Do Altruistic High School Students Flock Together?

Secondary Data Analysis of a Spanish Adolescent Network

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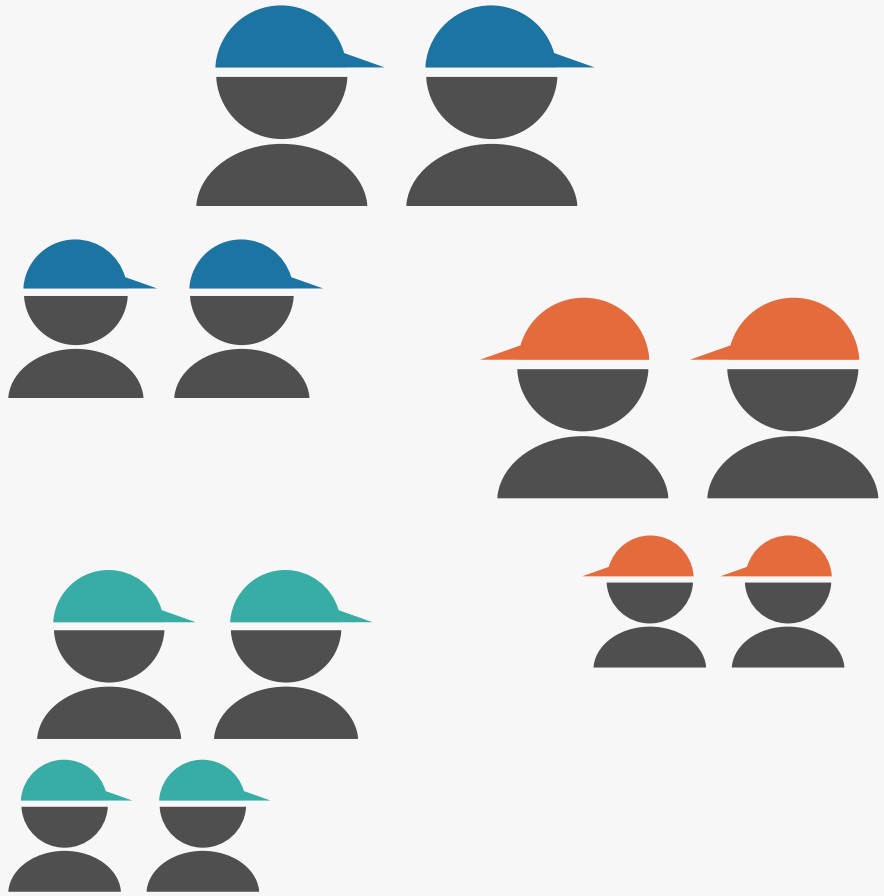
Introduction

Homophily: Birds of a Feather Flock Together



Key principle in social networks

- Tendency that similar people interact with each other
- Confirmed across many studies (e.g., McPherson et al., 2001)

McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a Feather: Homophily in Social Networks. *Annual Review of Sociology*, *27*(Volume 27, 2001), 415–444. https://doi.org/10.1146/annurev.soc.27.1.415

