A Proposal to Investigate the

Origins of Prosocial Sentiments

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Introduction

Humans are an unusually prosocial species (Henrich et al., 2003; McElreath et al., 2003). We vote, give blood, recycle, tithe, go to war, donate old clothes to charity, engage in collective action, conform to social norms, and punish transgressors. These activities are all *prosocial* because they benefit others, and some are *altruistic* because donors incur material costs. In many cases, the beneficiaries of prosocial acts are unknown to the donors, and do not reciprocate directly. Currently, there is considerable interest in how we came to be such an unusual species.

One school of thought, most prominently associated with Frans de Waal (Brosnan and de Waal, 2003), holds that the roots of prosociality can be traced back to our closest living relatives, chimpanzees. De Waal sees rudimentary examples of morality, punishment, inequity aversion, empathy, compassion, and concern for others' welfare in the behavior of other animals, particularly chimpanzees. If this is the case, then the origins of prosocial norms and moral sentiments likely precede the evolution of cumulative culture, a well-developed theory of mind, and symbolic language. However, others disagree. They point out that the range of altruistic and mutualistic behaviors in chimpanzees (and other primates) is much more limited, and qualitatively different, than it is in humans (Hammerstein, 2003; Silk, 2003; Tomasello, 1999). Moreover, when prosocial behaviors do occur, they are mainly limited to familiar group members—close kin, mates, or reciprocating partners. According to this view, there are fundamental differences between humans and other primates in their propensity for prosocial behavior. Prosociality is an emergent property of human societies, which is fundamentally tied to the emergence of a well-developed theory of mind, capacity for imitation, and culture (Boyd et al., 2003; Boyd and Richerson, 2002; Gintis, 2003a, b).

The goal of this project is to investigate the origins of prosocial sentiments and behavior using three converging lines of inquiry:

1. **Phylogenetic:** Do non-human primates exhibit prosocial behavior of any sort? In the vocabulary of game theory, the question is do non-humans possess 'other

regarding' preferences? And if so, what is the nature of these preferences and how strong are they?

2. **Ontogenetic:** What is the developmental trajectory for human prosociality and moral sentiments? When do these emerge, and how do they compare to non-humans? What kinds of supporting cognitive abilities are required for their emergence?
3. **Cross-Cultural:** Do prosocial behavior and sentiments vary cross-culturally? If so, how do the ontogenetic trajectories of these differences vary?

The strength of our three-tiered approach lies in our use of the *same* experimental instrument across lines of inquiry. This will maximize our ability to draw meaningful comparisons across species, across the lifespan, and across cultures, a task which has rarely, if ever, been tackled in a unified and systematic manner.

Below, we provide additional details about the project, beginning with the theoretical foundations underlying the work, and then describing the research we plan to conduct on chimpanzees, children and adults.

Theory and Hypotheses

A great deal of speculation, but little solid empirical work, has begun to link three key aspects of human psychology: prosociality, theory of mind, and imitation (Povinelli and Godfrey, 1993; Russon et al., 1998; Tomasello, 2000; Whiten, 1998). One hypothesis suggests that natural selection for the ability to learn by imitation generated the cognitive capacities that underlie a theory of mind (the capacity to represent the beliefs and intentions in the minds of others) in order to improve the fidelity of cultural transmission (Henrich and McElreath, 2003). Together, the ability and tendency to imitate the intentions of others, and its supporting capacity, theory of mind (TOM), may have paved the way for the cultural evolution or culture-gene coevolution of prosociality (Gintis, 2003a, b; Richerson and Boyd, 1998). This hypothesis proposes that prosociality in humans is to a significant degree culturally acquired through complex forms of imitative learning, and specific imitative capacities that require some abilities to represent and acquire the intentions and goals of others, as well as their motor patterns. Several predictions that follow from this hypothesis can be tested empirically:

1. Monkeys and apes will not be prosocial. This prediction is based on the fact that monkeys and apes show little capacity for true imitation (the ability to imitate the intentions, strategies and motor patterns of other individuals), and do not seem to have a well-developed TOM. There is more evidence for imitation and TOM in apes than monkeys, so there is some possibility that apes will show some prosocial tendencies.
2. In young children, the development of true imitation and a well-developed TOM will precede the emergence of prosociality[1]. Before these abilities are developed, the prosociality of children will be much like that of apes.

