PSYCHOLOGICAL DIMENSIONS OF COOPERATIVE LABOR EXCHANGE IN A RURAL CARIBBEAN COMMUNITY

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A thesis submitted in partial fulfillment of
the requirements for the degree of

MASTER OF ARTS IN ANTHROPOLOGY

WASHINGTON STATE UNIVERSITY
Department of Anthropology
MAY 2010

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ACKNOWLEDGMENTS

I would like to thank my committee and colleagues for all their assistance in helping me prepare this manuscript. I would like to thank April Bleske-Rechek for sparking my interest in the field and supplying me with the tools necessary for conducting quality scientific research. Thank you Rob Quinlan for giving me the freedom to investigate my own scientific inquiries. Also, thanks for having the patience to see them to fruition.

To my colleagues, Mark Caudell, Charlie Reed, and Susan Lukowski, thank you for entertaining my ideas. Your input is appreciated. Thank you Shane Macfarlan for assisting me every step of the way. Your knowledge is vast and your friendship is invaluable.

To all my field assistance, thank you. Without you, this project would have literally been impossible to complete.

To the National Science Foundation, thank you for funding this project.

Finally, thanks to all my friends and family for their support.

PSYCHOLOGICAL DIMENSIONS OF COOPERATIVE LABOR EXCHANGE

IN A RURAL CARIBBEAN COMMUNITY

Abstract

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May 2010

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Conditional social exchange, coalition building, and indirect reciprocity are a few characteristics making humans unique from other species of animal. Ecological dominance social competition models suggest cooperation and competition among conspecifics has played a crucial role in the evolution of human cognitive abilities. Borrowing from Evolutionary Psychology and Theoretical Biology, the current research combines social contract theory and models of direct and indirect reciprocity to examine the underlying psychological mechanisms associated with recurrent labor exchange in a rural Caribbean community. Results support the existence of evolved psychological mechanisms for social exchange and has important implications for human decision making in social situations.

TABLE OF CONTENTS

LIST OF TABLES

Dedication:

I dedicate this to my Mother, Grandmother, Sylvia, and Brother, Mike. You have all inspired me more than you could know and I thank you for that.

CHAPTER 1

INTRODUCTION

EVOLUTION OF COOPERATION

Conditional social exchange is rare occurrence in the animal kingdom (Packer, 1977; Wilkinson, 1988, Peake et al., 2002) yet it serves as the backbone of human sociality. Humans are a uniquely cooperative species in that they are characterized by a general willingness to give to strangers with little to no chance of return. This behavior is common across all human cultures and manifests itself in a multitude of forms – for instance, gift giving, meat sharing, and donating to charities (Kameda et al., 2003, Gurven et al., 2001). Despite its prevalence in human nature, the way in which cooperation and prosocial behavior could have evolved is still under debate.

Theoretical biologists have used game theory in past research to understand under what conditions cooperation could have evolved (Axelrod & Hamilton, 1981; Trivers, 1971). Formal models have shown that cooperation can evolve by natural selection if individuals receive compensation for their altruistic acts through either reciprocal altruism (Trivers, 1971) or from indirect fitness (Hamilton, 1964). These models, however, do not account for indirect reciprocity, a form of exchange where the return is expected from someone other than the recipient of the beneficence. As one of the crucial features differentiating humans from other animal species, the evolution of indirect reciprocity has been a focus of recent debate among theoretical biologists. (Milinski, et al., 2001; Roberts, 2008; Panchanathan & Boyd, 2003).

Two main theoretical stances have emerged from this literature: (1) image scoring (Nowak & Sigmund, 1998) and (2) standing strategy (Sugden, 1986; Leimar & Hammerstein, 2001). The main tenets of these stances differ in how individuals are affected by failure to reciprocate. In image scoring, any defection has a negative effect on how an individual is viewed by their peers. A failure to reciprocate will lower an individual's score, making them a lesser candidate for future reciprocal

relationships. Standing strategy, on the other hand, takes into account the standing of the individual on the receiving end of the defection, deeming the defection justified if the standing is bad and unjustified if the standing is good (Liemar & Hammerstein, 2001; Panchanathan & Boyd, 2003; Roberts, 2008).