Choice Homophily: A Mechanism Causing Homophily

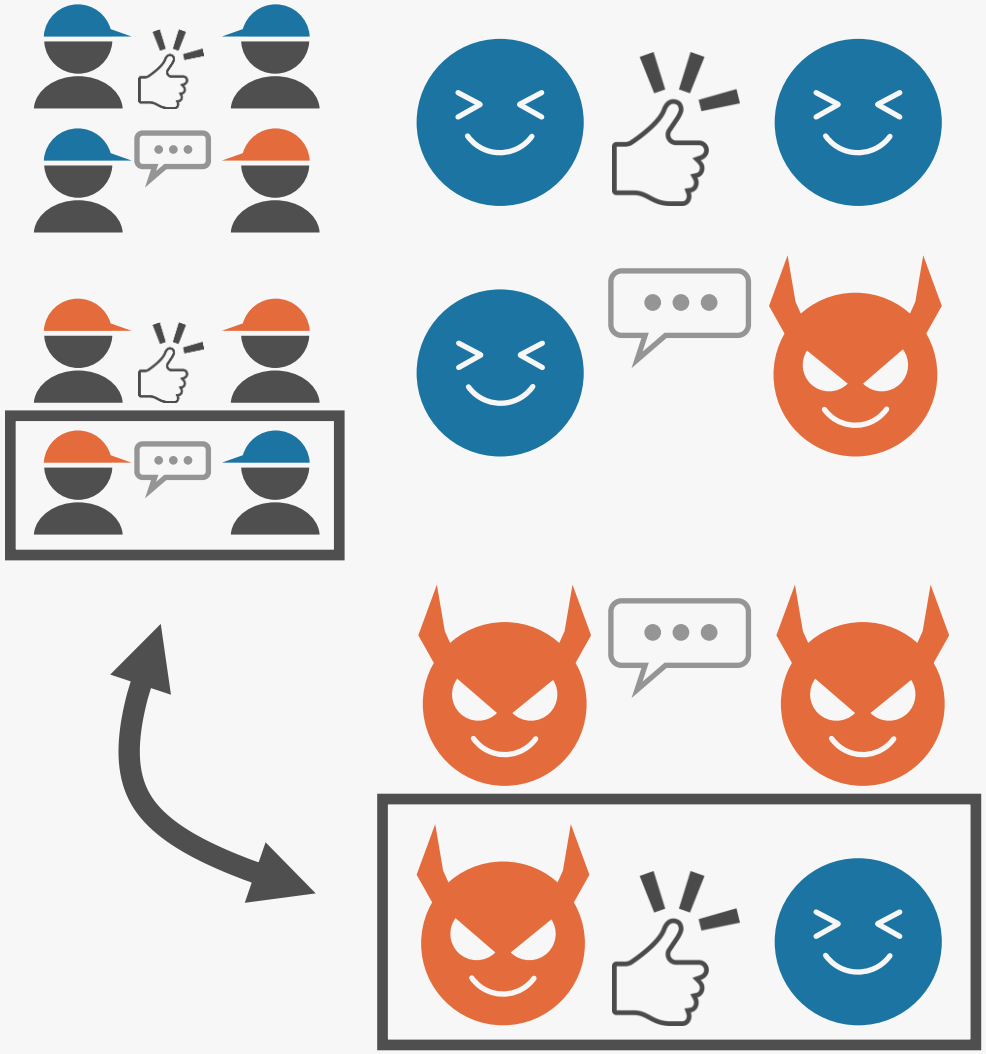
Choice homophily (Kossinets & Watts, 2009)

- Preferring ties with similar others
- cf. Contagion – friends becomes similar to each other
- E.g., Non-early birds are more likely to make friends with each other.
  Early birds are more likely to make friends with each other.
- However, some traits may not satisfy the assumption (e.g,. Ilmarinen et al., 20)

Kossinets, G., & Watts, D. J. (2009). Origins of homophily in an evolving social network. *American Journal of Sociology*, *115*(2), 405–450. https://doi.org/10.1086/599247

Ilmarinen, V.-J., Lönnqvist, J.-E., & Paunonen, S. (2016). Similarity-attraction effects in friendship formation: Honest platoon-mates prefer each other but dishonest do not. *Personality and Individual Differences*, *92*, 153–158. https://doi.org/10.1016/j.paid.2015.12.040

Choice Homophily May Not Apply to ALTRUISM



Non-altruists should like to form a tie with altruists

- tend to help others
- **Everyone**, including , benefits from ties with
- prefers to form ties with
- Contradictory to choice homophily

→ Is there homophily of altruism?
(e.g., Samu et al., 2025)

