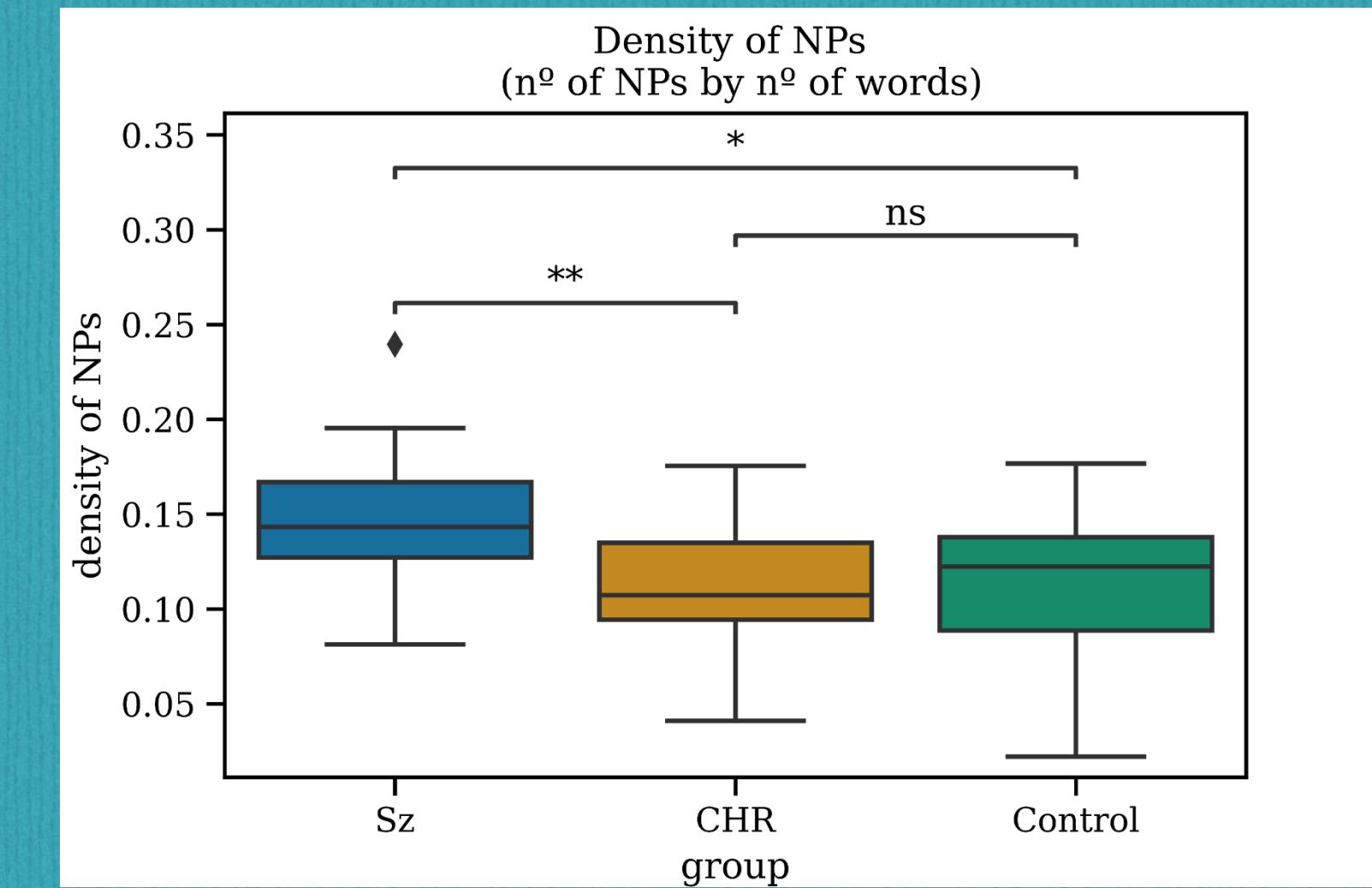
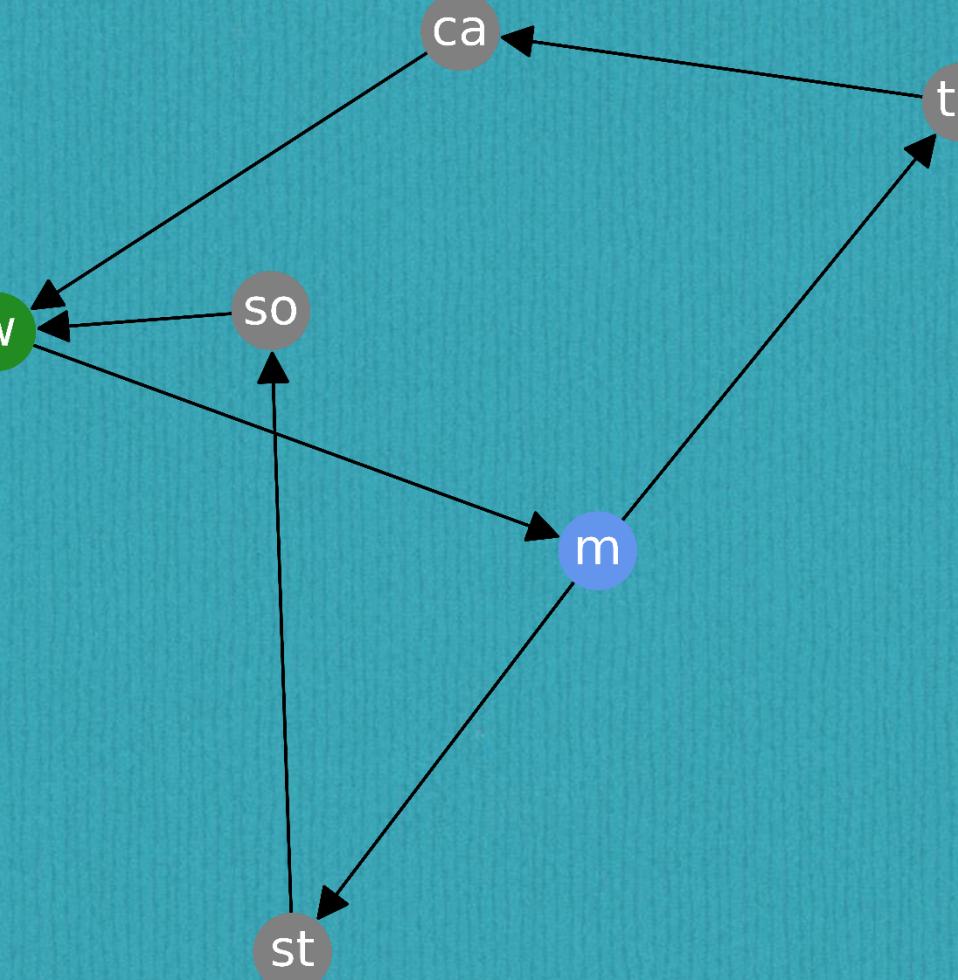
- Referential meaning has long been found to specifically deteriorate in individuals with Sz, with unclear reference making discourse difficult to follow (Rochester and Martin, 1979; Docherty et al. 1996).
- Anomalies of pronominal reference are prominent (McKenna and Oh, 2005; Watson et al., 2012).

A study of referential meaning

A



B



- *Control over reference in speakers with SZ.*
- 60 Chilean Spanish speakers (20 Controls, 20 CHR, 20 SZ).
- Clinical interviews with 909.2 words on average.

LANGUAGE AND PSYCHOSIS SUPPLEMENT

Coreference Delays in Psychotic Discourse: Widening the Temporal Window

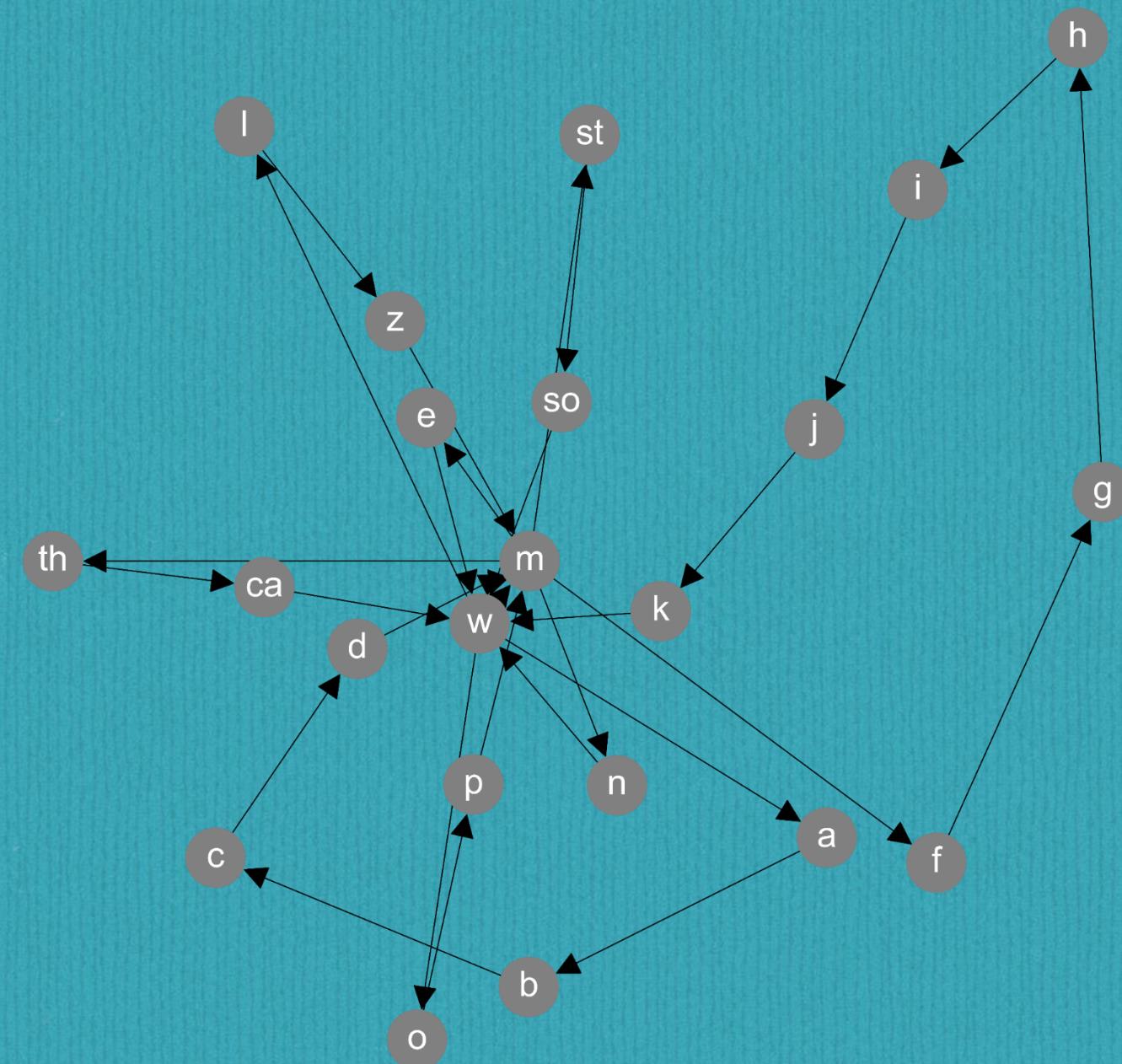
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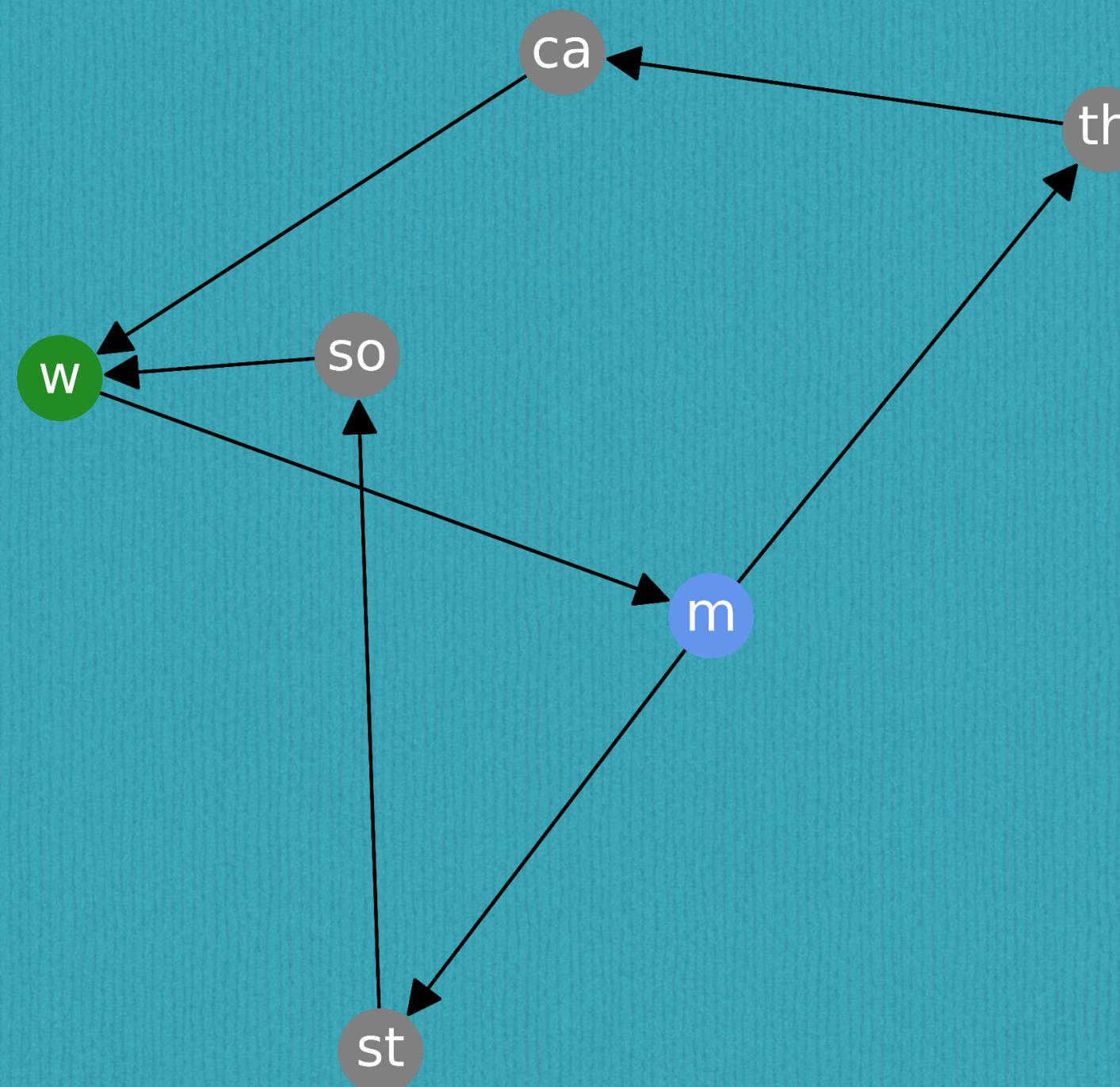
A study of referential meaning