Building on past research by incorporating reputations, Panchanathan and Boyd (2003) showed the evolution of indirect reciprocity can exist when individuals subscribe to either a reputation discrimination strategy (RDISC) or behave in accord with contrite tit-for-tat (CTFT). By employing a reputation mechanism, parsing defections into "justified" and "unjustified," both can evolve to be stable strategies. Even in instances where the population is a mixture of RDISC or CTFT, and "all-cooperators," the former strategies are selected for. As additional support for the effectiveness of reputations, Roberts (2008) notes, as long as reputations are as reliable as direct experience, standing strategy can be successful. However, research examining indirect reciprocity outside of the laboratory is scant, making it difficult to generalize to extant populations.

Another possible mechanism that may explain the persistence of cooperative behaviors, specifically those performed unconditionally, is competitive altruism (Roberts, 1998). With this mechanism, altruistic behavior is seen as a trait with a signaling benefit (Zahavi, 1975). That is, having the qualities of an altruist can benefit individuals beyond the social exchange. For instance, an altruist, who is cooperative by nature, may look more attractive as a mate than would a defector. In the case of competitive altruism, variation in cooperative effort paired with individual choice in exchange partners promotes cooperation (Foster & Kokko, 2006; Fu et al., 2008; Barclay & Willer, 2007; McNamara et al., 2008). Furthermore, the interplay between variation in cooperative effort and partner choice result in non-random, positive assortment for cooperative types. Thus, the additional benefits cheaters gain by defecting is trounced in the long run (i.e. the benefits are ephemeral).

A common concern amongst researchers questions whether humans have the cognitive capacity to engage in the computational bookkeeping associated with non-direct reciprocity (Sugden, 1986;

Milinski et al., 2001; Panchanathan & Boyd, 2003; Roberts, 2008). With an emphasis on large groups where direct observation would be difficult, Panchanathan & Boyd (2003) state, "computing standings may require greater cognitive capacity than image scores because it requires both knowledge of others' behavior as well as inferential knowledge of their intent."

In his 2008 study, Roberts alludes to evolved psychological mechanisms, stating, "...it is important to be realistic about how much information will be available and how much information individuals will process." There is a seemingly unlimited amount of information available for consumption; in order to sift through the noise, individuals must have an inherent sensitivity to information that could prove to be adaptively beneficial. Evolutionary psychologists supplement the research in theoretical biology by suggesting the requisite presence of a psychological mechanism designed to detect cheaters (Cosmides & Tooby, 2008). If humans have evolved the appropriate decision rules for social exchange, specifically the ability to detect violations, then finite cognitive capacity could be reconciled with efficient information processing.

THE PSYCHOLOGY OF SOCIAL EXCHANGE

Proponents of the Ecological Dominance-Social Competition model (EDSC) have suggested that social exchange and competition among conspecifics has played a crucial role in the evolution of human cognitive abilities, arguing specifically that "...as hominin ancestors became better able to handle the hostile forces of nature, selective pressures resulting from cooperation among conspecifics became increasingly important, particularly in regard to social competencies (Flinn et al., 2005)." The EDSC along with paleoanthropological evidence suggests that some form of conditional social interaction has occurred for over two-million years (Isaac, 1978; de Waal, 1989, de Waal & Luttrell, 1988). In addition, recent research using agent-based models have shown that recurrent interactions

were a likely characteristic of our ancestral environment (Tooby, et al., 2009; Krasnow et al., 2009, Delton et al., 2009). Results of these studies bolster the adaptive value of having the cognitive ability to detect violations of social conditionals. If repeated social exchanges were likely to occur, then the ability to engage in social exchange, specifically defense against free-riders, would in fact be adaptive. Thus, recurrent social interaction with conspecifics has likely played a major role in molding our evolved psychology.