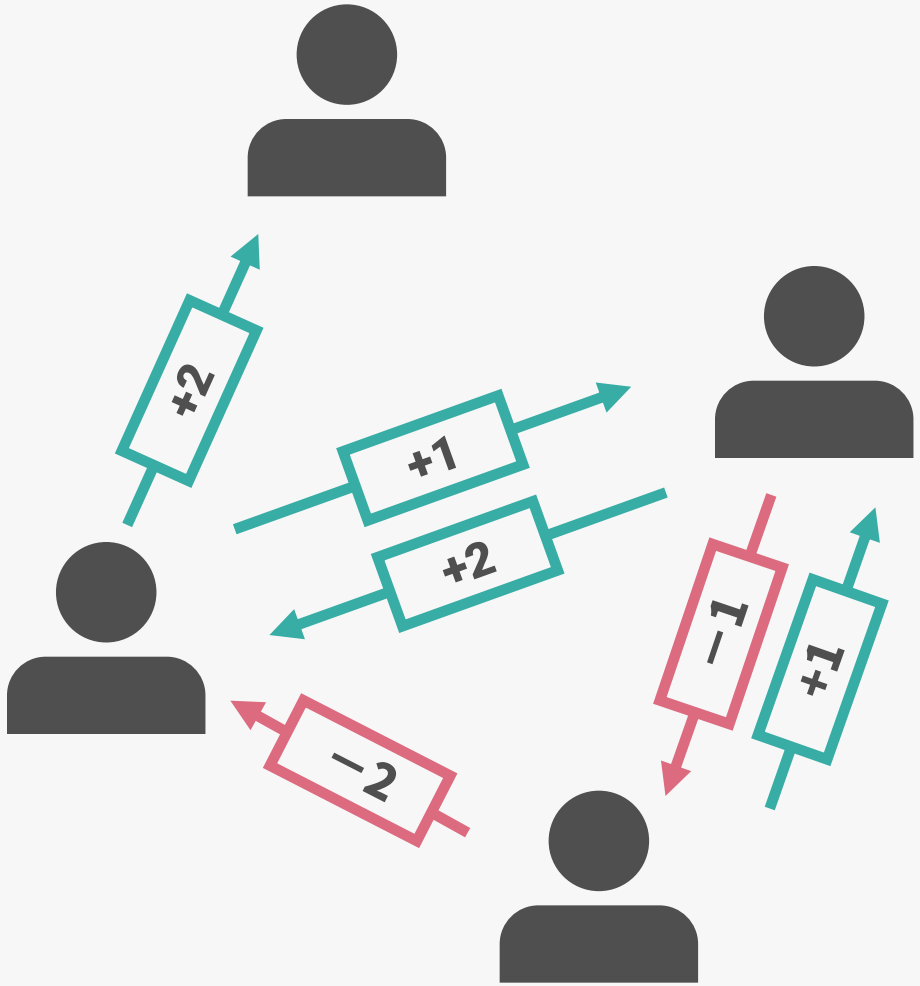
Research Questions

1. Is there homophily of altruism in friendship networks?
   - Are altruists connected with other altruists?
     Non-altruists connected with other non-altruists?

2. If the answer is YES, how strong is this tendency?
   - How does it compare to homophily based on gender and cognitive skill?