A



There was [a man] on [the street] waiting for [someone].
Later, [a woman] met [him]. Although [they] went to [a cafe],
[she] seemed to be busy.

B

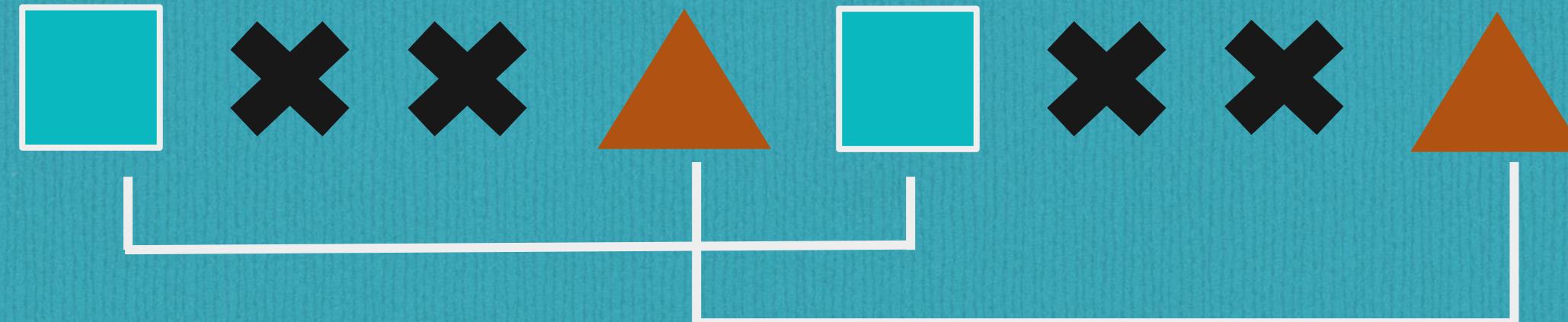


Recurrent entities: in color

Non-recurrent entities: in gray

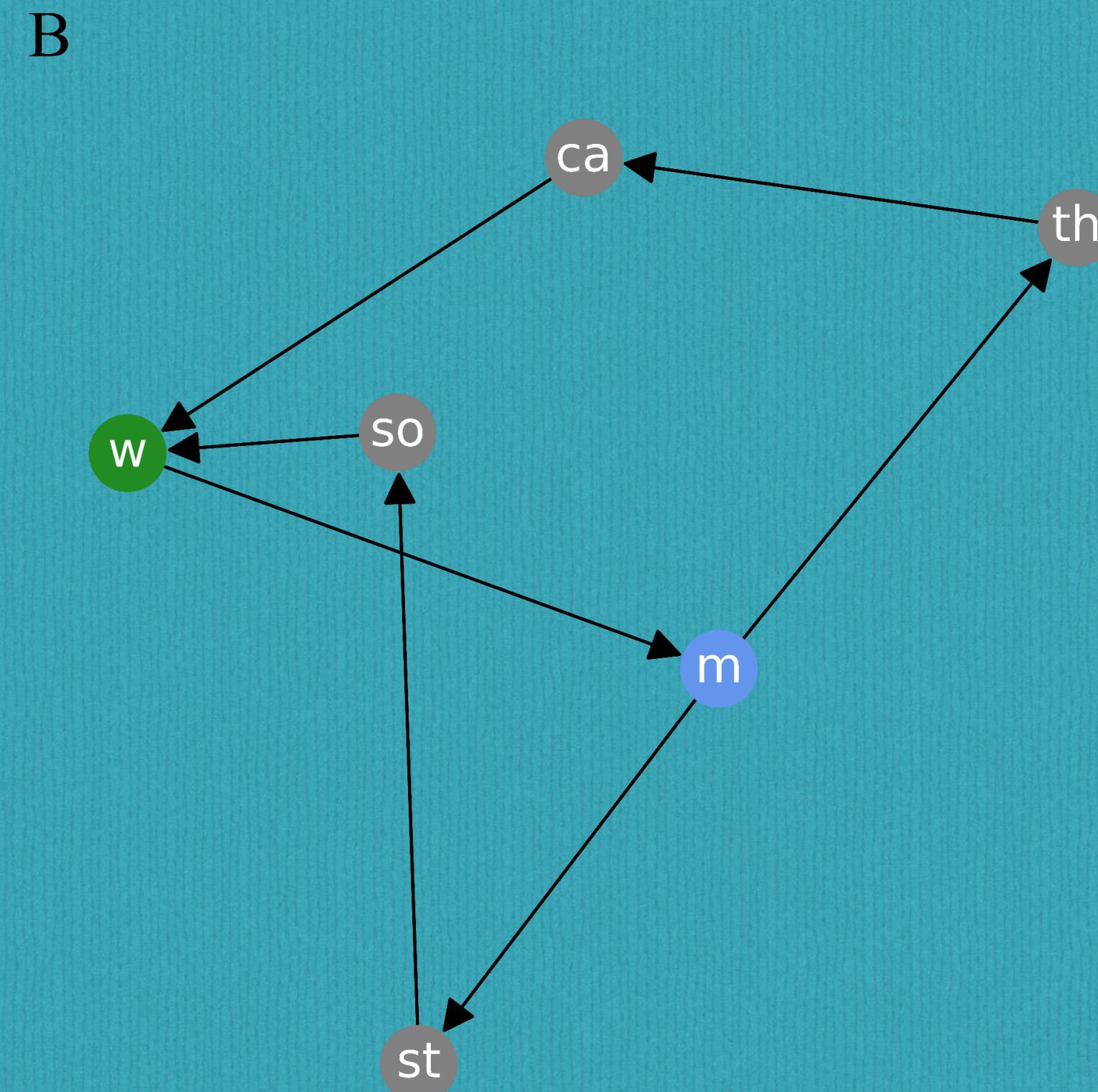
A study of referential meaning