In forming social contract theory, Leda Cosmides (1989) suggested that the human neurocognitive architecture includes a set of programs that are functionally specialized by natural selection to solve problems specific to conditional social exchange, including a subroutine for cheater detection. Using the Wason selection task, a reasoning test in the form of a conditional rule (if p, then q), Cosmides (1989) found evidence for an increased ability to detect violations when the conditional rule was in the form of a social contract. Moreover, the results are not due to familiarity with logic conditionals as performance on descriptive conditionals and precautionary conditionals do not yield the same level of performance as do social contracts. The findings support a modular reasoning ability with specific mechanisms designed to solve adaptive problems of social exchange, including a defense against free-riders.

Sugiyama et al. (2002) and Stone et al. (2002) respectively extended this research, providing evidence that mechanisms for detecting cheaters are buffered against cultural variation and can be selectively impaired in patients with brain damage. Sugiyama et al. (2002) found similar levels of performance in detecting violations of social conditionals for Amazonian hunter-horticulturalists and Harvard undergraduates, suggesting reasoning about social contracts is a universal feature of our evolved cognitive architecture. Stone et al. (2002) built on this by demonstrating damage to the bilateral limbic system impairs reasoning about social contracts, but not other reasoning tasks of the same formal structure. The combined results point to a panhuman, species-typical mechanism that is

functionally separated from formal reasoning.

The coevolution of decision rules and search engines suggests that specific information useful for the survival and reproductive efforts will likely be stored. In line with the logic of theoretical biologists, the proper application of decision rules guiding social exchange behavior (e.g. social contract algorithms and cheater-detection) are necessary for the evolution of cooperation. By storing information about past social exchanges, an individual will be more equipped to make informed decisions in future social exchanges, subsequently making it very difficult for defectors to invade a population.

Over the past 10 years, research in neuropsychology and experimental psychology have provided evidence that memory systems are, in fact, multiple and distinct (Tulving & Schacter, 1990; Klein et al., 2002; Schacter & Tulving, 1994). For instance, Klein et al., (1996) noted a dissociation between memory for personal events and general facts about life in an patient who suffered form amnesia. The amnesia did not affect the patients ability to remember that she had been enrolled in classes, however, she could not recall any specific experiences in those classes.

Adaptive problems, and their requisite adaptive solutions, differ from one another insofar as they employ different neurocomputational systems. "Search engines should have evolved to accelerate the delivery of appropriate information to an activated decision rule (Klein et al., 2002; pg 307)." A system designed for solving one adaptive problem will not be engineered for solving another (Tooby & Cosmides, 1992). Furthermore, each neurocomputational system relies on specific inputs and decision rules and different decision rules are designed to retrieve different kinds of information from memory (Klein et al., 2002; pg 315).

If social contract algorithms are being used to detect cheaters, perhaps results from individual interactions (i.e. whether the partner defected or not) are the pieces of information being stored for future use. An example reminiscent of an iterated prisoner's dilemma would be, you defected on me in

our last interaction, I correctly retrieve that information from memory and make an informed decision to not interact with you again. However, finite cognitive capacity will pose a problem once an exchange network has grown to the point where accurate recall of past interactions gets clouded. The fact that this information will only be useful if it is recalled accurately suggests the human mind is equipped with a more efficient method of storage. In terms of social exchange algorithms, the problem of computational overload can be overcome by the use of trait summaries. In the case of altruistic behavior, the trait summary would come in the form of a reputation. Use of trait summaries would reduce the amount of cognitive capacity necessary for examining social exchange relationship, making evolution of indirect reciprocity by standing strategy possible (Klien et al., 2009; Panchanathan & Boyd, 2003).

Reputation, as a trait summary, would decrease the cognitive effort that goes into recalling the outcomes of social exchange by averaging the past exchange events into a probability of return rate. For instance, a good reputation for exchange would align with a high probability of reciprocation. When one individual is not capable of forming a relationship with every other possible exchange partner, and some form of communication exists, reputations would prove to be beneficial information to encode. As long as trust exists between people, then reputations are potent.

This line of research has given social scientists better insight into our evolved psychological processes and can be used as a guide for cognitive anthropologists and psychologists alike to investigate how individuals store and process social information through the examination of manifested social-exchange behavior. Engaging in social exchange requires specific cognitive machinery, and the effectiveness of that machinery is most certainly constrained by finite cognitive capacities.