Dataset for Secondary Analysis

Dataset Contents

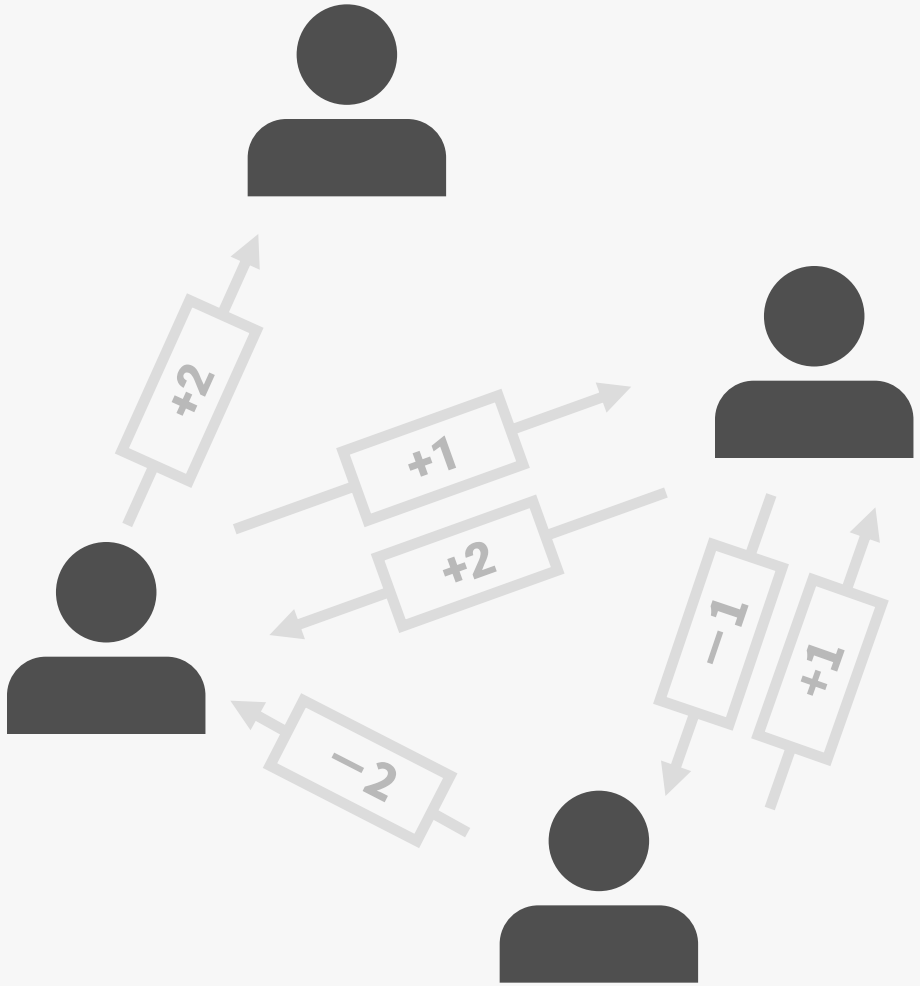


Social network of
Spanish high school students

- Population : **13** high schools
- Nodes ( ): **3,395** students
- Edges ( ): **60,566** relationships

Ruiz-García, M., Ozaita, J., Pereda, M., Alfonso, A., Brañas-Garza, P., Cuesta, J. A., & Sánchez, A. (2023). Triadic influence as a proxy for compatibility in social relationships. *Proceedings of the National Academy of Sciences*, *120*(13), e2215041120. https://doi.org/10.1073/pnas.2215041120