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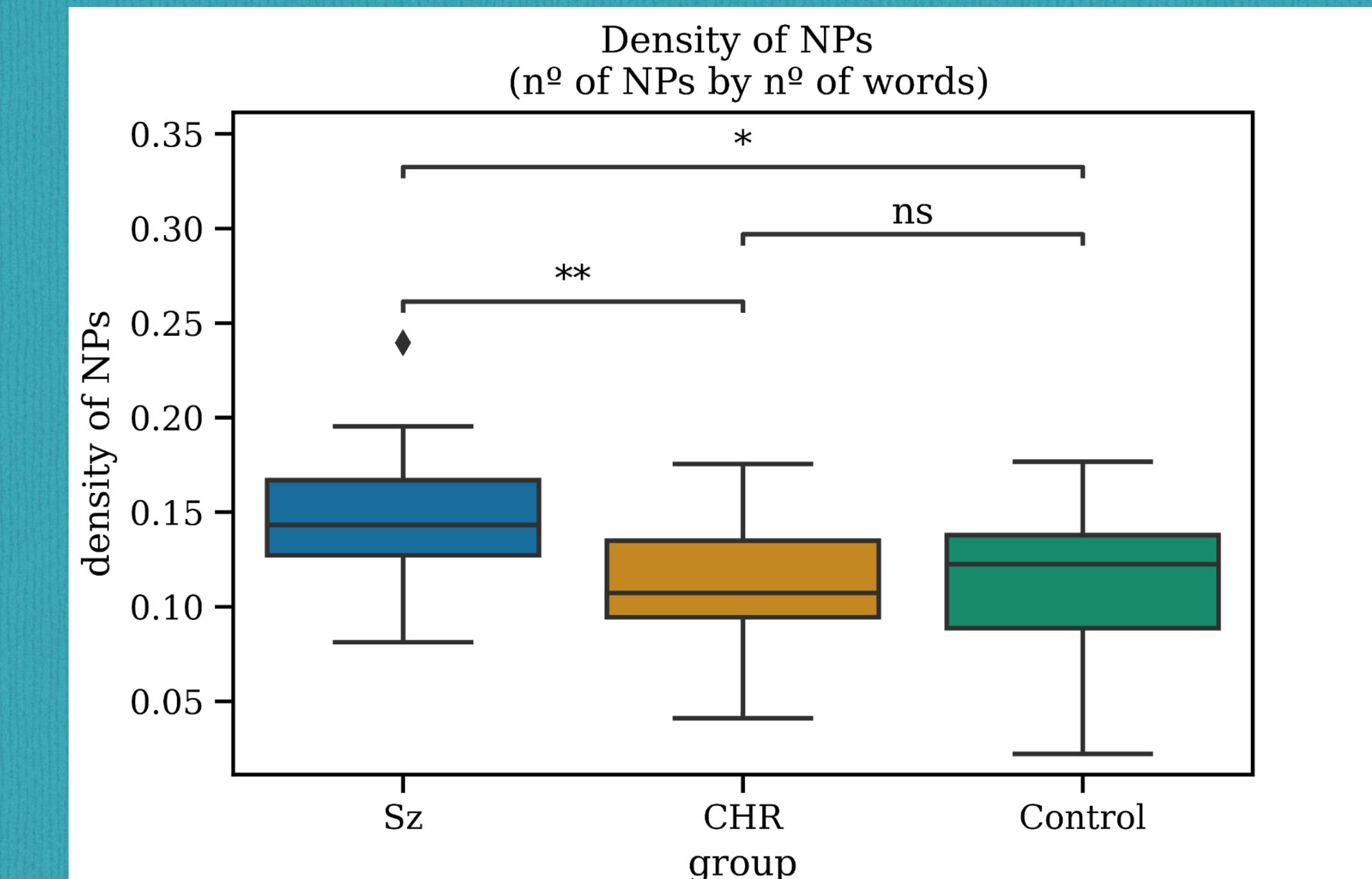
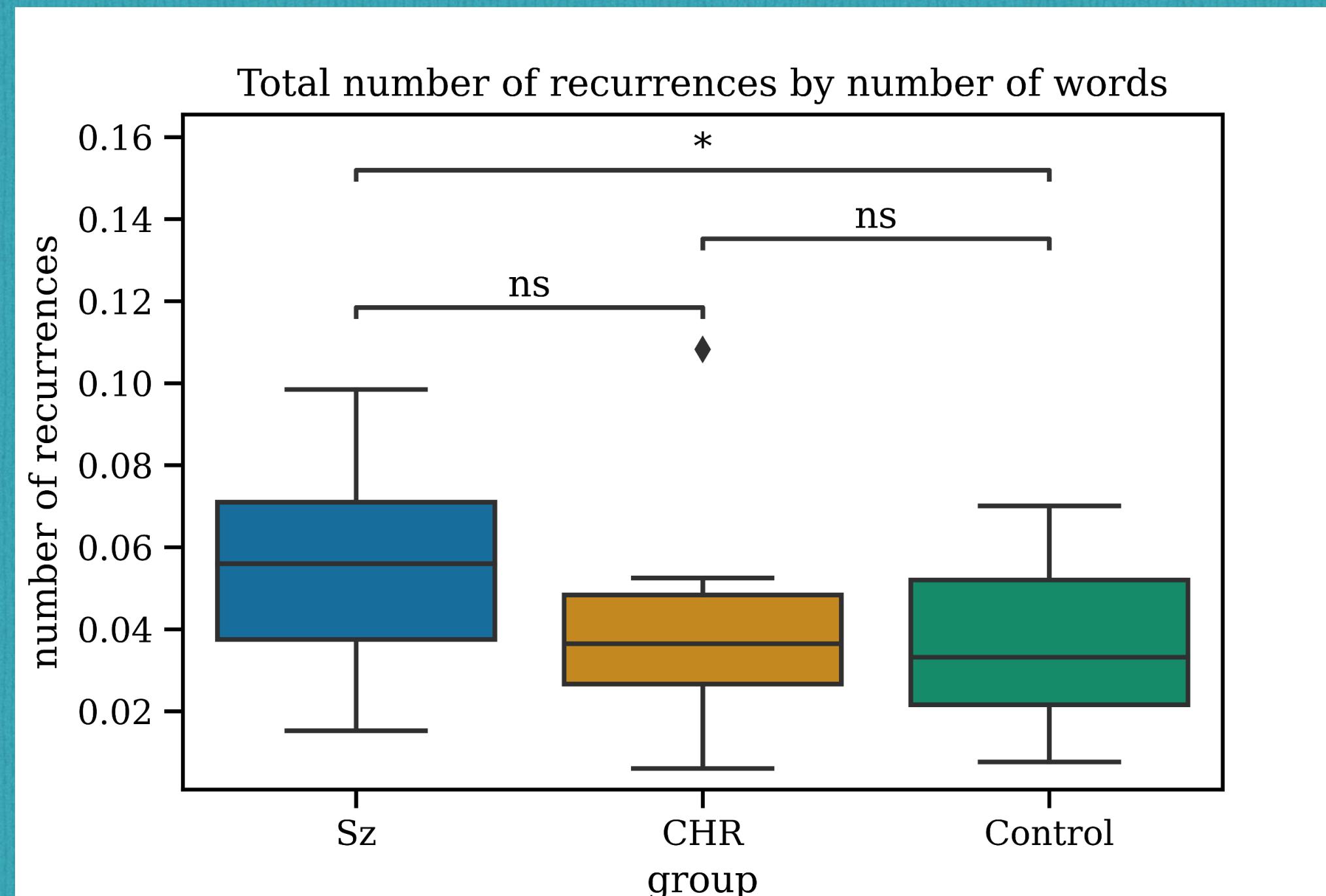


Topological distance:

number of nodes (NPs) between a recurrent entity and itself.



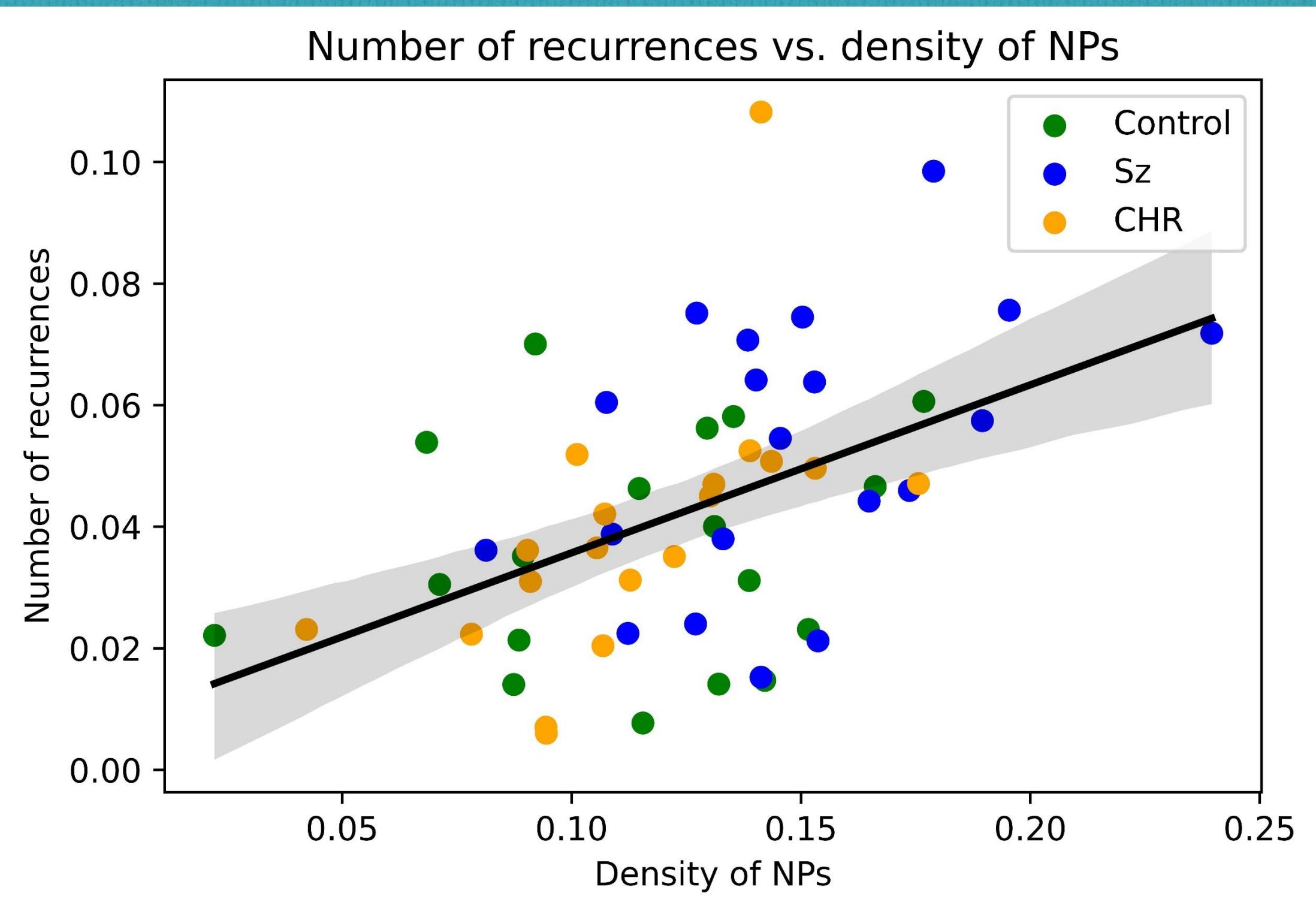
Number of recurrences and NPs



Total number of recurrences: sum of the degree of the nodes that represent the recurrent entities.

