

Indirect Reciprocity, Gossip, and Reputation-Based Cooperation

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Humans not only live incredibly social lives, but they also live incredibly prosocial lives. Biologists and social scientists have long marveled at the human ability to join together in efforts to produce public goods that could not be achieved by any single person alone. The ability for humans to cooperate, that is, to engage in behaviors that benefit others (sometimes even at a cost to oneself), underlies some of the most notable human accomplishments. Yet cooperation can sometimes be very challenging for individuals in a group (or between groups) because some situations can contain a conflict of interest, such that it is in each individual's immediate self-interest to free ride and take advantage of others' cooperation (i.e., social dilemmas; De Dreu, 2010; Fehr, Fischbacher, & Gächter, 2002; Van Lange, Rockenbach, & Yamagishi, 2014).

For decades theorists and researchers have attempted to understand why humans cooperate in social dilemmas (Dawes, 1980; Komorita & Parks, 1995; Pruitt & Kimmel, 1977; Van Lange, Balliet, Parks, & Van Vugt, 2014). One of the most long-standing traditions has been from a biological perspective. According to Darwinian theory of evolution, a species cannot evolve to be cooperative unless there are sur-

vival and reproductive benefits from cooperation, and cooperative traits must compete with noncooperative alternatives, which can result in potentially greater fitness benefits if social interactions are modeled as a social dilemma (see Rand & Nowak, 2013). This problem of cooperation has attracted some of the greatest minds across a number of scientific disciplines in the biological and social sciences.

Since the 1960s, many theories have been proposed to explain why humans evolved to cooperate. Hamilton (1964) formalized the idea that cooperating with kin can increase the replication of one's own genes by increasing the chance of survival and reproduction of others who share one's genes (i.e., inclusive fitness). This was followed by Trivers's (1971) model that people may cooperate with others from whom they expect future cooperation (i.e., direct reciprocity). With direct reciprocity, actors receive (sometimes delayed) benefits directly from the individual they helped. Several additional candidate models have been forwarded in more recent years, including costly signaling (Gintis, Smith, & Bowles, 2001), generalized reciprocity (Pfeiffer, Rutte, Killingback, Taborsky, & Bonhoeffer, 2005), and gene-culture coevolution (Richerson et al., 2016).

In this chapter, we draw attention to a model of how humans evolved to cooperate (and also avoid interactions with noncooperators)—reputation-based indirect reciprocity—and this model carries rich potential for understanding some basic cognitive and motivational processes underlying social behavior. Indirect reciprocity involves two events: (1) An actor extends a benefit (or not) to a recipient and (2) a third party obtains knowledge of the actor's behavior and decides to cooperate (or not) with the actor at some point in the future (Alexander, 1987/2017; Boyd & Richerson, 1989; Nowak & Sigmund, 1998b). An essential element for indirect reciprocity to occur is that a third party directly observes the interaction between the actor and the recipient or learns about the actor's behavior through communication, such as gossip. Direct and indirect reciprocity vary in how an actor acquires benefits from his or her own cooperation. *Direct reciprocity* occurs when the recipient of the benefit of a cooperative action returns a benefit to the cooperative actor. *Indirect reciprocity*, on the other hand, occurs when anyone, except for the recipient of the benefit of a cooperative action, delivers a benefit to the cooperative actor. Direct and indirect reciprocity can also involve responding to others' noncooperative actions by imposing either direct or indirect costs on the noncooperative actor, respectively. In this chapter, we focus on indirect reciprocity and reputation-based cooperation. Indirect reciprocity could be a unique evolutionary pathway to human cooperation, although a few examples suggest that indirect reciprocity can also occur in other species, such as cleaner fish (Bshary & Grutter, 2006) and song sparrows (Akçay, Reed, Campbell, Templeton, & Beecher, 2010). Regardless, the capacity for language has enabled humans to exploit this route to cooperation in large groups of genetically unrelated individuals (Dunbar, 2004).

Although much of the theoretical work on indirect reciprocity emerged from the biological sciences, the topic of indirect reciprocity is now widely studied by a growing number of scientists across numerous disciplines, including behavioral economics and psychology. They have studied (1) the influence of indirect reciprocity on cooperation in the lab and field, (2) environmental conditions that facilitate indirect

reciprocity, and (3) the proximate psychological processes that underlie this human ability. Our purpose in this chapter is to integrate biological, economic, and psychological research on how indirect reciprocity facilitates cooperation. In doing so, we use models in evolutionary biology to generate insights about how humans have evolved to engage in reputation-based indirect reciprocity and discuss ideas and research about the proximate psychological mechanisms operating to make this form of cooperation possible.