[1] It is important to realize that, while the development of these abilities (TOM and true imitation) is necessary, it is not sufficient to explain prosociality because the cognitive abilities and motivations lead

3. More prosocial children are expected to score higher on imitation and theory of mind tasks, but not vice-versa.
4. The degree and trajectory of prosociality in humans will vary substantially across cultures because prosociality is, at least in part, culturally acquired.

Addressing these predictions will have important implications for our understanding of both the phylogenetic and ontogenetic origins of human prosociality. Results confirming the above predictions will link the evolution of human imitative/cultural capacities firmly to the evolution of human sociality, while simultaneously highlighting those evolutionary processes that play an important role in our divergence from other primates.

Alternative Theories

Alternative approaches to human prosociality suggest that human tendencies are merely an extended, or hypertrophied, product of standard evolutionary mechanisms for cooperation/prosociality, such as kinship or reciprocal altruism. Within the context of the current experimental paradigm, these mechanisms predict that human or ape subjects will be indifferent to the prosocial choice or will prefer the non-prosocial option. This is the case unless the participant 'misunderstands' the experiments in some sense—thus, this hypothesis has been called the "Big Mistake Hypothesis" (Boyd and Richerson, 2002). For example, if male chimpanzees or humans are accustomed to living in small groups of close kin then they might act more prosocially then kin selection theory predicts because their behavioral predispositions are shaped by high baseline relatedness. Similarly if a species' psychology evolved in an environment containing predominately long-term repeat partners, then members of this species might act prosocially towards another because, in an evolutionary sense, they are anticipating future interaction. While there is good reason for skepticism about the theoretical and empirical entailments of the Big Mistake Hypothesis (Fehr and Henrich, 2003; Henrich and Henrich, 2004), the following predictions follow from it:

1. Male chimpanzees will make prosocial choices because their psychology has evolved in the context of living in fairly stable kin-based groups with opportunities for long-term partnerships.
2. Female chimpanzees will not make prosocial choices because they are the dispersing sex and do not live among kin or form close bonds with other females in their groups.
3. There will not be any regular relationship between a child's imitative abilities, TOM, and prosocial tendencies. This follows from the hypothesis that prosociality is hypertrophied extension of the mechanisms responsible for cooperation in other animals.
4. There will be little cross-cultural variation in prosociality because the evolution of prosociality is based on conditions in a set of ancestral environments which preceded the evolution of culture.

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cultural learners to acquire prosociality if, and only if, prosocial behaviors and intentions are present in their learning environment.

These two sets of hypothesis will allow us to comparatively evaluate the predictions coming out of Dual Inheritance Theory with those from standard acultural evolutionary approaches (Cosmides and Tooby, 1989).

Phase I: The Phylogenetic Roots of Prosociality—Chimpanzees

We know little about the fundamental prosocial tendencies of great apes or other nonhuman primates. Previous work on cooperation in nonhuman primates focuses on the deployment of altruism and the dynamics of reciprocity or exchange. Thus, de Waal and his colleagues have investigated food sharing and contingent exchanges within dyads, focusing principally on chimpanzees and capuchins. De Waal has demonstrated in experimental settings that chimpanzees preferentially share food with animals that have recently groomed them (de Waal 1997a) and that capuchins tend to share with those who recently shared food with them (de Waal 1997b). He and his colleagues have also explored the 'rules' that underlie exchanges, and recently published a report in *Nature* which claimed to provide evidence of inequality aversion in capuchin monkeys (Brosnan and de Waal, 2003; c.f., Henrich, forthcoming). Similarly, work focused on the dynamics of exchanges within dyads in tamarins, which seem to have very strong concerns about contingencies (Hauser et al., forthcoming). While important, this body of work does not address the possibility that nonhuman primates have 'other-regarding' preferences which lead them to generally prefer prosocial outcomes.