The aforementioned research supports the presence of mechanisms necessary for cooperation by competitive altruism to evolve, however, the existence of distinct decision rules alone is not sufficient. In order for social exchange algorithms to be effective, they must work in tandem with

memory systems. Individuals must be able to effectively store and retrieve from memory, information relevant to successful future social exchanges. Borrowing from Evolutionary Psychology and Theoretical Biology, the current research combines social contract theory and models of direct and indirect reciprocity to examine the underlying psychological mechanisms associated with recurrent labor exchange in a rural Caribbean community. This study will test 2 hypotheses: (1) Memory for social exchange will operate separately from other non-social memory systems. (2) given our limited cognitive capacity, recollection of past social exchanges will be better predicted by reputations for cooperation than cumulative individual experiences, and (3) individuals in a cooperative labor exchange environment will exercise non-random, positive assortment for cooperative reputations (i.e. they will seek out exchange partners with similar reputations for cooperation).

CHAPTER 2

ETHNOGRAPHIC BACKGROUND

Study Setting

The Commonwealth of Dominica is a small, rural island nation located between Guadeloupe and Martinique, approximately 400 miles off the coast of Venezuela. Compared to other islands in the Caribbean, Dominica is relatively underdeveloped. The population (approximately 65,000) consists of mixed African, European and Island-Carib decent (Quinlan, 2004).

Bwa Mawego, the area of study, is one of the least developed villages on the island. There are approximately 600 full and part-time residents (Macfarlan & Quinlan, 2008). The average annual income in Bwa Mawego is $5,000 E.C. (1,850 U.S.). As forms of employment, most adults are involved in horticulture, fishing, and limited wage labor (e.g. construction of houses, shops, schools, and roads). It is, however, the cultivation of bay leaf that the village is primarily known for (Quinlan, 2004).

Bay oil industry and male networks

Dominica, along with other Caribbean communities, encompasses distinct sex roles. Bwa Mawego is matrifocal in domestic structure, but patrilinieal in land inheritance (Quinlan, 2006). Women are seen as being the center of household and kinship ties and, while it may be true that males are marginal to home and family life, they are certainly not marginal to the society as a whole. Wilson (1971), argues that the primary role of work crews is to provide the social mechanism by which the individual male achieves his identity. Although the importance of male work crews has been referenced in ethnography, albeit rarely, it has for the most part been overlooked in past empirical research and needs further critical analysis.

Bay oil, distilled from bay leaf, is the most important source of cash for most people in Bwa

Mawego. Bay oil production is a labor intensive, multiphase process. The process consists of 3 to 4 weeks of bay leaf collection. This includes clearing the area surrounding the crop, harvesting the crop, and carrying bundles weighing upwards of 100 lbs to a factory for distillation. Once in the factory, the bundles of bay leaf are manually rammed into a still and cooked for approximately 15 hours over a wood fire (Macfarlan, 2010).

Due to the laboriousness of the task, it is common to have multiple individuals working on one batch at any given time during the process. The process can be completed by one individual, but this adds significant time and requires a great deal of energy. Villagers rarely do this by themselves. Typically, labor exchange in bay oil production is in-kind. That is, it is assumed that if I help you, you are obligated to help me. Given that the process requires exorbitant amounts of energy, being on the receiving end of a violated social contract (i.e. unrequited labor) can prove to be very expensive. To lower risk of violation, the socio-cultural structure of labor exchange necessarily takes the form of a biological market where the decision to cooperate is based on the comparison between the offers of several potential partners (Noe & Hammerstein, 1994).

In a system characterized by repeated social exchange, and where individual merits are based on an individuals effectiveness as a work partner, loyalty is the single most powerful bond uniting a crew. "The solidarity or communion of the crew is founded on their loyalty to each other and manifest in their sharing of activities (Wilson, 1969)."