Information about High School Students

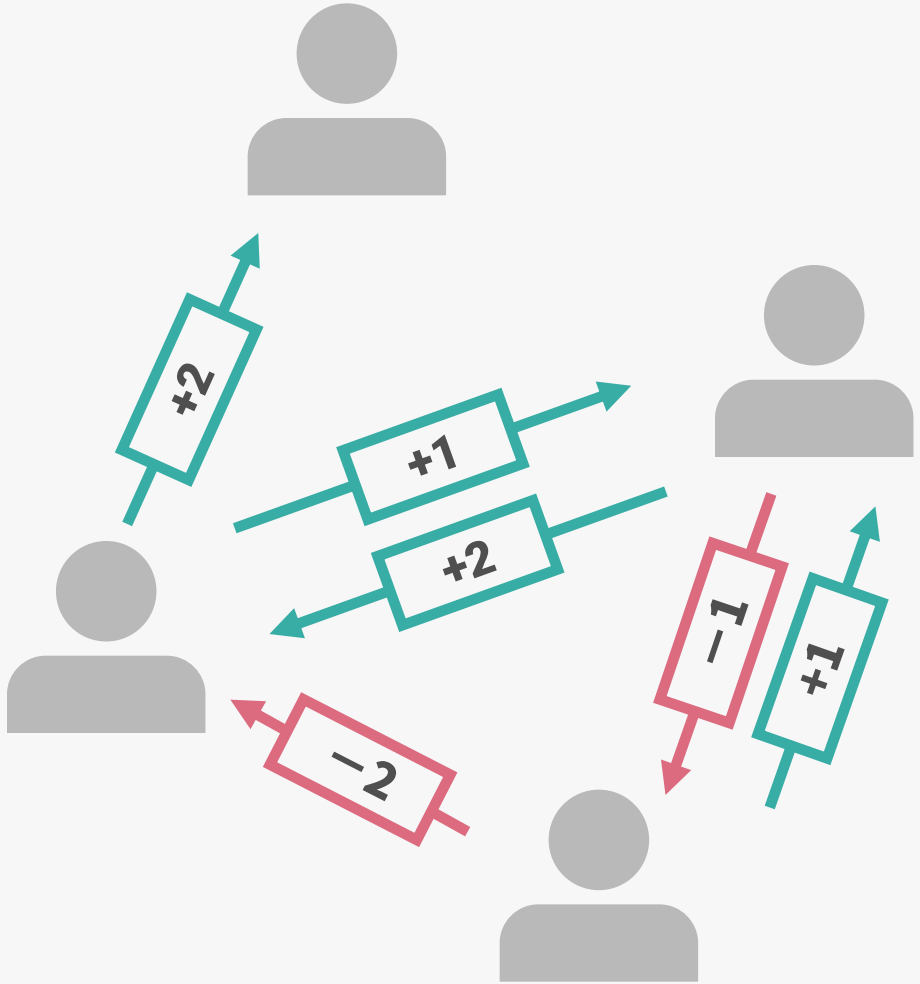


- Gender
- Cognitive skill (Cognitive Reflection Test Score: CRT)
  - E.g., A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost?
  - Correct answer: $0.05
- Prosociality (prosocial vs. selfish distribution; 3 items)