Our exploration of prosocial behavior in chimpanzees makes use of a simple experimental protocol. Chimpanzee subjects are trained to manipulate a simple, two-choice apparatus. Both choices simultaneously deliver one food tray to the subject and one food tray to another individual. In the baseline version of our experiment, subjects are allowed to choose between two alternatives that differ in their reward distribution:

(a) a reward for self and equivalent reward for another individual,
or
(b) a reward for self and no reward for partner.

Note that the subject's payoffs are the same in both cases, but the other individual's payoffs differ. If an individual has prosocial ('other-regarding') preferences, they will routinely choose option (a). If individuals are antisocial (maximizers of relative payoff: Price et al., 2002), they will routinely choose option (b). And if individuals are indifferent about their partner's payoff (maximizing absolute self-interest), they will choose at random between options (a) and (b).

A detailed protocol for implementing this experiment has been developed by Silk and Povinelli and his research team (see Appendix A). The protocol includes a number of controls that are designed to make sure that the chimpanzees comprehend the general features of the task, and to exclude possible confounds that would complicate interpretation of the results.

The early phases of this chimpanzee protocol are currently being implemented with a group of well-studied chimpanzees in Povinelli's research lab. The experimental

apparatus has been constructed, the chimpanzees have learned to operate the apparatus, and have completed early stages of the protocol. They understand which lever to pull to secure a reward for themselves; they have learned that they can pull only one lever; and they have all been tested for their willingness to take food rewards in the presence of other group members. The work-to-date has been supported by overhead operating funds by Povinelli, who has assigned one of his post-doctoral fellows, Dr. Jennifer Vonk, primary responsibility for developing the protocol and running the project.

Work on the chimpanzee protocol can continue rapidly as soon as the project is funded (see budget needs below). In addition, the baseline protocol will be modified to assess the nature of preferences or moral sentiments related to altruism, contingency, and inequity aversion. For example, we intend to construct a variant of the Dictator Game in which the subject is given a choice between (a) a reward *x* for self and reward *x* for the other individual, (b) reward 2*x* for self and 0 reward for the other party. In this case, the subject must incur a personal cost, *x,* to provide a benefit to the other individual. The protocol assesses behaviors with material payoffs that are meaningful to the subjects, much like games in behavioral economics. The details of these additional protocol variants cannot be precisely specified because they depend on the results of the first phase.

The series of experiments we have planned will continue for three years (Spring 2004-Spring 2007).

While this instrument was originally developed for studying prosocial behavior in chimpanzees, it can also be used to study prosocial behavior in other nonhuman primates or human children in almost any setting.

Phase II: The Ontogeny of Prosociality in Humans

Building on the experimental work with chimpanzees from Phase I, Phase II asks the question: What is the nature of prosociality in humans? By merging the strength of the comparative method (the same experimental tool applied across species) with a developmental approach to prosociality, we hope to begin to contribute to such fundamental questions as: (1) Is human prosociality part of a deep phylogenetic history that we share with our primate relatives, or is the nature of human sociality sufficiently different from non-humans to expect that quite different evolutionary processes have influenced the emergence of human sociality, (2) And, if humans did inherit some prosociality from our common ancestor with chimpanzees, how much did we get?, (3) How does the degree of prosociality in non-human primates compare to humans at different stages of development,[2] and (4) When and how does prosociality develop in humans compared to potentially related cognitive abilities, such as theory of mind and complex imitative abilities. The evidence that we produce in this phase of the project will help us evaluate alternative evolutionary hypotheses regarding the origins of human prosociality.

[2] Phase II concentrates solely on American subjects, but Phase III attacks the issue of the variation in developmental trajectories across diverse human societies.