Significant correlation between density of NPs and number of recurrences: 0.48

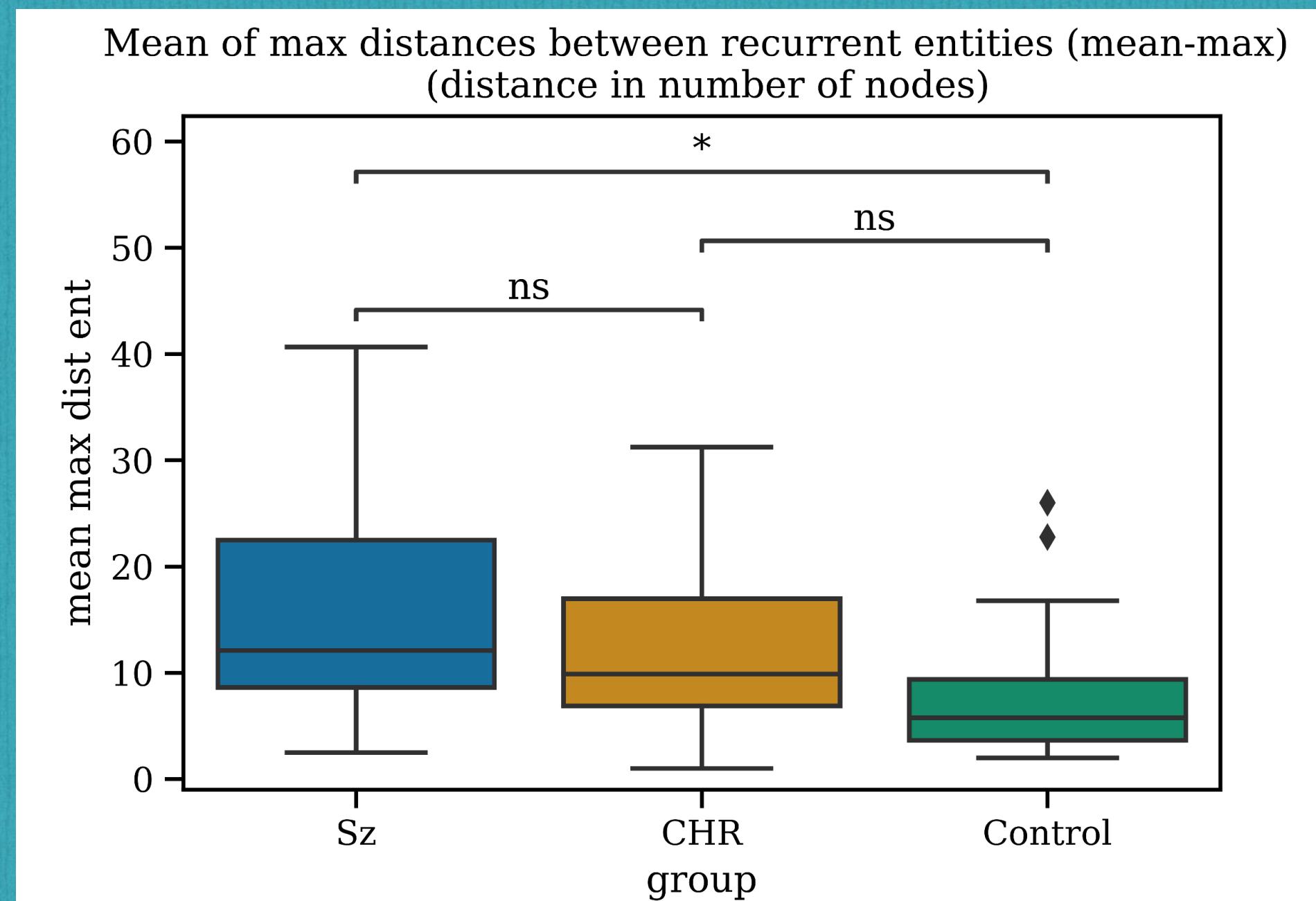
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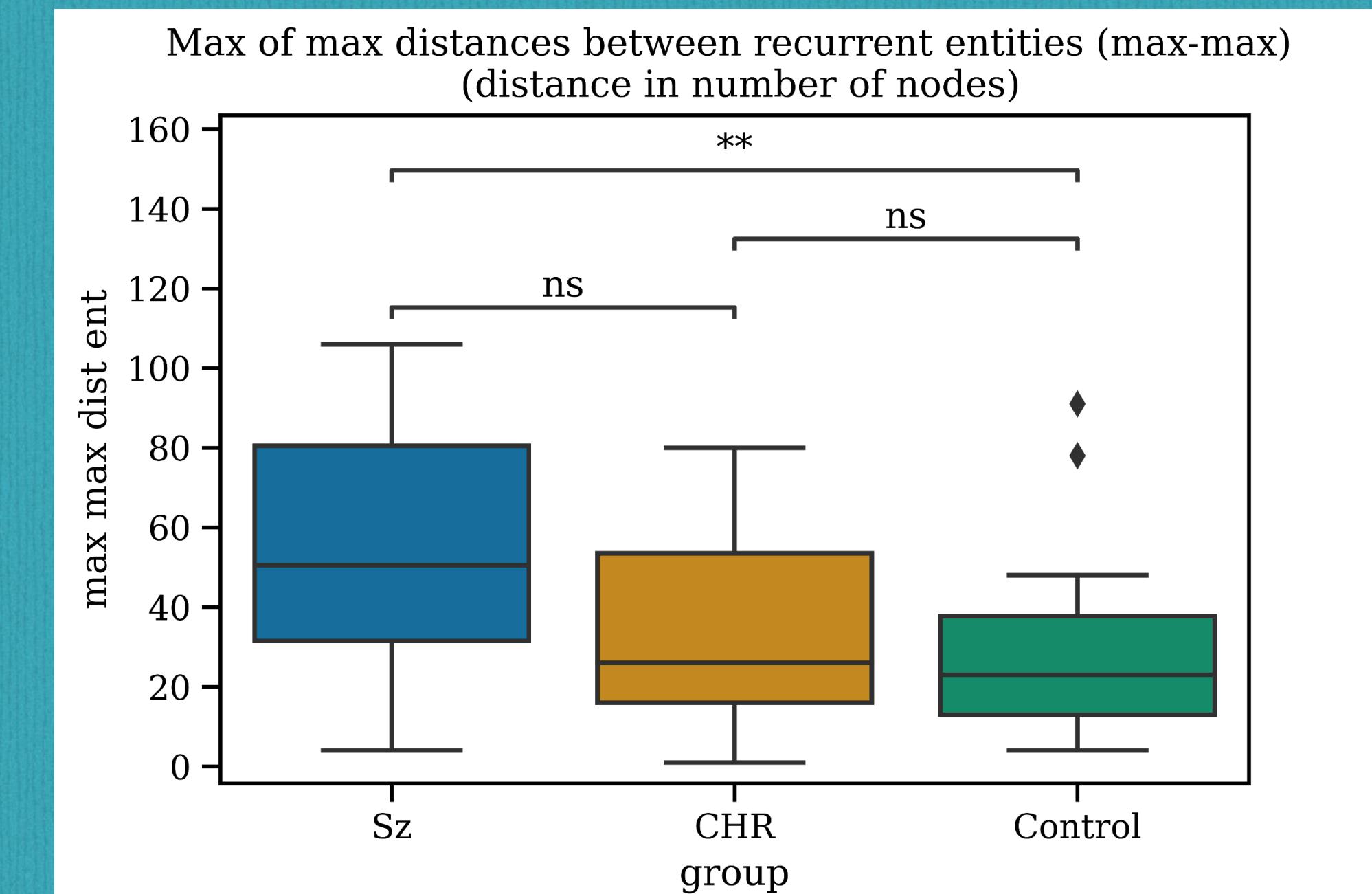
Significant correlation between density of NPs and number of recurrences: 0.43

Topological distance



* : p-value < 0.05

** : p-value < 0.01



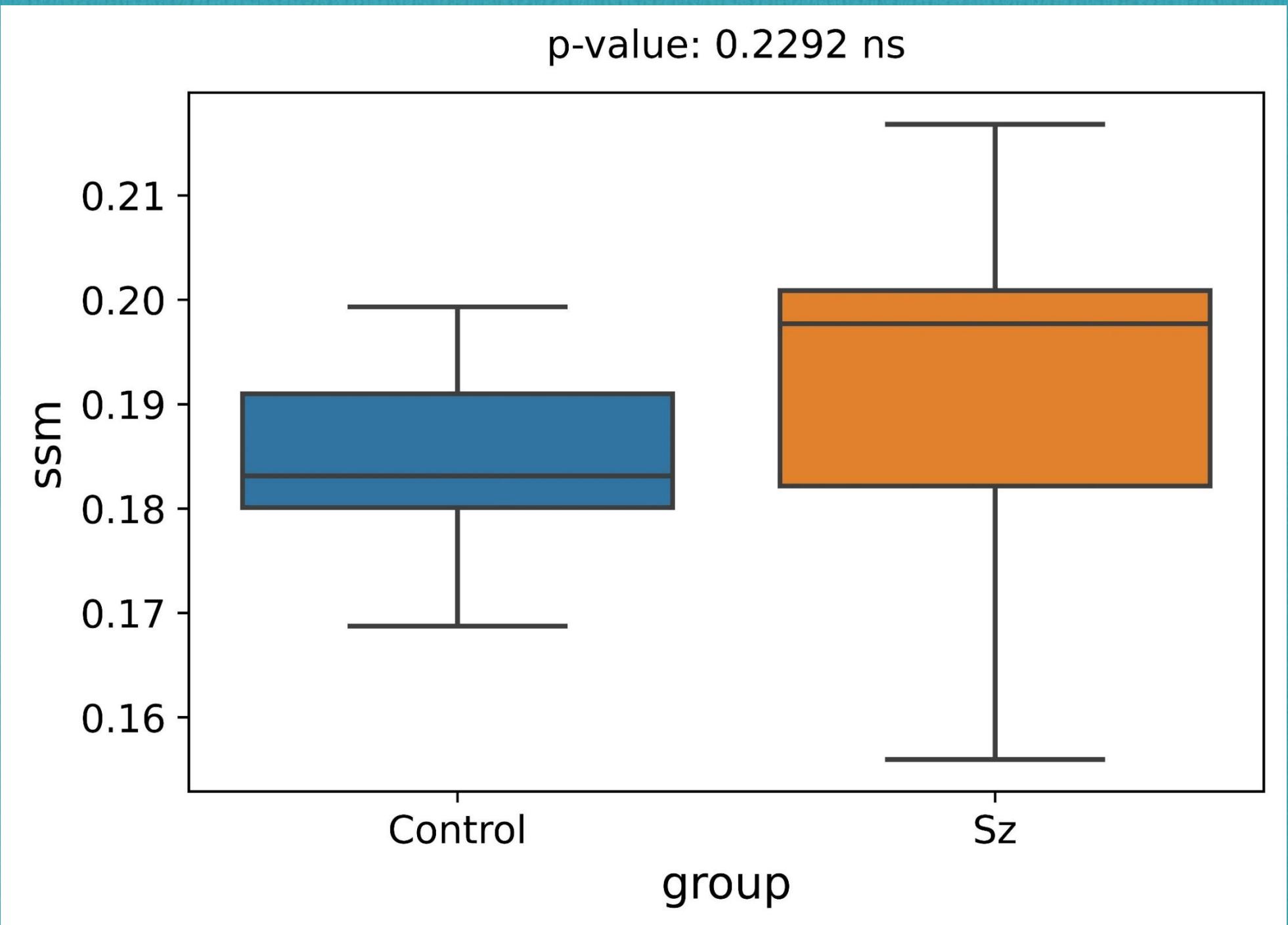
Interim summary

- SZ produce more NPs (SZ>CHR; SZ>CON).
 - Mainly because there are ***more recurrences in total*** in SZ.
 - Correlation between total number of recurrences and density of NPs.
- This leads to the (topological) distance between a recurrent entity and its coreference being larger.
- This also means that the various recurrent entities interfere with each other, creating entanglement between referential threads.

Relation between referentiality and conceptual meaning

- Is there a relationship between these two concepts? Should there be a relationship between both kind of meanings?
- Increase in semantic similarity in First Episode of Psychosis (Alonso-Sánchez et al., 2022).
- Following Bleuler's conceptualization of "loosening of associations" (1908) in schizophrenia, many studies have explored NLP tools such as semantic similarity, with the prediction of a decrease of semantic similarity.
- But loosening of associations could predict the opposite: Increase in semantic similarity reflecting greater associativity between concepts, or a 'shrinking' semantic space.
- This would be consistent with data from Zhang (to appear) in Chinese, indicating increase in semantic similarity (see next talk).

