

NATURAL-LANGUAGE “CHEAP TALK” ENABLES COORDINATION ON A SOCIAL- DILEMMA GAME IN A CULTURALLY HOMOGENEOUS POPULATION

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ChickenHawk is a social-dilemma game in which the only way to win is to play "Hawk" against "Chicken." The purpose of the game is to distinguish between uncoordinated and coordinated self-sacrifice. In a test of four signaling conditions with players who belong to a culturally homogeneous population, a “cheap talk” condition led to efficient coordination, whereas signaling opportunities engaging social reputation and allowing eye-contact without speech yielded poorly coordinated altruistic behavior. The implications are: (1) without language, mere willingness to cooperate on a social dilemma is insufficient for coordinating intentions, and (2) given a sufficiently cohesive social group, language can coordinate inequitable, altruistic sacrifices of modest but real material incentives, even where fully anonymous defection is an option.

1. Motivation

In their coda to Christiansen and Kirby’s (2003) *Language evolution*, Komarova and Nowak appeal for applications of game-theoretic studies of nonkin cooperation to research on the evolution of language, asserting gnominically that, “we speak because we cooperate, we cooperate because we speak” (p. 336). Taking up the challenge of that koan-like chiasmus, this study game-tested the extent to which successful cooperation depends on speech in a modern population, given a naturalistic social environment but a material conflict of individual interest. The idea was to pit natural language against “costly signaling” on a clear-cut social dilemma where only defectors could gain rewards, but any reward required partners to exactly match one partner’s defection to the other’s sacrifice. For any resources at all to be extracted required both cooperation and coordination. Two questions arose. First, how much coordination of intention to cooperate can face-to-face signaling effect without speech? Second, how much cooperation can verbal agreements sustain given both an incentive and anonymous opportunity to defect? Answers might clarify how “we cooperate because we speak,” or, instead, suggest that language is akin to a flashy feature bolted on to an already functional system, enabling new tricks.

2. Theory

If language is a “discrete-combinatorial system” like DNA or binary code, as Pinker (1994, 1998) has described it, then the content of its signals cannot be considered inherently self-guaranteeing in the sense spelled out by the Zahavian (1997) theory of “handicap” or “costly” signal selection. There are no inherent

falsehood production costs. Drop the word “no,” and the previous sentence becomes both false and easier to produce. Indeed, this feature of language is part of universal folk wisdom, encapsulated in myriad adages. “Talk is cheap.” “Don’t just talk the talk; walk the walk.” “Names will never hurt me.”

The prior assumption of this study, then, both from costly-signaling theory and from experimental evidence of indirect reciprocity and reputation anxiety shown by nonkin human participants in economic games (e.g., Brandt et al., 2003, Kings-Casas et al., 2005, Milinski et al., 2002, Nowak & Sigmund, 1998), was that discrete-combinatorial language could not have bootstrapped the evolution of uniquely human habits of layered, opportunistic groupishness, often involving nonkin cooperation. These behaviors require costly signaling of quality and intent. Their core signal is always, “Invest in me; don’t mess with me.”

Language can encode this message, but can it vouch for it?

3. Population

With apologies to Sartre, the human evolutionary environment of adaptation is other people. Geography and food-gathering methods matter less than cultural familiarity and the sense of shared membership in determining levels of nonkin cooperation. For that reason, this study sampled a modern population that, despite living in a postindustrial consumerist society, reasonably approximates the typically close-knit ancestral social context.

None of the participants identified themselves as close genetic kin, but all were adult college students. More than 80% preferred to identify themselves as active members of the Church of Jesus Christ of Latter-Day Saints (Mormons). This percentage is roughly equal to that of active Mormons in the college’s student body and in the local county. A majority of participants had lived most of their lives in Utah and been born within 100 miles of the college. Many of the men had already served their 2-year Mormon missions. All surveyed participants chose the cultural identity “American” and most chose to describe their ethnic identity as “White” or “Caucasian.”

In short, the participants in this study came from a loosely defined cohort within a cohesive cultural group. They had many common experiences of major rituals, group educational hurdles and life-history stages, as well as a strong sense of their shared, distinct sociocultural identity and of a history rooted in their religious geography, which incorporates familiar details of their surrounding landscape. In that sense, they formed a sample of an entirely “natural” human population, however modern, field-tested in their home habitat.