Evolutionary Dynamics, Direct Reciprocity, and Indirect Reciprocity

With the exception of species that reproduce incredibly fast (e.g., fruit flies), we cannot observe how the process of evolution selects for the adaptive design of a species. Because it can be exceedingly difficult, or even impossible, to study the process by which evolution shapes organisms, scientists have resorted to creating their own "organisms" (i.e., agents) in computer programs. Agent-based modeling is an approach used to study how evolutionary dynamics can select for certain behavioral strategies in a population of agents. This method has become incredibly popular over the last few decades and has yielded several valuable insights about how evolution could have shaped human social behavior (Nowak, 2006).

The models always begin with a population of agents that have preprogrammed behavioral strategies (e.g., always cooperate, always defect, tit for tat, and win–stay, lose–shift), and then these agents interact with each other over a lifespan in a situation that contains specified outcomes. The outcome is the number of offspring an agent produces in a lifetime, and offspring always have a higher chance to inherit the behavioral strategy of their parents. In the context of the study of cooperation, agents are most often specified to interact in a prisoner's dilemma (PD; or some variant of the PD, see Figure 14.1). In the PD, each person can decide to deliver a benefit (b) to the other at some cost (c) to him- or herself. When the benefit to the other is greater than the cost to oneself ($b > c$), then both can obtain better outcomes if each person decides to extend a benefit to the other. However, in this type of situation, the best out-

come for each person can be obtained by not paying the cost to deliver a benefit to the other, and nonetheless receive a benefit delivered by the partner. Thus, cooperation in the PD is mutually beneficial, but it is always vulnerable to exploitation and free riding by noncooperators. A corpus of literature has formed around understanding the behavioral strategies that can successfully maintain cooperation in a species and are robust to invasion by noncooperators (for reviews, see Nowak, 2006; Rand & Nowak, 2013; West, Griffin, & Gardner, 2007).

These models have generated support and insights about behavioral strategies of direct reciprocity in a population characterized by repeated encounters. Early modeling work demonstrated that the simple rule of tit for tat (i.e., cooperate first, then follow one's partner's previous behavior) outperformed many other more complex strategies (Axelrod, 1984). Subsequent modeling work discovered another strategy that outcompeted tit for tat—win–stay, lose–shift (i.e., cooperate only if both players had the same behavior on the previous round; Nowak & Sigmund, 1993). Yet these strategies can make costly errors in environments where people sometimes intend to cooperate but end up defecting. In these environments, a more for-

giving tit-for-tat strategy (i.e., cooperates once again after a partner defects, but then defects after a partner's second defection; tit for two tats; Wu & Axelrod, 1995) is more successful. Also, adding some generosity to the tit-for-tat strategy can be effective in “noisy” environments in which it is not always certain that an intended choice results in actual choice (Kollock, 1993). Indeed, changing parameters of the environment itself (e.g., the situation is noisy or not) or the social environment (i.e., the strategies followed by others) can affect which strategy is most successful. Thus, modeling work can benefit from attempting to make plausible assumptions about the ancestral conditions in which humans evolved to cooperate (Tooby & Cosmides, 1996).

The modeling work reported here provides us insights about how evolution may have shaped certain strategies of cooperation that could acquire direct benefits, and still prevent a population from being invaded and exploited by defectors. The models can be used to generate hypotheses about different adaptations humans could have developed to regulate their cooperation to acquire direct benefits (see Delton, Krasnow, Cosmides, & Tooby, 2011), such as cheater detection (Cosmides, Barrett, & Tooby,

		Player B	
		Cooperate	Not Cooperate
Player A	Cooperate	$b - c$ / $b - c$	b / $-c$
	Not Cooperate	$-c$ / b	0 / 0

FIGURE 14.1. The interdependence structure of a prisoner's dilemma. Cooperation means delivering a benefit (b) to one's partner at a cost (c) to oneself ($b > c$).

2010), revenge and forgiveness (McCullough, Kurzban, & Tabak, 2013), gratitude (Ma, Tunney, & Ferguson, 2017), generosity (Van Lange, Ouwerkerk, & Tazelaar, 2002), and inferences about future interactions (Delton et al., 2011).