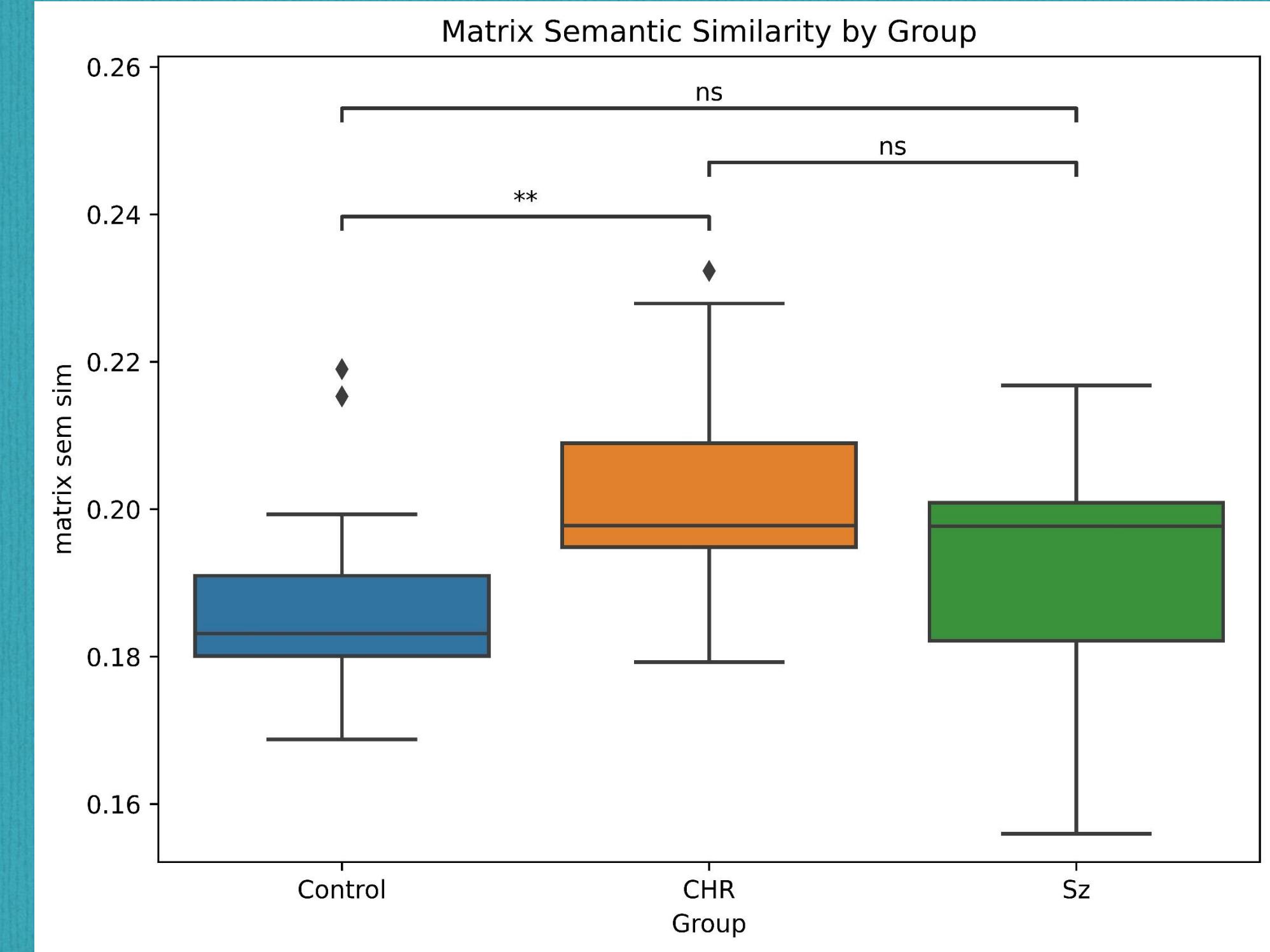
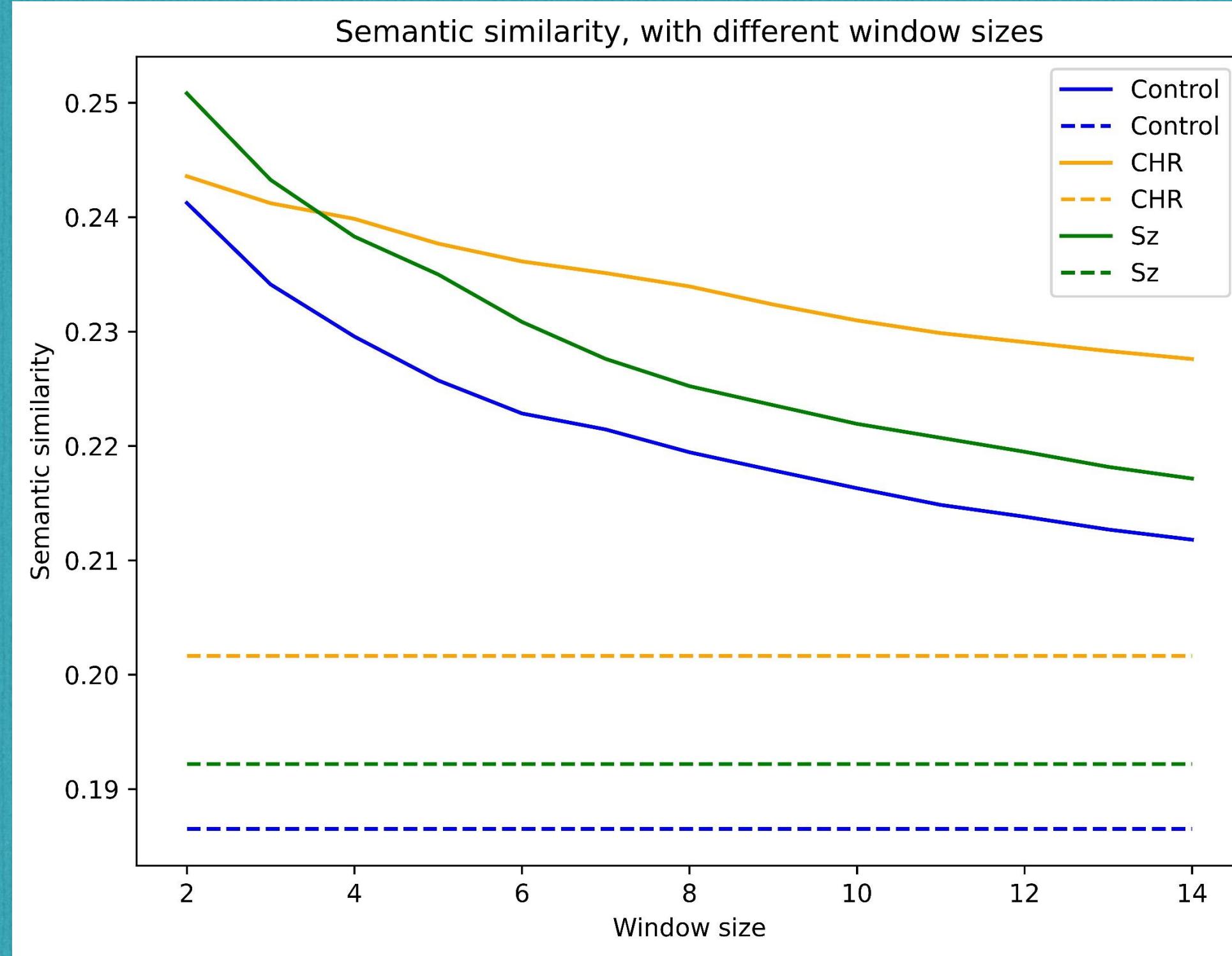
Semantic similarity measures in this data



ssm: semantic similarity (from affinity matrix).

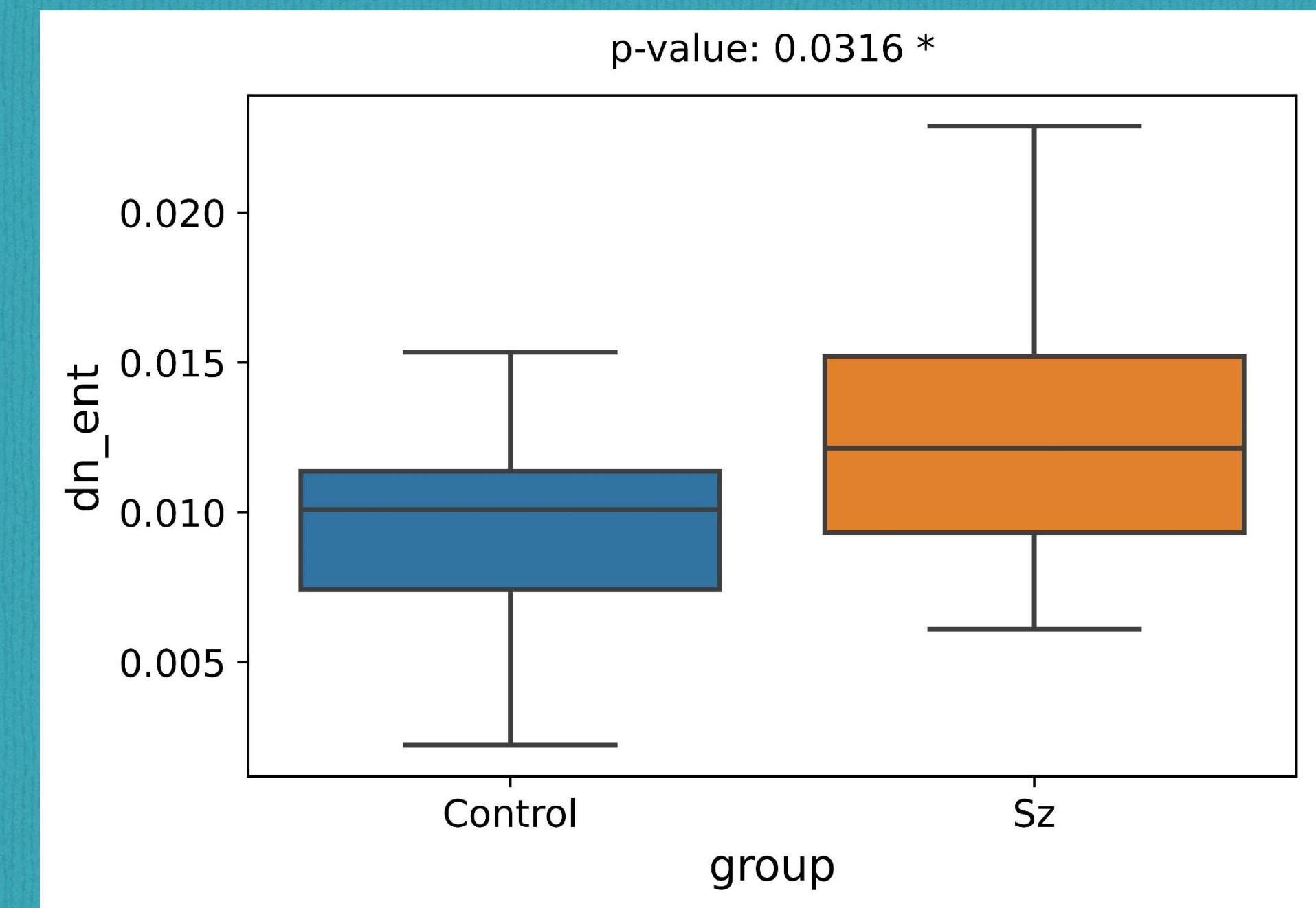
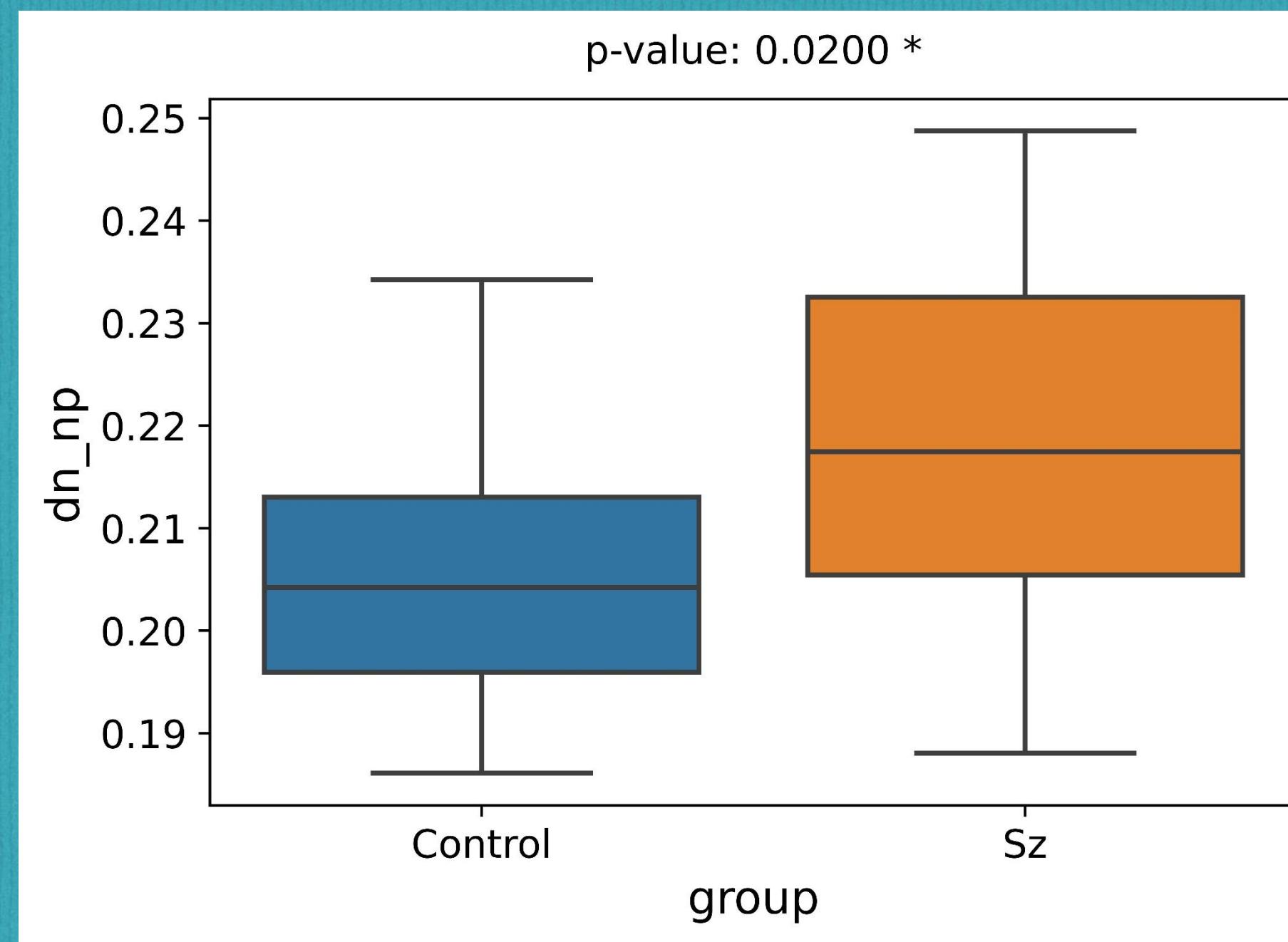
Non-significant increase in semantic similarity in Sz