4. Methods

4.1. ChickenHawk Game Design

Pairs played a two-person, one-shot game for an entry in a \$100 prize drawing.

The choices were to demand or cede the entry. If both players demanded or both ceded, neither won anything. The only way to win an entry, therefore, was to demand and hope that one's partner ceded that sole opportunity. Players made their choices using preprinted, numbered tickets as ballots: a large, red ticket constituted a demand; a small, blue ticket meant the player had opted to cede the opportunity. (See Fig. 1.)

	Column Player	
	Blue	Red
Blue	0, 0	0, 1
Row Player		
Red	1, 0	0, 0

Figure 1. 2x2 ChickenHawk Matrix.

The simplicity of the game and the fact that to defect is each individual's resource-maximizing strategy makes the game easy to teach. The single-shot format removes the possibility of reciprocally exchanged payoffs. The lottery shields defectors' anonymity, and, as the maximum possible entries in each lottery is quite small, anyone who gains an entry has a good chance of winning. Spite is also in play, as a defection can deny an entry.

4.2 Basic play

A small group of participants (6-12) gather in the same room. All are volunteers and have been paid an honorarium of \$10US. No attempt is made to prevent participants from interacting with each other normally before or after the experiment. Participants receive instruction in their game, are quizzed, practice the game at least once and discuss the outcome. They open their coded envelopes, remove their red and blue tickets, and play one game. In all of the treatments, the winner receives a private check in the mail.

4.3 Public Balloting

Two of the treatment conditions use a public ballot box, which is a small box carried to each participant. In these treatments, the participants stand in a circle, facing each other, and must stuff their red or blue ticket into the box in view of the group. In these treatments, the valid entries are determined at the time of the experiment, and all are sealed in identical envelopes. The envelopes are shuffled in a bag. A participant who ceded draws. The experimenter marks the envelope. The envelope is set aside, check to be mailed later.

4.3.1. The reputation condition

In this treatment, none of the partners are identified to each other before they make their choices, but they know that the box will be opened and the partners matched by checking their codes against a list, immediately after play. Participants are not allowed to converse or gesture once they have opened their envelopes, removed their tickets, and circled around to start play. They may, of course, exchange eye contact and facial expressions. After 20 seconds pause, the experimenter counts down from 10, and then brings the ballot box around.

4.3.2. The honest condition

After opening their envelopes and removing their tickets, players must hold one ticket in each hand. Partners are pointed out to each other. They may not speak or gesture to each other, except by raising, lowering, or waving either or both tickets. Again, they may exchange eye contact and facial expressions. After 20 seconds and then the countdown from 10, each player is committed to whichever color of ticket she or he holds aloft.

4.4. Secret Balloting

The other two treatments employ a two-compartment ballot box with two armholes in the front and a lidded, fastenable top. In these treatments players practice with both the lid up and the lid fastened so that they learn how to place their choice in the upper compartment and discard their other ticket in the bottom one. In these conditions, the drawing is done by a research assistant later. As in all treatments, the winner gets a check in the mail.

4.4.1. The no-signaling condition

This is the control treatment. After instruction and practice, participants face outward in a circle and after 30 seconds the box is brought around. There is no talking or eye contact, and no player is given any information about partners or the votes cast. As soon as the box has completed the round, the game is done.

4.4.2. The “cheap talk” condition

Partners are identified as in the “honest” condition. They have 30 seconds to confer. The experimenter counts down the last 10, then they must form an outward-facing circle. The box comes around and when they have all voted, again the game is done.

4.5 Replications

Colleagues donated classroom time for the first 2 replications. The participants

in those 2 classroom groups (N = 22 and N = 12), each played the game under all four conditions, but with a different, randomly assigned partner each time. The two groups played conditions in reverse order. As it was possible that these repetitive-play circumstances triggered a sense of reciprocity even where there was no material opportunity for it, the experiments were then replicated as true one-shot trials, outside the student-center cafeterias. The participants in these 7 smaller “cafeteria” groups (N = 56) played only one game apiece. These trials replicated each of the 4 signaling conditions twice, once with a group of 6 players and once with a group of 8.