Wonderfully evocative of the aforementioned conditional social exchange logic (Cosmides, 1989) and models of reciprocity, the reciprocal exchange of labor in Dominica provides a perfect foundation for an unobtrusive examination of the underlining psychological processes involved in social exchange. Furthermore, given the importance of male social networks in Afro-Caribbean Communities (Wilson, 1969; Wilson, 1971; Dirks, 1972), an understanding of how the cognitive machinery involved in social exchange manifests itself could shed light on the process of social group

formation. It is argued here that this type of system should promote assortment for cooperative relationships.

Given the relevance of bay oil to the community and the manner in which it is produced, reciprocal labor exchange, Bwa Mawego provides a perfect venue for the examination of repeated social exchange. In accord with social contract theory and models of indirect reciprocity, this study will examine the way in which individuals store and process social exchange information using longitudinal data on labor exchange. Considering the small size of the community and the recurrent face-to-face interactions that take place, exchange rates and network sizes in Bwa Mawego should be large enough to put a natural constraint on memory. Thus, it is argued that reputation will be the most effective mode of storing social exchange information.

CHAPTER 3

STUDY 1: DIFFERENTIATING MEMORY SYSTEMS

METHOD

Participants

Interviews were conducted with men living in Bwa Mawego who were currently active in the bay oil industry (N = 19-21). Ages ranged from 34 to 67 (M = 47.22, sd = 10.59). Individuals were compensated monetarily for their participation in this study.

Measures and Procedure

Interview: Each individual participated in a 20-minute, one-on-one interview. Due to illiteracy rates, participants were required to verbally freelist (Quinlan, 2005) from recall the individuals in the community whom they had worked with in the bay oil factory over the past 2 years. Freelists were egocentric in that the prompts used centered on the personal experience of the interviewee. For instance, participants were asked, *"Who has **helped you** in the bay oil factory over the last 2 years?"* Participants would then list from memory the partners that have assisted them in the bay oil factory. Unlimited time was alloted for answers, however, most individuals completed their lists within a few minutes. Participants were instructed to inform the interviewer when they had listed, to their knowledge, all of the individuals they had worked with. After the first list was completed, participants were prompted to freelist in the same manner, the individuals whom they had helped in the bay oil factory over the last 2 years (e.g. *"Who have **you helped** in the factory..."*). To control for order effects, freelist prompt order was varied across participants. Prompt order did not affect individuals' ability to accurately recall past bay oil partners (t = -0.45; p = 0.67; n = 21). To mitigate the effects of outsider response that is coupled with oral freelisting, interviews were conducted in private. Anytime a response was prompted by someone other than the interviewee, that response was eliminated from the freelist.

A list of men currently active in the bay oil industry was compiled with the help of an informant from the village. Individuals from that list were solicited for interviews. The selection process for participants has characteristics of a convenience sample insofar as the selection process for the participants relied on who was available. Many of the men were temporarily out of the village or working late hours - often in the bay oil factories, making it difficult to obtain interviews.

Observed labor exchange: As part of a dissertation (Macfarlan, 2010), over the course of the last two years a key informant in the village of Bwa Mawego has collected data, via daily spot check, on the social intricacies of the local bay oil labor exchange. The content of the data collected consists of who was manager, who was assisting, who owned the bay leaf, and what factory it was processed in (Macfarlan, 2010). In order to get a proxy for actual social exchange relationships, data on partners, days given, and days received was extracted from the the 2 years of spot checks for each of the 21 individuals who participated in the interview. By comparing the observed data to the freelist data, researchers were able to calculate social exchange recall scores.

To account for error in recall, three separate recall scores were created. Formulas for each score examined the relationship between four variables: (1) observed data, (2) correctly recalled, (3) forgotten, and (4) incorrectly recalled. "Correct recall" is indicative of partner names that showed up on both the observed data and the freelist data. "Forgotten" is indicative of partner names that showed up on the observed data, but not the freelist, and "incorrect recall" are all superfluous partner names (i.e. names of individuals listed as partners on the freelist, but never observed).