Semantic similarity using different windows

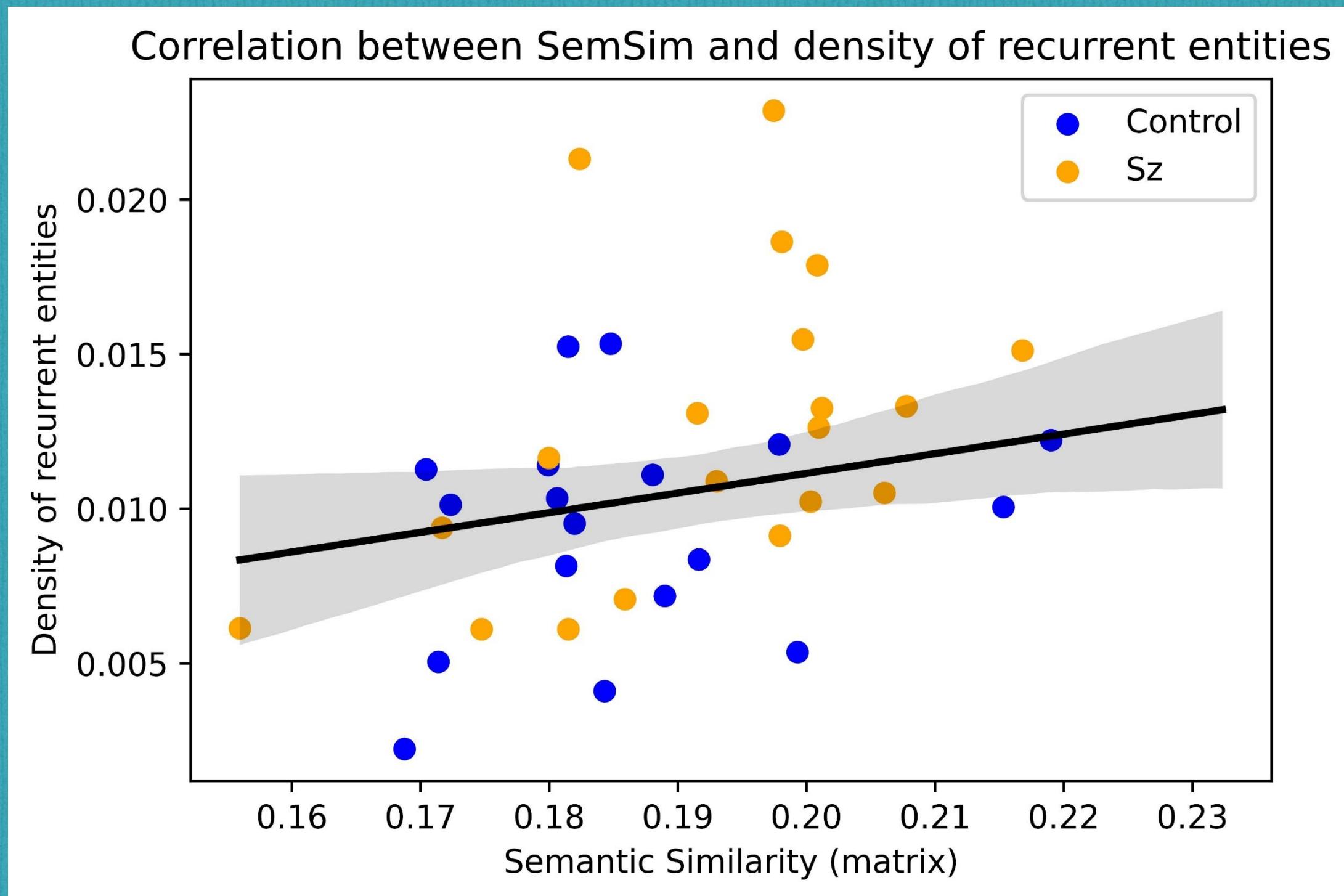


As the word windows become larger, the average semantic similarity approaches the average semantic similarity in the affinity matrix.

Relationship between NPs, entities and semantic similarity



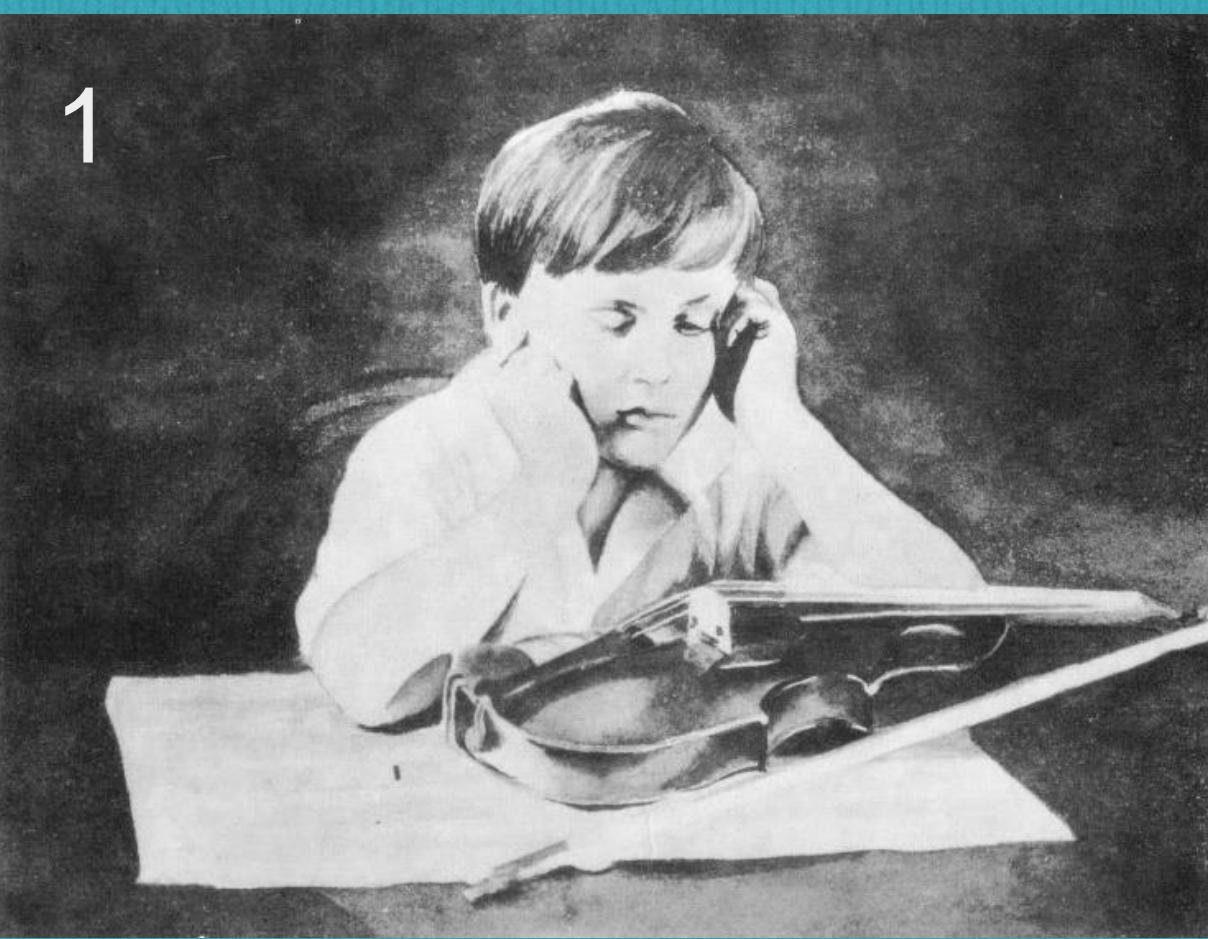
Relationship entities and semantic similarity