Similarly, agent-based models have also provided insights about how evolution may have shaped the way humans engage in indirect reciprocity and its role in the maintenance of large-scale cooperation. Nowak and Sigmund (1998a, 1998b) found that indirect reciprocity can evolve if agents have knowledge about how their partners have behaved toward others in previous interactions (i.e., image score), then condition their behavior on their partners' past behavior. In this modeling work, in each round of interactions between agents, agents were randomly assigned to be a donor or a receiver. The donor could decide to pay a small cost to provide the receiver with a larger benefit. Each donor would receive a positive point for each helping behavior and a negative point for each failure to help. Cooperation evolved when agents assigned as donors conditioned their decisions to help based on the recipients' image score (i.e., only help if the recipient has a positive image score). Since this initial work, a number of models have further examined how different environments and decision rules can affect the evolution of cooperation via indirect reciprocity (e.g., Ohtsuki & Iwasa, 2006).

The modeling research described here serves two complementary goals. First, modeling behavioral strategies of indirect reciprocity can help us understand how humans evolved to cooperate. Second, the modeling work can be used to develop and test hypotheses about how evolution could have modified the design of an organism to cooperate to acquire direct and indirect benefits. Modeling evolutionary dynamics can be viewed as a way to develop theories and generate new predictions that can be tested using behavioral experiments—and this is where the modeling becomes most relevant for psychologists.

An initial step in testing predictions from an agent-based model is conducting behavioral experiments to observe whether human behavior varies according to how the models predict (for a list of predictions generated by specific agent-based models of indirect reciprocity, see Table

14.1). For example, empirical researchers could design lab experiments to examine whether the possibility of punishing defectors, with the decision to punish affecting one's reputation, is especially effective at promoting cooperation in larger groups (e.g., groups of eight vs. groups of four; dos Santos & Wedekind, 2015).

A further step would be unpacking the abilities that could have evolved to promote these types of behavior—and this is often an entirely different enterprise in applying evolution to understanding human behavior, often referred to as an *adaptationist approach* or *evolutionary psychology* (Tooby & Cosmides, 1992). The agent-based models provide insights about the evolutionary success of certain behavioral strategies, but the models are agnostic about the actual psychological mechanisms that could have evolved through the process of evolution to promote such behaviors. Importantly, evolution does not select for organisms to engage in a specific behavior. Instead, the outputs of the evolutionary process are psychological mechanisms that process input from the environment and produce behavior. Interestingly, there has been much more agent-based modeling work on the role of indirect reciprocity on cooperation compared to an adaptationist approach. Much of what comes next is a discussion of the possible psychological mechanisms that could be operating to enable indirect reciprocity to promote large-scale cooperation. Yet prior to discussing the proximate psychology of indirect reciprocity, we take a moment to consider recent work that has documented the phenomenon that people actually engage in indirect reciprocity in their daily lives and in controlled lab environments.

Indirect Reciprocity in the Field

Agent-based modeling of the evolution of indirect reciprocity suggests that humans could have adaptations that regulate their cooperative behavior in a way that is structured according to indirect reciprocity. One of the first steps in a program of research on this topic is to document that humans in fact do behave in ways that look like indirect reciprocity, and a number of recent field studies give us insights in this matter.

TABLE 14.1. Examples of Testable Hypotheses about Human Behavior Derived from Agent-Based Modeling on Indirect Reciprocity