Table1. An example for prosociality measure

	You	Partner
Selfish	€20	€0
Prosocial	€10	€10

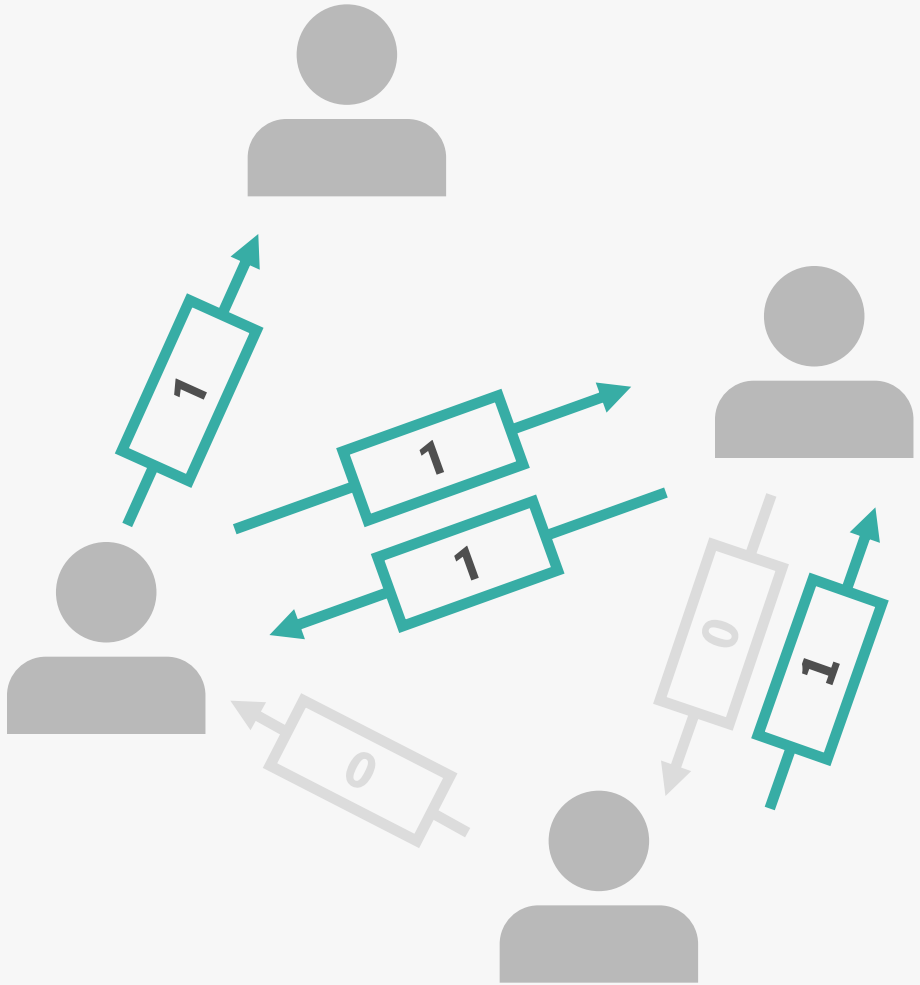
Information about Social Relationships



Original ratings:

- −2: very bad
- −1: bad
- NA: no relation
- +1: good
- +2: very good

Using Only Positive Relationships in This Study



Original ratings:

- −2: very bad
- −1: bad
- NA: no relation

} 0

- +1: good
- +2: very good

} 1

For this secondary analysis,
we focused on positive ties:

- **Positive tie (+1 or +2)** → **1**
- **Other (not mentioned, negative)** → **0**

Results and Discussion

Analysis: Index of Homophily

Assortativity coefficient (Newman, 2003)

$$r = \frac{\sum_{xy} xy\left(e_{xy} - a_x b_y\right)}{\sigma_a \sigma_b}$$

It measures a tendency of students to connect with other students who are similar to them in terms of

- Gender
- Cognitive Skill (CRT)
- Prosociality

x, y: the value of source (target) nodes (i.e., each node's gender, CRT, and prosociality)
e_{xy}: the fraction of all edges in the network that join together nodes with values x and y
a_x, b_y: the fraction of edges that start at nodes with values x and y
σ_a, σ_b: the standard deviations of end a_x and b_y

Newman, M. E. J. (2003). Mixing patterns in networks. *Physical Review E*, *67*(2), 026126. https://doi.org/10.1103/PhysRevE.67.026126

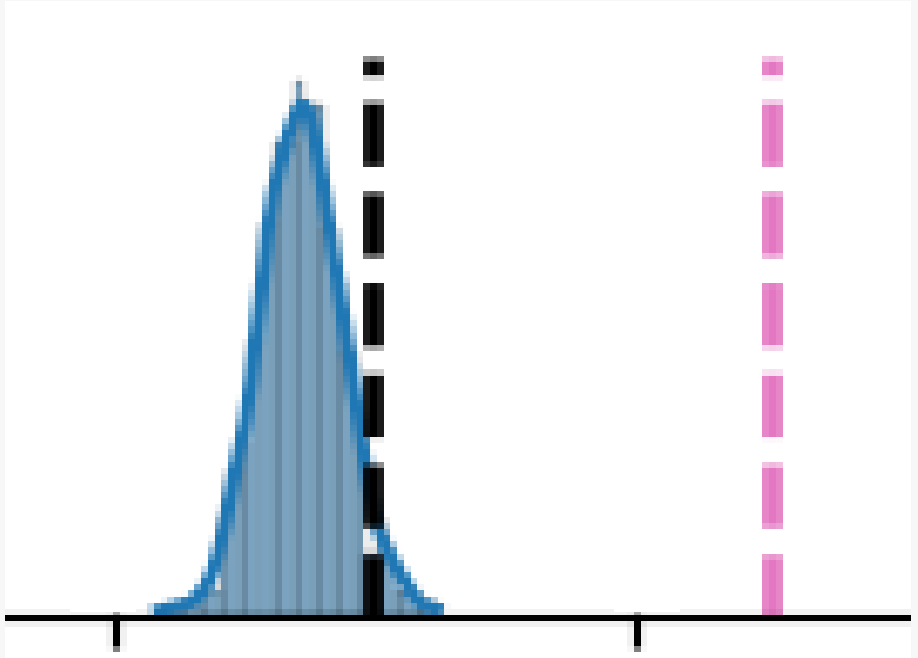
Permutation Test (Statistical Test)

Why?