(1) Recall 1: correctly recalled partners/observed labor exchange partners

(2) Recall 2: (correct recall – forgotten labor exchange)/ actual labor exchange

(3) Recall 3: (correct recall – (forgotten labor exchange + incorrectly recalled labor exchange))/actual labor exchange

Memory Game: Following the Interview, participants were asked to partake in a single-sided,

visuospatial memory task in the form of the game Concentration. Two individuals declined participation in the memory game decreasing the sample size from 21 to 19. "[Concentration] can be played by people across the lifespan, from young children to elderly adults, and across demographic and diagnostic groups (e.g. non-readers, children with mental retardation, adults with amnesia or communicative impairments, individuals form different cultures or native languages (Washburn & Gulledge, 2002)." The paradigm is ideal for testing visuospatial memory across cultures. In addition, Dominicans recognized the game as one they occasionally play called *Tea cup and saucer*. Thus, familiarity with the rules of the game was of no concern to researchers.

A typical game of concentration consists of matching pairs of symbols from an array of stimuli. In this case, the stimuli consisted of 8 pairs of matching cards, each differentiated by one of four shapes (circle, square, triangle, and star) in one of two colors (black and white). The stimuli were culturally unbiased – shapes are universally recognized.

Measures of performance for the visuospatial memory task were borrowed from Eskritt et al. (2001). Simply, a turn is counted as each time a set of cards is flipped. The more turns it takes to solve the memory task, the lower the performance rating will be. Given the nature of field work and the limited access to laboratory equipment, error measurements were not collected. Rather, performance was measured solely by counting the number of turns it took each participant to complete the game.

Ego Network Size: As a means for examining the external validity of social recall, researchers obtained social networks from all participants. A pile sort method was used. Network sizes were indexed by counting the number of nodes connected to the Ego. Both in-degree and out-degree ties were combined to get a total network size for each Ego (See Macfarlan (2010) for data collection and analysis).

CHAPTER 4

STUDY 1: RESULTS

A correlation matrix was constructed using the standardized values of all the memory variables. While all three measures of social exchange recall (*Recall 1, Recall 2, Recall 3*) were correlated at the significant or marginally significant level (R1 & R2; r= .53, p= .013; R1 & R3, r= .80, p< .000; R2 & R3= r= .42, p= .06), scores on the visuospatial memory task were not significantly related to any social exchange variables (R1, r= .-.13, p= .61; = R2, r= -.24, p= .31; R3 , r= -.164, p= .503). Table 1 displays descriptive statistics and correlations of all the memory variables.

Table 1. Correlation and descriptive statistics for memory variables

Variable	Spatial	Recall 1	Recall 2	Recall 3	Mean	s.d.
Spatial	1				31.35	10.6
Recall 1	-0.13	1			10.24	5.8
Recall 2	-0.24	0.53**	1		0.41	0.24
Recall 3	-0.16	0.8***	0.42*	1	5	4.9

Note. ***p< .000, ** p= .013, *p = .06

To bolster the external validity of the social recall measure and further separate its functional qualities from visuospatial memory, a preliminary analysis of individual differences in both abilities was assessed. Performance measures in both visuospatial tests and social exchange recall were examined as predictor variables in a regression analysis with social network size, a proxy for social competency (Table 2).

Results indicate that proclivity for accurate recall of past social exchanges (B= 3.588, t= 2.24, p=.039), and not visuospatial performance (B= -1.73, t= -1.04, p=.315), is a predictor of social network size. In this case, social network size is seen as a characteristic relevant to individual socio-cognitive competency. According to these results, the first hypothesis, that there is a distinction between memory systems based on function, was supported.

Table 2. A regression of social and spatial memory performance on social network size

Source	SS	df	MS	Number of obs	19
				F(2, 16)	3.86
Model	363.595148	2	181.797574	Prob > F	0.0429
Residual	754.089062	16	47.1305664	R-squared	0.3253
				Adj R-squared	0.2410
Total	1117.68421	18	62.0935673	Root MSE	6.8652

network_size	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
social recall	3.588563	1.599547	2.24	0.039	.1976755	6.979451
visuospatial	-1.733666	1.669708	-1.04	0.315	-5.273288	1.805957
_cons	19.56406	1.57683	12.41	0.000	16.22133	22.90679

CHAPTER 5

STUDY 2: POSITIVE ASSORTMENT FOR REPUTATIONS

METHOD

Participants

Two-hundred and three dyads were constructed from the 21 interviews. Egos, on average, had 9.9 (SD= 5.8) partners. After accounting for repeated dyads, the sample size was decreased to 144 unique dyads.