Study	Model description	Hypotheses
dos Santos & Wedekind (2015)	Computer simulations tested two reputation systems (reputation based on cooperative and noncooperative actions and reputation based on punitive and nonpunitive actions) in a public goods game involving groups of unrelated individuals.	Compared to reputation systems based on cooperation, reputation systems based on punishment (1) are more likely to lead to the evolution of cooperation in larger groups, (2) more effectively sustains cooperation within larger groups, and (3) are more robust to errors in reputation assessment.
Leimar & Hammerstein (2001)	Simulations tested how cooperation evolves through two indirect reciprocity strategies (i.e., image scoring and standing strategy).	(1) Image scoring strategies enhance cooperation only when the cost of cooperation is small. (2) Standing strategy outperforms image scoring even when there are errors in perception.
Roberts (2008)	Evolutionary simulations compared indirect reciprocity strategies (i.e., image scoring and simple standing) with direct reciprocity strategies in large groups with less repeated interactions and in small groups with more repeated interactions.	(1) As probability of repeated interactions increases, indirect reciprocity through image scoring becomes less stable in promoting cooperation than direct reciprocity by experience scoring. (2) Indirect reciprocity through standing strategy is as stable as direct reciprocity in promoting cooperation when individuals have repeated interactions with few partners.
Sasaki, Okada, & Nakai (2017)	An evolutionary analysis compared a simple “staying” norm with other prevailing social norms that discriminate the good and the bad.	Staying is most effective in establishing cooperation than other social norms that rely on constant monitoring and unconditional assessment (i.e., scoring, simple-standing, stern-judging, and shunning). ^a
Giardini, Paolucci, Villatoro, & Conte (2014)	An agent-based simulation assessed how cooperation rates change when agents can punish others or know others' reputation and then defect with free riders or refuse to interact with them.	(1) Both punishment and reputation-based partner selection are effective in maintaining cooperation. (2) Cooperation decreases when people defect after learning about free riders' reputations. (3) A combination of punishment and reputation-based partner selection leads to higher cooperation rates.
Giardini & Vilone (2016)	An agent-based model tested the conditions under which gossip and ostracism might enhance cooperation in groups of different sizes by addressing the effects of quantity and quality of gossip, network structure, and errors in gossip transmission.	(1) Cooperation is more likely to thrive in larger groups when the amount of gossip exchanged is abundant. (2) Inclusion errors (i.e., one's negative reputation is understood as positive) in gossip transmission are more detrimental to cooperation than exclusion errors (i.e., one's positive reputation is understood as negative).

^aStaying = the reputation of a person who gives help stays the same as in the last assessment if the recipient has a bad reputation; scoring (or image scoring) = people lose reputations anytime they fail to help someone in need; simple standing (or standing strategy) = reputation declines when one fails to help someone with a good reputation; stern judging = people lose reputations when they help someone with a bad reputation or fail to help a person with a good reputation; shunning = people gain a good reputation only when they help someone with a good reputation; otherwise they lose a good reputation.

In a field study with 2,413 residents, researchers collaborated with a utility company to examine participation in a program to prevent blackouts during high electricity demand (Yoeli, Hoffman, Rand, & Nowak, 2013). They found that participation rate was tripled when residents' identities were observable (vs. concealed) on the sign-up sheet, and this positive effect of observability was four times larger than that of monetary reward. More importantly, observability had a larger effect for homeowners (vs. temporary renters) and people living in apartments (vs. houses), as they tend to have longer-term relationships with neighbors. In this study, we clearly see that people are more cooperative when their behavior is observable, and so can affect their reputation within their social network.

Similarly, van Apeldoorn and Schram (2016) examined indirect reciprocity in a field experiment utilizing an online platform in which people can ask and offer services to each other for free. They created new member profiles that vary in serving history (i.e., "serving" or "neutral" profile), then sent out service requests to worldwide members. People were more likely to reward a service request from someone who had previously offered services to others. Another natural field experiment conducted in a hair salon revealed that customers tended to offer more tips to hairdressers who were collecting donations to a charity, compared to doing nothing (Khadjavi, 2016). These studies support the idea that people are more cooperative with others who have a cooperative reputation.

In fact, people are strongly influenced by information about others' reputations, even more so than information about their similarity with others. Abrahao, Parigi, Gupta, and Cook (2017) conducted a large-scale online experiment with 8,906 users of Airbnb playing an interpersonal investment game. In this game, the users had to make trust decisions toward potential receivers whose profiles varied in distance (i.e., the extent to which the receiver matched the demographic attributes of participants across four categories) and two reputation features (i.e., the average ratings and the number of reviews on Airbnb). The users had 100 credits that they could keep or invest in the receivers they chose. Any amount invested was tripled and the re-

ceiver could then decide to return some amount to users. The authors found that people tend to trust receivers with a better reputation even though they are dissimilar, and this was further confirmed when analyzing real-world data of 1 million actual hospitality interactions among users of Airbnb.

Taken together, these field studies show that indirect reciprocity promotes cooperation in contexts outside of the laboratory. Specifically, this work documents that people are willing to (1) behave in ways that maintain a positive and cooperative reputation and (2) condition their cooperation on their partners' reputations.

Indirect Reciprocity in the Lab

Several experiments using economic games as a paradigm to study cooperation have demonstrated that people do engage in indirect reciprocity. Wedekind and Milinski (2000) conducted a behavioral experiment with a design similar to previous modeling work (i.e., Nowak & Sigmund, 1998b). In this study, participants interacted with each other in several rounds, and in each round they were selected to interact with a different person as a donor or a receiver. The donor decided whether to give 2 Swiss Francs to a receiver who would then earn four Swiss Francs. In each round, participants (assigned a pseudonym) could see the previous decisions made by their partners. The study revealed that people were more likely to give money to another person who had given money to others in the past.