Prior work on Prosociality in Children

While there has been a substantial amount of work on prosociality in children (Eisenberg, 1982; Eisenberg and Mussen, 1989), little of this work has used real payoffs and none has used a protocol that can be transported to non-human species. Because most of this work has focused on either self-reports of moral emotions and responses to hypothetical moral dilemmas, or naturalistic observation, adding work involving experimentally controlled decision-making situations, in the tradition of behavioral economics, adds an important component to the existing lines of research.

Some quite interesting work from experimental economists on children's behavior in bargaining and public goods games suggests that younger children are less prosocial than adults (Harbaugh and Krause, 2000; Harbaugh et al., 2002). Given the difficulty of the tasks, this work is limited to older children (ages 7+) and cannot be extended across species.

In sum, the present proposal has several advantages over prior work: (1) our task focuses on actual behavior, with real costs and benefits, (2) the task is simple enough to use on young children in a wide range of societies, giving us both a developmental and cross-cultural foothold, and (3) the task is transferable to other primate species, yielding comparative insight into the phylogeny of prosociality.

Methods

Our second phase deploys the same protocol described above, along with two other well established experimental tools—the False-Belief and the Imitation Tasks—on several age sets of human children from the American middle class in Atlanta and adults. We will begin with 5-year-olds from a kindergarten, then do 4-year-olds from a nursery school, and finally 3-year-olds. If we do not detect uniform prosocial tendencies in the sample of 5-year olds, we will sample 7-year-olds. In each case, subjects will be given the Prosociality Task, then a Theory of Mind Task, and finally an Imitation Task. We will also test undergraduate to establish an adult baseline.

Prosociality and Imitation Protocols

These two protocols will be designed by our interdisciplinary team at the June conference. In designing the prosociality protocol, we will follow the attached chimpanzee protocol as closely as possible, but some modifications may be required. An important modification that we might consider, for example, is controlling for familiarity with the partner. With chimpanzees it is not practical for subjects to be paired with an unfamiliar partner, but this is likely to be a much smaller problem with human children. For the Imitation Task, we will be aiming for a complex task involving a series of subparts that require the acquisition of both motor patterns and intentions/goals. Subjects will be both scored and incentivized according to the number of subparts they replicate.

Theory of Mind Task

The Theory of Mind task is a standard protocol from developmental psychology that will allow us to assess whether the subject is able to understand that other individuals can hold false beliefs (beliefs different from the subject). On average, American middle class

children can successfully pass the TOM task at age 4, but there is sufficient variance around that average that some 3-year-olds will pass the task and some 5-year-olds will not.

We will use a simplified version of the false belief task, specifically designed for cross-cultural work (Callaghan et al., 2004). Briefly, the two experimenters bring the subject into a room containing three bowls. Experimenter #1 places an object under one of the bowls in full view of the child, and then departs. Under the guise of "playing a trick," Experimenter #2 and the child move the object under a different bowl. Experimenter #2 then asks the child where Experimenter #1 will think the object is when he/she returns. If the child picks the second bowl, she "fails". If she picks the first urn, she "passes". A more detailed description of this protocol is attached (Appendix B).

Recruitment

7-year-olds: recruitment from second grade classes in Atlanta public schools
5-year-olds: recruited from kindergartens in Atlanta public schools
4-year-olds: recruited from nursery schools around Emory
3-year-olds: recruited from volunteer families (Rochat maintains an extensive list of such families)

Phase III

We are not requesting funding for this portion of the project now, but we discuss it briefly here because it plays an important role in our vision of the project.

We will deploy the Prosociality, Imitation and TOM tasks from Phase II in 10 small-scale societies, focusing on children and possibly adults. To accomplish this goal, we will assemble a team of committed ethnographers and cross-cultural psychologists, with an expertise in various small-scale societies throughout the world. We will hold a methods conference at which we will lay out our existing results, refine the protocols for use in cross-cultural settings, plan auxiliary data collection, and set out a detailed schedule for completion of data collection, analysis, and submission of final results. In general, we'll follow the highly successful model of the "jungle-games" project.