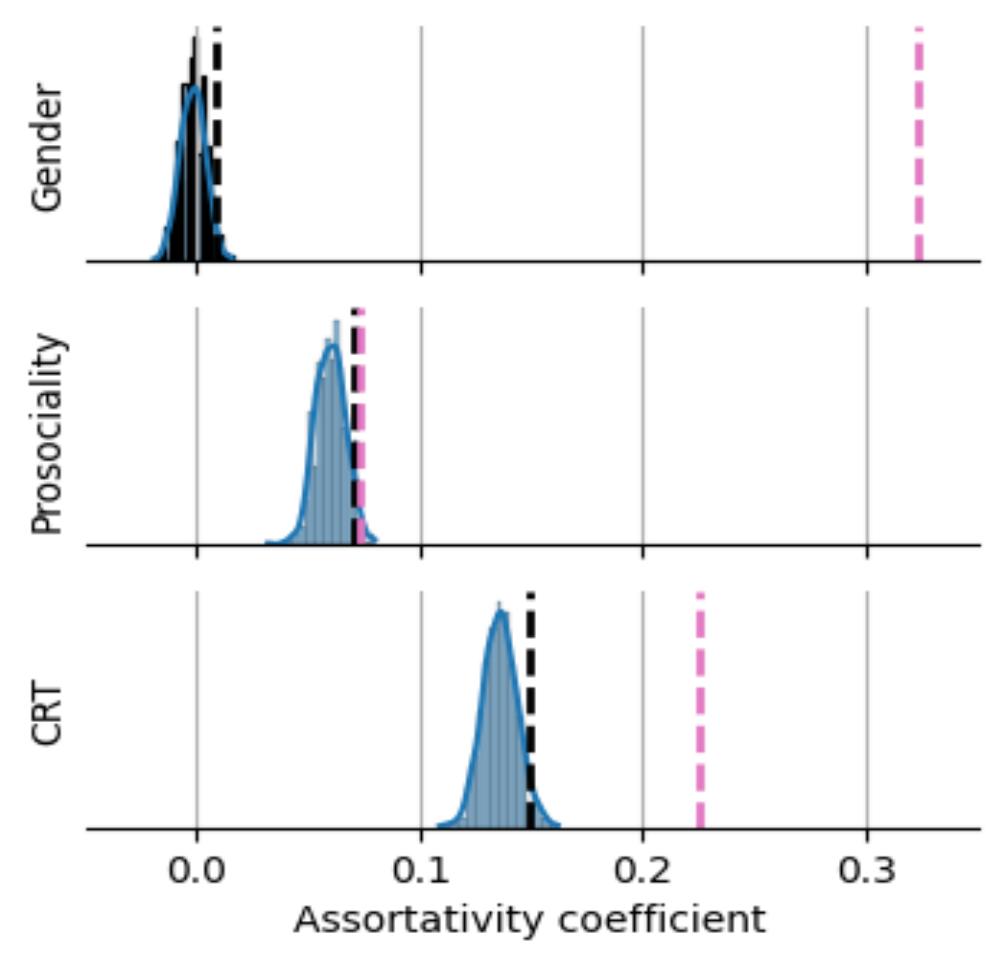
Network data **violate the independence assumption** of standard statistical tests.

How?

1. Calculate **the observed assortativity coefficient**
2. Shuffle attributes of the nodes randomly 1000 times
3. Create **the null distribution** of the assortativity index based on the 1000 random networks
4. Compare **the observed value** to **the 95th percentile in null distribution**



Results: All Homophily Indices Were Significant



95 %tile observed coefficients

Assortativity Coefficient
= Index of Homophily

Finding 1

Homophily was **significant for all attributes**

(95th percentile of null dist. < All obs. coef.)