5. Expectations by condition

Decades of social-dilemma game experiments, reviewed in Sally (1995) and Camerer (2003), show that we should rarely expect all participants to play the self-interested strategy, and especially not in one-shot games nor experiments in which participants meet each other. Nonetheless, the no-signaling condition of ChickenHawk should logically produce the most defections, as it affords no chance to exploit language, knowledge of who one’s partner is nor any social preferences for cooperation or enhancing reputation.

Conversely, in the reputation condition it would reasonable to expect the most frequent altruism, as the condition affords an opportunity to display a sacrificial gesture but not to identify or coordinate with one’s partner.

Reasoning from the theoretical distinction between “cheap talk” and “costly signaling” systems outlined above, the prior expectation in this study was that, given the homogeneity of the participant population and their prior acquaintance, they would be able to coordinate their pairwise choices with the greatest collective efficiency in the “honest” condition in which partners could see each others faces and signal to each other, at least semaphorically, their options on a simple, binary decision.

On the other hand, the temptations of anonymity, as well as the complex social emotions that arise in face-to-face conversation, justified an expectation of greater defection in the “cheap talk” condition, out of self-interest or a desire to deny someone else an entry he or she may have forcefully negotiated.

6. Results and discussion

As expected, under no conditions did all participants defect. And also as expected, they defected at by far the highest rate in the “no signaling” condition. Individual participants were, equally unsurprisingly, much more likely to cede their opportunity in the “reputation” condition, so much so that the collective efficiency of resource extraction in those treatments was lowered by the surplus of altruists matched to each other.

Two results ran sharply contrary to expectations. The first surprising result

was that, even when participants had both the motive of reputation and the possibility of arranging their choices by pre-play signaling through holding up their ballots and exchanging eye-contact and facial expressions with their partners, they were incapable of extracting resources at a rate significantly better than would be expected from a random voting pattern. Nor was this due to excess of self-interested demands for entries. As in the “reputation” condition, too many of these players ceded. They cooperated, but they failed to coordinate. (See Table 1.)

Table 1. Summary results, all treatments

Condition	Pairs’ Success Rate	Pair- Type Skew	Participants’ Altruism Rate
No signal	0.33	DD**	0.21** (-)
Reputation	0.46	CC*	0.69* (+)
Honest	0.42	CC*	0.69* (+)
Cheap Talk	0.92**	CD*	0.5

N = 24 pairs (48 subj.) for each condition: 90 unique participants, 96 unique pairings, 192 ballots.

* p<0.05, with random play as the null hypothesis; ** p<0.01

Significance measured by 95%CI & 99.7%CI of random binomial distribution for pairs’ success & participants’ altruism rates.

Significance measured by χ^2 with 1df for pair-type skew.

(+/-) indicates direction of deviation from expectation

The second surprising result was that any temptations to renege on deals made in a mere thirty seconds of pre-play conversation in the “cheap talk” condition did not derail the effectiveness of talking itself for coordinating strategies. Deals between partners were honored, judging by their 92% efficiency at extracting the one available entry per pair.

This latter result may simply derive from the fact that this is an exceptionally prosocial cultural group, but it seems difficult to imagine that the population sampled by this study, atypically homogeneous though it may be today, would be more interdependent than most ancestral human groups. Nor can the caveat of a peculiarly prosocial culture cover the curious *lack* of better coordination on the “honest” condition. If anything, those results would imply that too much eagerness to display one’s commitment to self-sacrifice could interfere with a group’s collective success. This is not implausible: extravagant individual costly-signaling displays, even of group loyalty, could be counterproductive for the group’s collective efficiency.

So perhaps we do “cooperate because we speak.” Or at least speech enabled us to leverage cooperation into much more efficient coordination. We need not abandon the argument that language, as discrete-combinatorial system, could not do so. Both the theoretical expectations and empirical findings of this study fit with Baker’s (2004) suggestion that language differences function as necessary

barriers to out-groups. One needs commitment to master any in-group's language. Where all the linguistic markers of identity comport, as for the participants in this study, the in-group status marked by speech may itself be the costly signal that bolsters even the cheapest talk.

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