Measures and Procedure

Three individuals ranked 53 men actively involved in bay oil on their reputation for cooperation. A dichotomous scale was constructed using an emic term for cooperation: *kudme*. Individuals from the village, when asked to define *kudme,* described it as, "a free help," or help with no expectation of reciprocation. Raters were asked to rank each individual on their general willingness to give *kudme* (e.g. Would _____ give a kudme, yes or no?). Reputation scores were analyzed for reliability using consensus analysis. The results of the consensus analysis produced a new interval variable which was termed "reputation for cooperation."

Social contracts are represented in the literature as conditional statements, "If I help you, you are obligated to help me back." A violation of a social contract occurs when the obligation is not fulfilled. Discrepancy scores based on repeated social exchange, labor exchange in this instance, approximate an individuals degree of cheating within a dyadic relationship.

Labor exchange discrepancy scores were calculated for each dyad by subtracting the days received from the days given for each Ego. Thus, a score of 0 = equal exchange, -1 = one more day given by the Ego than received, and 1 = one more day received by the Ego than given.

Reputation assortment was constructed in a similar fashion. Values for reputation assortment were obtained for each dyad by subtracting the partner's reputation from the Ego's reputation and taking

the absolute value.

CHAPTER 6

STUDY 2: RESULTS

To examine the relationships of cumulative exchange interactions and reputations on recall ability, two mixed-effects logisitc regression models were compared. To account for their underlying contribution to the model, "Ego" and "Dyad" were used as grouping variables. Variables that did not conform to the assumptions of regression were transformed; the transformed data was used in the analysis. Descriptive statistics for all variables used are presented in Table 3.

Table 3. Descriptive statistics for study 2 variables

Variable	Obs	Mean	s.d.	Min	Max
Labor exchange discrepancy	208	0.13	2.4	-6	16
Partner reputation	144	0.9	0.24	0	1
Reputation Discrepancy	143	0.15	0.28	0	1

The first analysis suggests that the access of reputational information, in relation to cumulative direct experience, is a better predictor of recall of past social interactions. Partners' reputation for cooperation was a significant predictor of recall (O.R.= .26, z = -2.44, p = .015), whereas, discrepancy in labor exchange was not (O.R.= .96, z = 0.08, p = .65). Results support our hypothesis that reputational information would provide a more efficient form of social exchange status than will direct experience.

Given that reputation was a better predictor of recall than was direct experience, the analysis moved to an examination of the impact of non-random assortment on cooperative relationships. A second analysis probes the effectiveness of positive assortment in cooperative exchange relationships. The comparison revealed that discrepancy in repuational information, or assortment on reputation predicted recall better than partner reputation (O.R.= 0.26, z = -2.44, p = .015; O.R.= 4.33, z = 1.86, p = .06)

In both models reputation for cooperation was a stronger predictor of recall than was cumulative individual experience. Furthermore, a comparison of the models suggests reputation discrepancy scores predicted recall better than partner reputation alone. Table 4 presents the results of the mixed-effects logistic regression models.

Table 4. A comparison of two logistic regression models for recall of social information

Model 1: Partner reputation and labor exchange discrepancy				
Recall	O.R.	S.E.	z	P>z
Partner reputation	4.33	3.4	1.86	0.06
Direct experience discrepancy	0.94	0.7	-0.76	0.45
Model 2: Reputation discrepancy and labor exchange discrepancy				
Reputation discrepancy	0.26	0.14	-2.44	0.015
Direct experience discrepancy	0.96	0.8	-0.45	0.65

CHAPTER 7

GENERAL DISCUSSION

"The desire to gain an advantage by engaging in undefected free riding may be a basic temptation of human nature, and the desire to cooperate preferentially with other cooperators – and to confirm their cooperativeness with reputational or monitoring-related information may be equally deep rooted in the our evolved psychology (Price, 2006).