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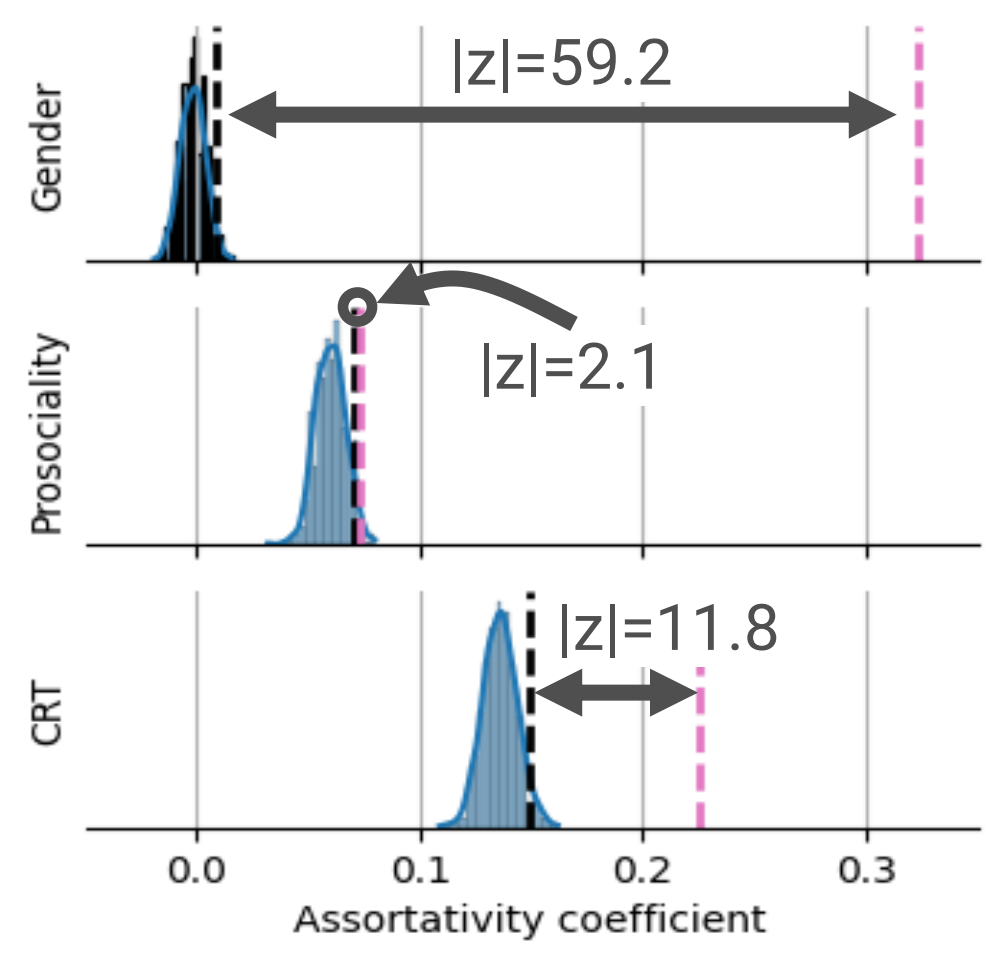

Assortativity Coefficient
= Index of Homophily

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Finding 2

The strengths of homophily varied across the three attributes

- Z-score: Gender > CRT > Prosociality (59.2 > 11.8 > 2.1, respectively)

Discussion

Conclusion

- Homophily of altruism existed, but it was very small in its effect size.

Limitation

- The dataset is a cross-sectional dataset (does not allow causality inferences)

Future directions

- Focus on bilateral relationships to investigate the nature of reciprocal relationships
- Use lab experiments to test causal mechanisms

Summary for Q&A

What?	Investigated homophily in altruism
Why?	Unclear if a general preference for altruists leads to homophily
How?	Calculated assortativity coefficients of gender, CRT and prosociality
Results?	There was homophily of altruism
	The effect was very weak

Thank you for your attention!