Budget

To complete this three-tiered project, we seek funding to (a) continue our work with chimpanzees, (b) initiate work on children, and (c) launch cross-cultural investigations. The first step in this process is to complete the testing of chimpanzees in Povinelli's lab and to consider means of extending the protocol to examine behavior in the Dictator Game, inequality aversion, and so on. The second step will be to begin the work on children, incorporating tests of prosociality, TOM, and imitation. When this work is completed, we will broaden our investigations to include other groups of chimpanzees, other cooperative species that seem likely candidates for prosocial behavior, and extend our work to other cultural settings. For the present, we seek funding for the first two phases of the project: the work on chimpanzees in Povinelli's lab and the work on children that will be principally conducted at Emory.

To complete the work on chimpanzees and children, it will be necessary to have funding for the following:

(a) A meeting among the principal investigators and members of the Preferences Network to sort out methodological issues.
(b) Funding for research staff in Povinelli's lab who conduct the experiments, and do behavioral assessments of the chimpanzees (measuring dominance, affiliation, etc.).
(c) A postdoctoral fellow who would run the experiments on children at Emory.

Below, we articulate the rationale for these budgetary items.

(a) Meeting

A meeting among the Principal Investigators, collaborating researchers, and relevant members of the Preferences Network is crucial to maintain methodological rigor. This is one of the problems that has plagued experimental work on chimpanzee cognition and animal cooperation (see recent exchanges between the Tomasello/Call group and Povinelli), and has complicated the interpretation of results obtained by different research groups. We would expect that this meeting would be attended by the PI's, their principal collaborators (Jennifer Vonk from Povinelli's lab, Sarah Brosnan and Phillip Rochat from Emory), and representatives from the Preferences Network (such as Gintis, Boyd, Bowles, Fehr, Camerer, Eckle, Wilson). This is not an exhaustive list of participants, and we would welcome suggestions of other relevant participants. The goal is to convene a group whose theoretical and methodological input would strengthen the research project and enhance its effectiveness.

We think this meeting is crucial because it will insure that work done by different investigators follows a common format. This kind of meeting seems to have been a very valuable element of the cross-cultural economic games project, and allowed investigators

working with different populations to consider how the games should be adapted in different cultural settings. Here, we would consider, for example, how the methodology would be adjusted for children and cross-cultural settings, what baseline testing would be necessary to be certain that subjects "understood" the protocol, and what criteria should be adopted for scoring "choices.

This meeting is tentatively scheduled for the end of June 2004.

Meeting Budget

Air fare for participants from their homes to Baton Rouge, LA
Sample round-trip fares from Expedia.com
LAX-Baton Rouge, $450
Boston-Baton Rouge, $300
Atlanta-Baton Rouge, $275

Ground transportation from Baton Rouge to Lafayette (approximately 50 miles)
Estimated cost $30/person

Hotel rooms for participants:
Sample rates from Expedia.com for budget hotels in Lafayette, LA
$50-75 per person per night for 3 nights

Food and incidental expenses: $50 per person per day

Estimated expenses based on attendance by 15 (Povinelli and Vonk would attend, but not require funding for travel or lodging) ….**$15,000**

(b) Funding for research in Povinelli's lab

Funding for personnel to conduct the experiments and to collect background data on the chimpanzees is needed. Povinelli has funded work in his lab up to this point, but this has meant that he has to divert funds and personnel from other ongoing projects. The labor demands of transferring subjects from their social groups into the research setting, operating video equipment to record all trials, and execute the protocol, require the efforts of 3 staff personnel. Support is therefore needed to continue participation in the project and to make progress in a timely fashion.

One of the most pressing needs is for research personnel to conduct some of the background data collection on the chimpanzees and to manage some parts of the experiments. Currently, personnel are not available for dominance testing, behavioral observations of social relationships among group members, and other background data that are important for interpreting the data collected during the experiment.

Funds are also required to cover some of the materials used in the experiments, including costs of video tapes which are used to record all experiments, DVD's for storage of video images, food rewards used in the experiments, and supplies used in construction of the experimental apparatus.