Significant Pearson correlation coefficient: 0.402

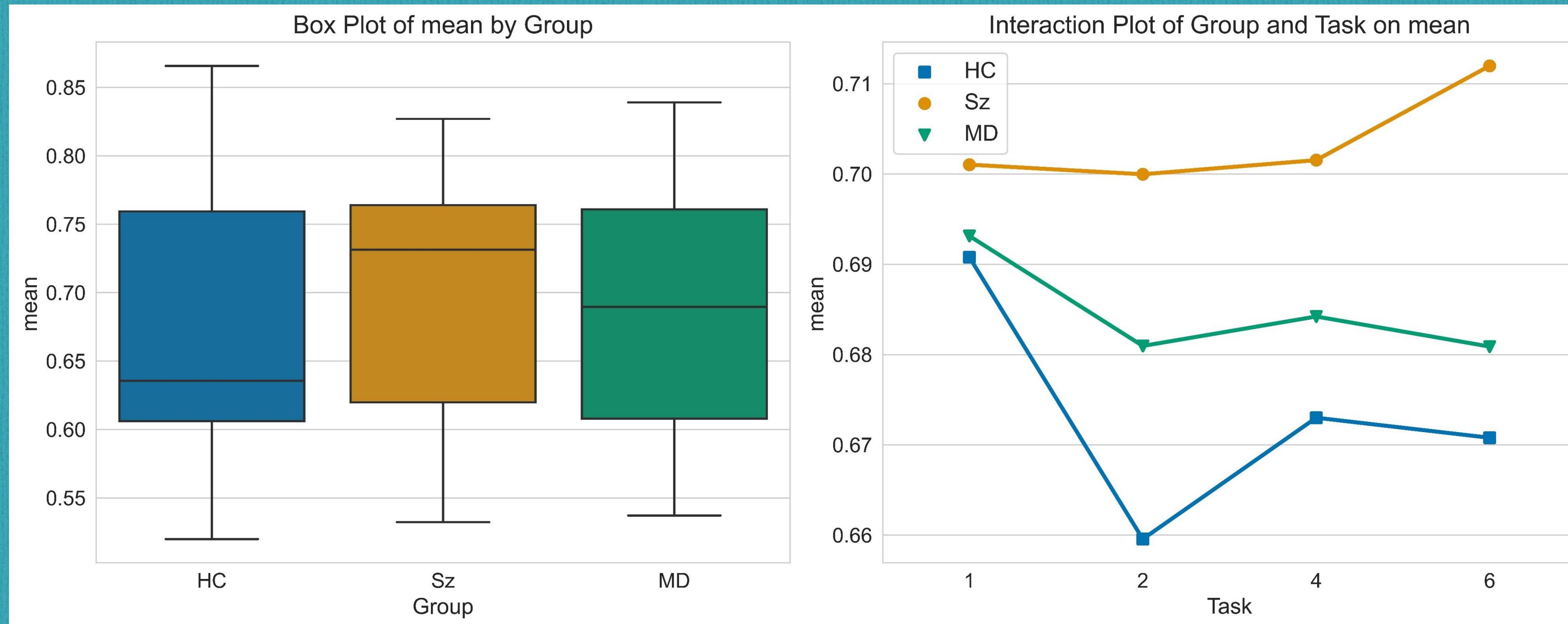
Semantic similarity measures in German: different task and language

- Data compiled and provided by the research team of the Department of Psychiatry of the Phillips University of Marburg (PI: Prof. Tilo Kircher; lead investigator: Dr. Friederike Stein).
- Spontaneous speech dataset using Thematic Apperception Test (TAT) from 43 clinically stable in-patients with schizophrenia spectrum disorders (SZ), 39 patients with major depression (MD), and 43 healthy controls (HC). 4 pictures and 3 minutes speech.



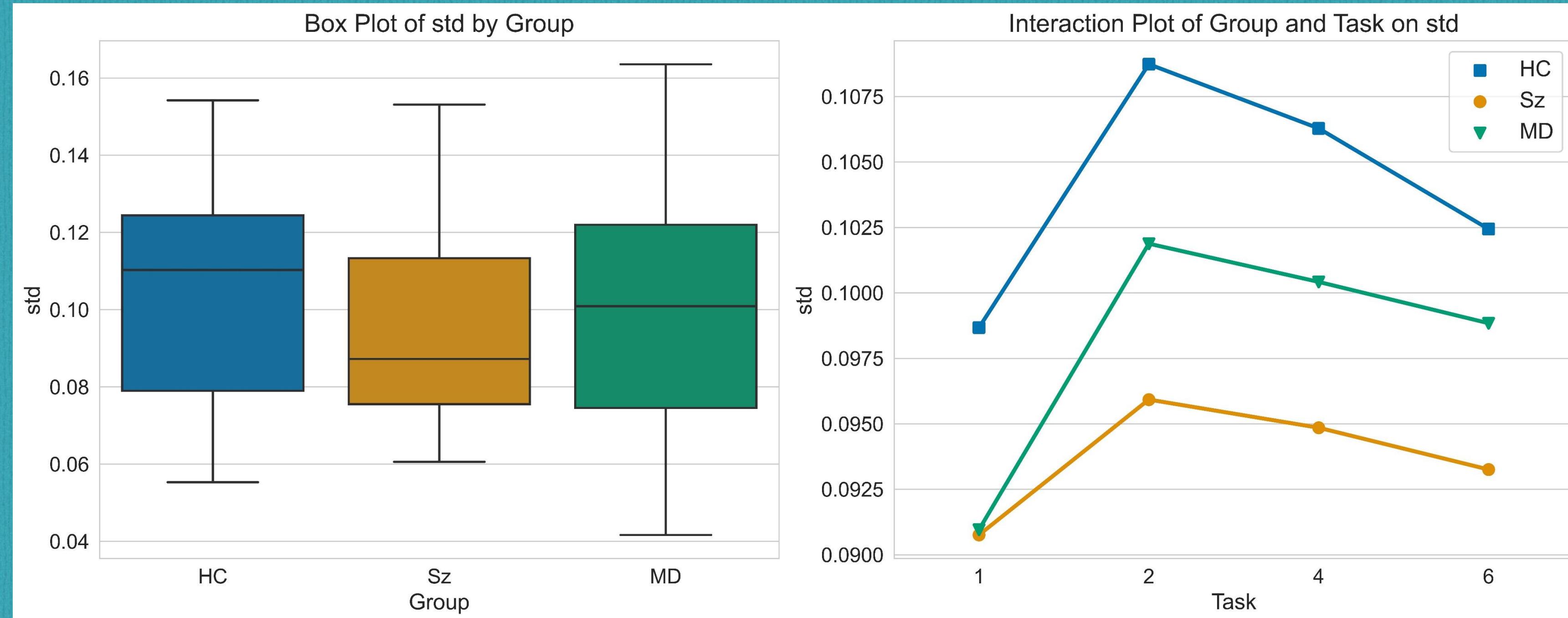
Thematic Apperception Test (TAT)
(Murray, 1943)

Semantic similarity (consecutive words)



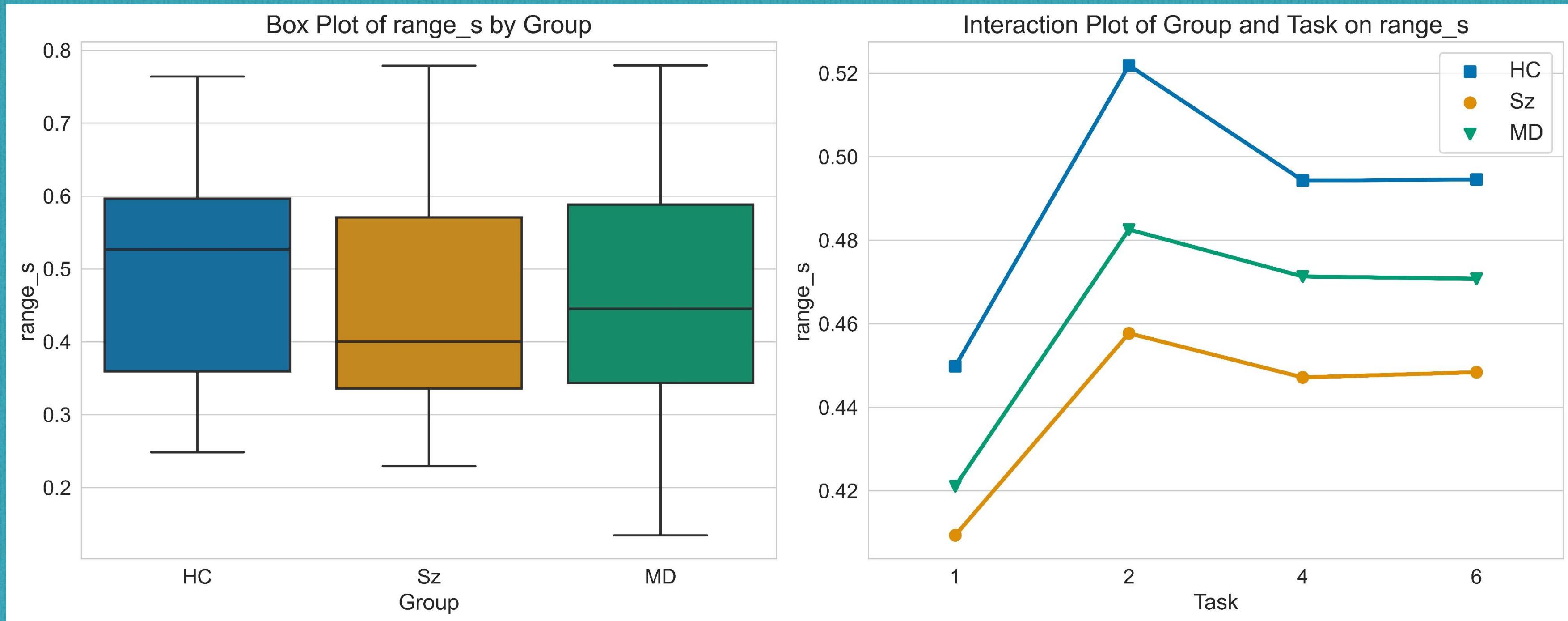
Significant differences between SZ and HC in **mean of semantic similarity** (consecutive words), but also picture effect.

Standard deviation of semantic similarity



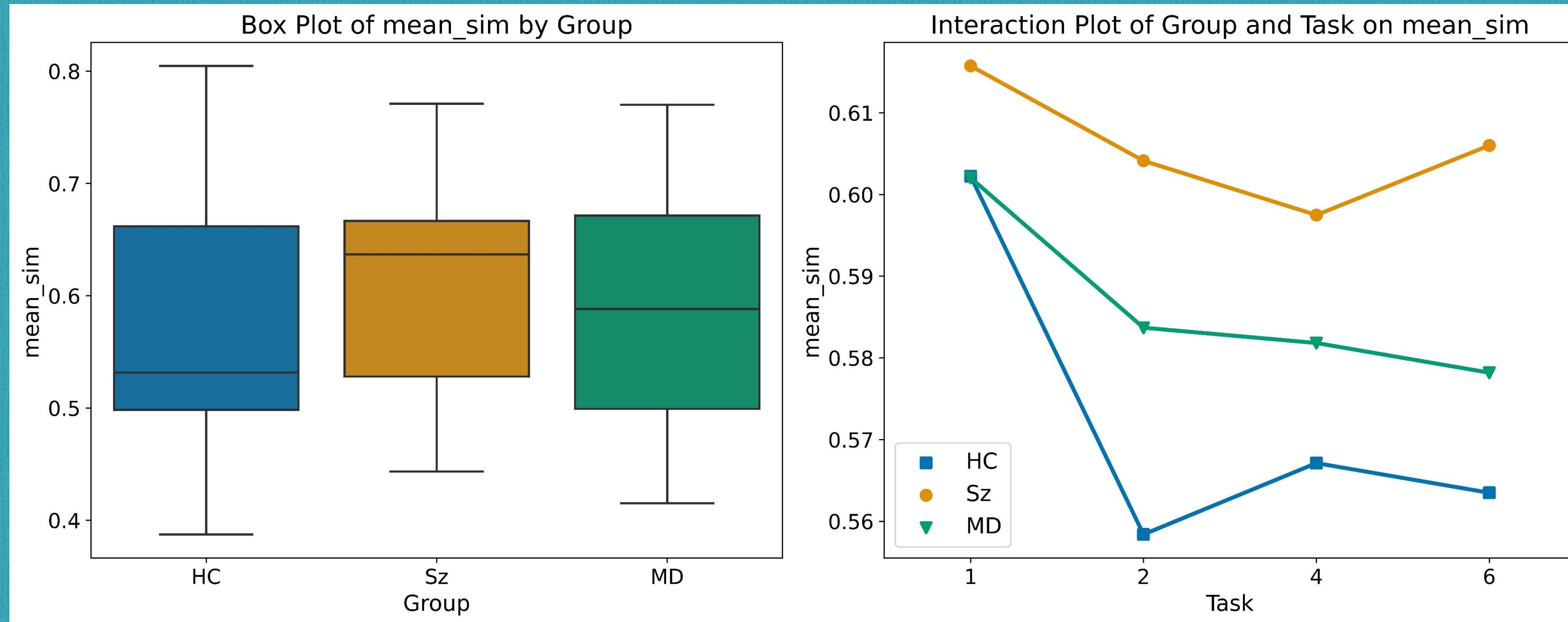
Significant differences between SZ and HC in **standard deviation of semantic similarity** (consecutive words), but also picture effect.

