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Friendship Modulates Hierarchical Relations in Public Elementary Schools

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Extended Abstract

Picture a typical elementary school classroom with its own social hierarchy, where some children are considered popular and others are not. Have you ever wondered what role friendship plays in this hierarchy? Despite social status and hierarchy being prevalent aspects of social life [1], little is known about the connection between social hierarchies and friendship, particularly in the context of young children in a public elementary school setting.

Since social hierarchy and individual status are not directly observable variables, measuring them is challenging, especially for children's communities. We conceptualize social status as a specific position within a social hierarchy that provides priority access to resources or "desirable things"[2]. Social hierarchies are expressed through deference from lower-status to higher-status peers.

We conducted a large-scale experiment with 856 children aged 9-12 from 14 Chilean elementary schools. Our aim was to measure social status through aggregated cooperative patterns and explore the connection between friendship and cooperation among students with different social statuses using a combination of experimental game theory and social network analysis. Students played a social dilemma on tablet computers to map the social structure of the classroom. In each round, students chose how many of their ten tokens to keep and send to a peer. Each student played as many rounds until interacted with all their classmates. To resemble a social dilemma, received tokens doubled in value to create a trade-off between social and individual incentives. For instance, fully cooperative interactions paid 20 tokens to each student, while non-cooperative interactions paid ten tokens. This experimental setting elicited cooperative patterns among known peers.

We constructed a network of interacted tokens and calculated normalized PageRankPage1998-fq to proxy individual status, which considers the total number of received tokens and the sender's social position. To account for randomness and noise in the observed behavior, we applied a degree-preserving randomization method to filter the network[3]. Then, we calculated two indicators: a cooperation gap that accounted for differences in observed cooperation between two individuals and a social rank gap, that compared the social rank between those two individuals.

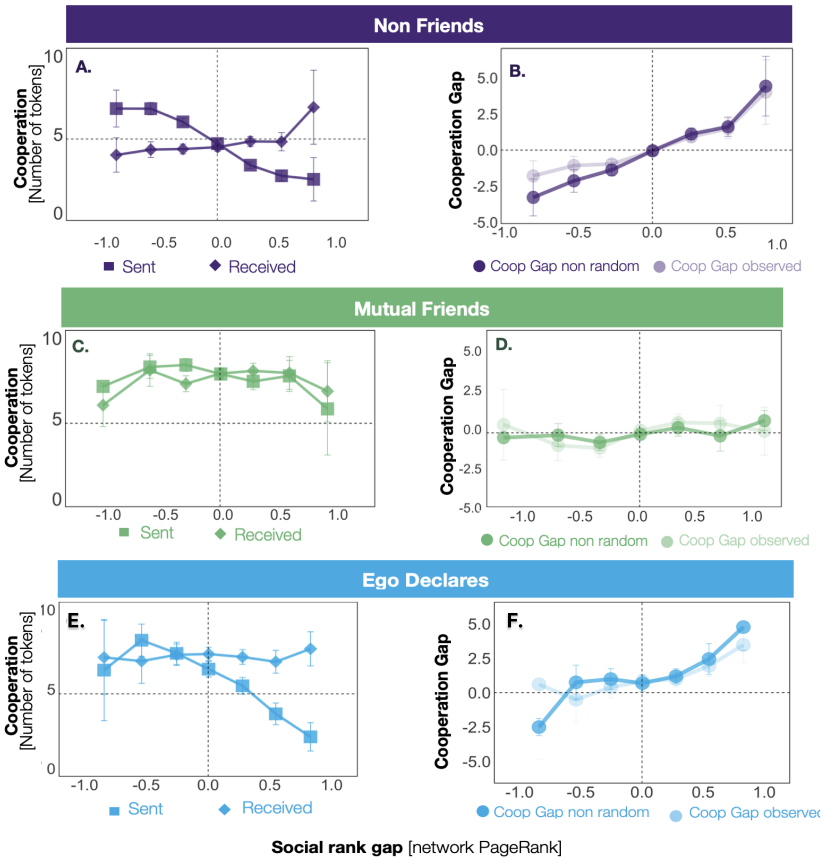
Considering the interaction between non-friends, we found that received tokens were negatively correlated with social status. This suggests that in a relationship between two students with high and low social status, the exchange of tokens favored the higher-ranked individual (Figure A). Furthermore, we observed that the higher the difference in social status, the greater the peer cooperation difference (or cooperation gap) (Figure B). These findings suggest acts of deference from lower-status individuals to higher-status individuals in relationships among non-friends.

In relationships involving mutual declarations of friendship, we found that the association between social status and cooperation disappeared. Students who were mutual friends sent and received more tokens than the average, and there was no cooperation gap (see Figures C and

D). Finally, in pairs in which only one of the individuals declared the other as a friend, we found that the behavior depended on the hierarchical relationship between the two students. If the higher-status individual made the nomination, the behavior of the pair resembled that of mutual friends. However, if the lower-status individual made the unilateral nomination, the behavior of the pair resembled that of non-friends, with a hierarchical pattern (see Figure-E and -F). These results may indicate an "aspirational" kind of friendship.

Our results suggest that friendship implies fundamental equality, which is not affected by social status differences in elementary school students. This study provides an experimental framework to quantify cooperative patterns among children, with potential applications in exploring the driving forces of social relationships and informing interventions in primary education.

Figure 1: **Friendship, cooperation and social rank.**



Right: Relation between social rank gap and interacted tokens in the game. The mean of interacted tokens (4.8) is marked as reference. **Left:** Relation between the difference in status and gaps in cooperative behavior. A social ranking gap of 1 indicates that the lowest status individual in the class is interacting with the highest status individual, measured by their class-group normalized PageRank.

References

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