Memory for social exchange is not directly related to visuospatial ability. In light of EDSC (Flinn et al., 2005), visuospatial abilities, which were likely used for tasks that precluded ecological dominance, may have been selected for early in our history. "Studies of human memory for visuospatial stimuli are comparable to studies of memory by non-human animals, in that comparative studies of short-term memory most always employ a recognition paradigm of some sort." (Washburn & Gulledge, 2003). Socio-cognitive competencies, on the other hand, were probably selected for after ecological dominance and more towards the onset of group formations and repeated social interactions. In line with an adaptationist perspective, perhaps the absence of a significant relationship between memory for past social exchange and visuospatial memory exists because of their separation in evolutionary history.

The absence of a relationship between visuospatial and social exchange recall performance also supports the evidence for the existence of multiple memory systems with multiple functions (Klein, et al, 2002). If systems are formed based on the type of information that is relevant for solving adaptive problems, and ability to detect cheaters is not directly related to visuospatial ability, then one would not assume a necessary relationship between individual performance on both tasks.

Results also suggest that reputational information is more likely to be recalled than is a cumulative history of past dyadic exchanges, or the running tally on past partners. In support of standing strategy (Sugden, 1986; Liemar & Hammerstien, 2001; Panchanathan & Boyd; 2003; Roberts; 2008), it appears that in a real life labor exchange system, individuals call upon information in the form

of trait summaries – in this case, reputations - as opposed to cumulative direct experience when asked to recall past social exchange interactions.

As stated by theoretical biologists, standing strategies might be too demanding to be realized with respect to memory capacity (Milinksi et al., 2001; Panchanathan & Boyd, 2003; Roberts; 2008). Results from this study show, however, that use of trait summaries or reputations, presumably to inform future decisions, are more likely to cue an individual into the state of a past social exchange relationship. The use of trait summaries necessarily uses less memory than does recalling direct experience across all exchange partners thus, limited cognitive capacity can be reconciled. While this research does show that individuals recall social exchange information by cuing into reputational information, it does not provide any empirical support suggesting that an aptitude for correctly recalling social exchange information beneficially manifests itself – although the author would hypothesize that it would, in fact, be beneficial.

Furthermore, results point to non-random, assortment for cooperative work relationships. Individuals are positively assorting on reputations for exchange. That is, It is not just how good the reputation of a potential partner is, but how good their reputation is relative to how likely they are to be a potential partner. This makes sense given the literature on biological markets. As Noe & Hammerstein (1994) state, "With few exceptions, partner choice has not been recognized in cooperative and mutualistic systems." Recognized here, we show that cooperative partner choice is indeed affected by non-random assortment. Much like mating, individuals strive for the optimal partner relative to their status.

Limitations

This study suffers from a small sample size. This will be remedied shortly, however, as additional data is presently being collected. This study also does not account for sex differences, as the labor exchange system specific to this research consisted of men only. The most crucial limitation to

this study is absence of living proximity as a predictor of social recall. It is likely that an individual's proximity has an impact on their ability to recall past interactions. Future research will need to address this.

Future Research

Results are the product of an initial analysis. Future research could improve the model by adding proximity. Proximity likely plays an important role in intraspecific cooperation and mutualism insofar as it taps into direct observations between individuals (Panchanathan & Boyd, 2003). For a more powerful model, future research should address proximity along with direct experience and reputation. Furthermore, like labor exchange to social contract logic, an equivalent naturally occurring event that taps into hazard management logic would provide a good comparison to the results here, on social contract logic.

Implications

This research is not suggesting the existence of a social intelligence per say; rather, using evolutionary theory and the adaptationist program as a foundation, it examines the interplay between darwinian algorithms for social exchange and the memory systems they operate in tandem with. These findings highlight the potency of reputation and assortment for the functioning of psychological mechanisms associated with social exchange.

Although the study suffers from small sample sizes, the evidence presented articulates well with findings across theoretical biology, evolutionary psychology and anthropology, and neuropsychology.

Findings from this research can have important applications for cognitive anthropologists interested in schema formation, insofar as the mechanisms used in reputation may operate similar to the mechanism operating in the formation of reliable and generalizable schema.

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