Range of semantic similarity



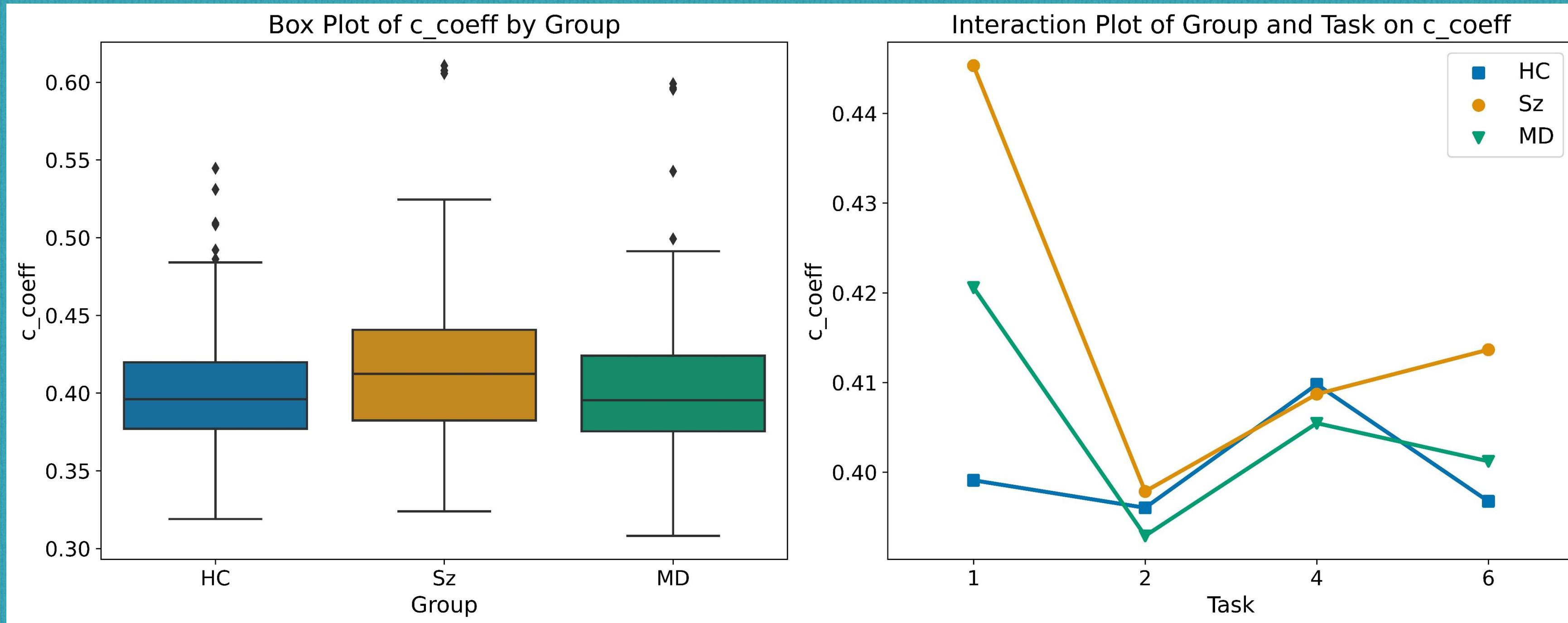
Significant differences between SZ and HC in *range of semantic similarity* (consecutive words), but also picture effect.

Semantic similarity (from affinity matrix)



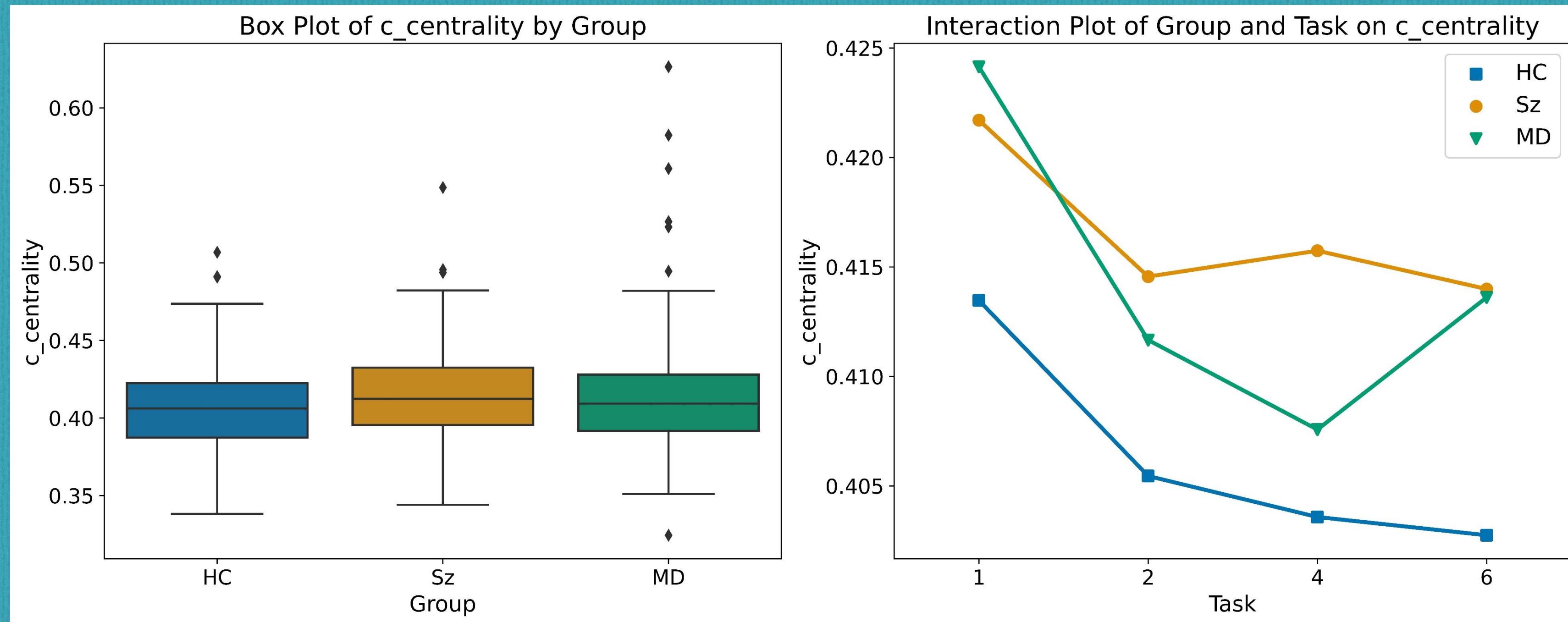
Significant differences between SZ and HC in ***mean of semantic similarity*** (matrix of all content words), but also picture effect.

Semantics graphs: Clustering coefficient



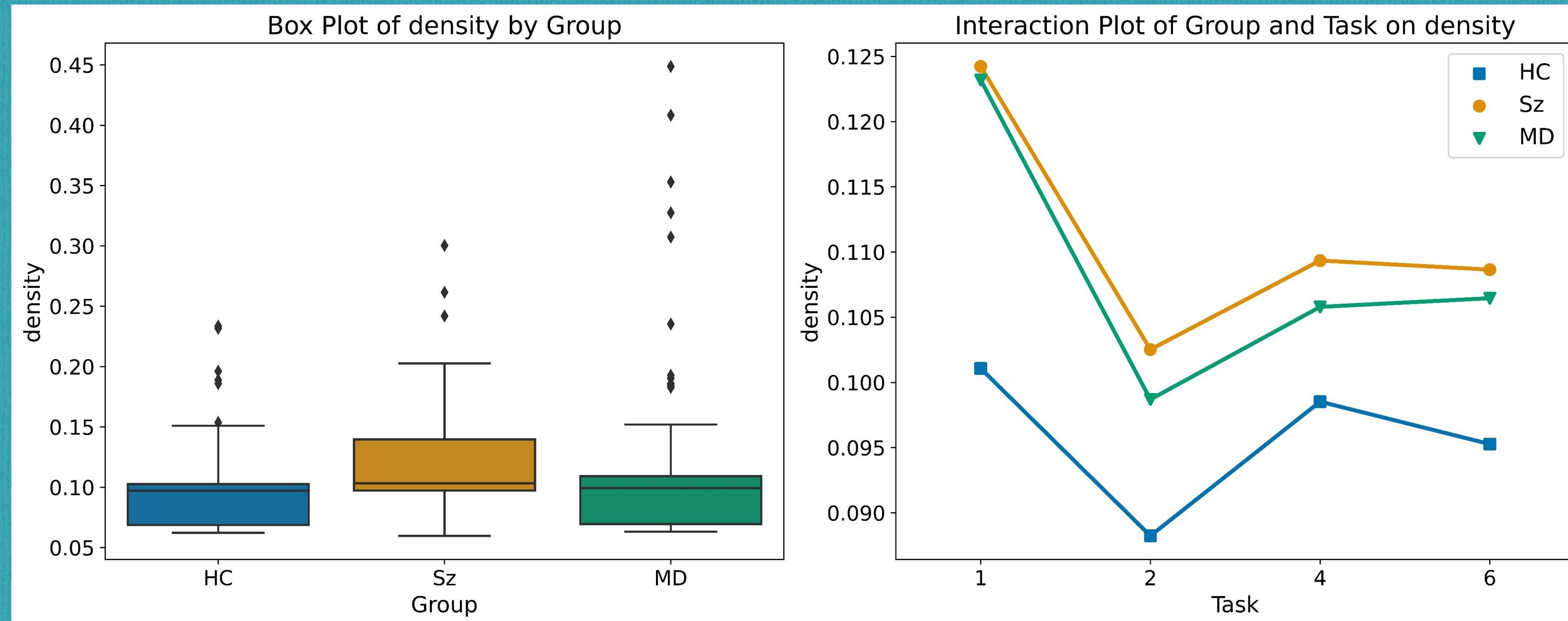
Significant differences between Sz and HC (p -value: 0.015) in **average clustering coefficient**. Also picture effect.

Semantics graphs: Closeness centrality



Differences between Sz and HC (p-value: 0.073) in **average closeness centrality**. Also picture effect.

Semantic graphs: Density of the graph



Differences between Sz and HC (p -value: 0.079) in **density of the graph**. Also picture effect.

Summary

- There is a connection between referential structure and lexical-conceptual structure.
- Recurrence, and NP production could be viewed as causing increase in semantic similarity and larger topological distance (Chilean data).
- Loosening of associations may relate to increase in semantic similarity.
- The use of semantic graphs to calculate semantic similarity leads to similar results.
- There is need to control for picture effects.