Povinelli Lab Budget

Full-time behavioral technician (salary + fringe benefits)... $40,000.

Supplies and research equipment…$8,000

(c) Research on children at Emory

Funding is needed to finance the experiments on children. This involves payments for subjects to compensate parents and children for coming into the lab. Fifty 3, 4, and 5 year-olds will be tested ($10/child), and it may be necessary to test 7-year-olds as well. Funds are needed to purchase video equipment to record the experiments, DVD's for video storage, mileage costs for subjects' parents, and the costs of mailings for recruitment of subjects.

It will be necessary to hire a full-time researcher who will be responsible for recruiting subjects, scheduling experiments, conducting experiments, data management and analysis. We plan to hire a postdoctoral level researcher who can work independently and will be committed to the project.

Emory Lab Budget

Subject Payments: $2500
- 5-year-olds (n = 50; $10/kid)
- 4-year-olds (n = 50; $10/kid)
- 3-year-olds (n = 50; $10/kid)
- 7-year-olds (n = 50; $10/kid; if needed)
- Adults (*n* = 30 $20/adult)

Video equipment: $750

Supplies, mileage, postage, recruitment: $2000

Research Fellow: $37,500 (salary + 7% fringe benefits)

Budget Summary

Item	Year 1	Year 2*	Year 3	Total
Methods Conference	$15,000			$15,000
Behavioral technician (Povinelli lab)	$40,000	$42,000	$44,100	$126,100
Supplies (Povinelli lab)	$4,000	$2,000	$2,000	$8,000
Subject fees (Emory)	$1,500	$1000		$2,000
Video equipment (Emory)	$750			$750
Supplies, postage (Emory)	$1,500	$500		$2,000
Research associate	$37,500	$39,375	$41,143	$118,018
Total	$100,250	$84,375	$87,243	$271,868

*Salaries increased 5% per year

Appendix B: adapted from Lieberman

The purpose of this test is to see if children understand that someone can believe something that is not true (*remember the typical task of hiding candles in the crayon box and asking children what they think is in the box: they believe there are crayons in the crayon box, when there are really candles – i.e., they hold a false belief)*, and at what age children in this culture seem to understand that.

The test should be administered by people who are familiar to the child, if possible. People not exposed to scientific methods may find the questioning pointless, so care must be taken to find people who are willing to follow the script exactly for child after child.

Age

3, 4 and 5 years

Procedure

Testing should take place in an area familiar to the child which contains vessels in which things might be hidden. An example would be a cooking hut or tent with pots or coconuts or bowls. Use the same place for all children if possible. Describe test place.

With both experimenters and the child present, one experimenter should place a common item, like a piece of candy, into the first covered place. This should be done with a verbal declaration of what is being done, and enough fanfare that there is no mistaking that the child has seen the object placed and hidden there. Then the experimenter who hid the object should announce he has to go out for a minute and will be right back. When he leaves and is no longer able to see, the second experimenter should suggest to the child that they play a trick on him and move the candy or other object to a different location, ideally within a meter of the first location. The experimenter should do this with the child if the child will participate; regardless it must be clear that the child saw the object moved and covered up in the new location.

Then the second experimenter asks the child, "Where will [first experimenter] look for the [candy] when he returns? Note if the child chooses the first location (where the first experimenter had left it) or the second location.

(**Note**: If the mother or someone else needs to be with the child during testing, it is fine, if they do not give away the correct answer. Consider if there will be status issues so the second experimenter needs to be of higher status than the first one. Ask parents what they think about the situation and questions.)

Camera

Make sure you can see where the child looks and points toward. Place camera a little to the side and behind experimenter who leaves the room.

Materials

3 bowls of similar material, different colors, small toy to hide

Venue

Needs to be quiet spot without intrusion.

Coding

Determine whether the child passes (i.e., points to the location where the experimenter hid her toy) the task or not (i.e., points to the location where the toy was moved after the experimenter left the room). Enter P or F on the Excel sheet. Also note whether the child looks to a different location than they point toward.

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