Similar experiments have revealed that people are more likely to help others who have a positive reputation (Engelmann & Fischbacher, 2009; Seinen & Schram, 2006; Stanca, 2009). When people can build a reputation in a group based on their helping behavior, then groups display higher levels of cooperation (Milinski, Semmann, & Krambeck, 2002). Furthermore, when people can gossip about each other during interactions in a repeated public goods game (i.e., a multiperson PD), then people become more cooperative, compared to when gossip is not allowed (Feinberg, Willer, & Schultz, 2014; Wu, Balliet, & Van Lange, 2015).

Of course, people may strategically build reputations to achieve higher earnings (e.g.,

only help others when being observed), and economists have been interested in empirically distinguishing such strategic behaviors aimed at maximizing self-interest from a motivation to extend benefits to others who have a cooperative reputation. To accomplish this, Engelmann and Fischbacher (2009) had participants interact in an 80-trial helping game involving a donor and a receiver. Participants were randomly assigned to be a donor or a receiver in each trial, and had a public or private score for the first or last 40 trials (i.e., public scores displayed past behaviors to current partners, and this information was not provided to current partners in the private score condition). This design allowed participants to interact with others who had private or public scores. Importantly, they found that people with a private score were still willing to help others with a higher positive public score. Thus, participants with a private score had no strategic incentives to condition their cooperation toward people with a cooperative reputation, so it is unlikely that a motivation to maximize own outcomes was directing these behaviors. The authors take this as evidence that people have a social preference to help others who have a helpful and cooperative reputation.

Lab studies have also examined how effective and efficient indirect reciprocity can be at promoting cooperation. This question becomes especially relevant when one compares gossip (i.e., reputation sharing) with another mechanism that can support cooperation: the possibility to punish others' past behavior. A prior study revealed that gossip is more effective and efficient than punishment (Wu, Balliet, & Van Lange, 2016a). Although punishment can be an effective means to promoting cooperation, punishment is costly to enact and can result in retaliation. Gossip, on the other hand, may be less costly to enact and involves less exposure to the costs of retaliation. There can be reputational costs in gossip, but this is not always true (Feinberg, Cheng, & Willer, 2012).

The agent-based models suggest that indirect reciprocity is a possible route through which evolutionary processes shape human cooperation, and now we see that both lab and field experiments have documented that people do engage in indirect reciprocity. However, docu-

menting the existence, effectiveness, and efficiency of indirect reciprocity does not provide an explanation for this behavioral phenomenon. Moreover, agent-based models and economic models do not specify the cognitive and motivational processes that produce behaviors in a system of indirect reciprocity. Currently, there is a need to develop theories about the proximate psychological mechanisms that could be operating to produce these forms of behavior.

An Evolutionary Psychology Approach

Agent-based models suggest that humans could have evolved to cooperate in a system of indirect reciprocity, so an evolutionary psychology approach can be applied to hypothesize about the proximate psychological mechanisms that could have evolved to produce these behaviors. Evolutionary psychology aims to understand how different cognitive and motivational mechanisms of the human mind have evolved to function and produce behavior. Prior to applying this perspective, we need to understand a few key concepts (for several reviews, see Confer et al., 2010; Cosmides & Tooby, 2013; for comparisons of this perspective to other approaches in the social sciences, see Tooby & Cosmides, 1992, 2015).

An evolutionary psychology approach is an adaptationist research program, in that researchers test hypotheses about some adaptive designs of an organism that promote a functional output. An *adaptation* has four properties: (1) It is a system of reliably developing properties of a species, (2) it is incorporated into the design of an organism, (3) it is coordinated with the structure of the environment, and (4) it causes a functional outcome (at least increases the probability of a functional outcome within the environment that it evolved; see Tooby & Cosmides, 2015). Adaptations must solve a problem necessary for the reproduction of an organism and can be understood as the output of the evolutionary process. Thus, an evolutionary psychology research program is largely about understanding the adaptations that underlie and explain variability in human behavior.

To understand any single adaptation, researchers need to generate hypotheses about

the *environment of evolutionary adaptedness* (EEA). The EEA “for a given adaptation is the statistical composite of the enduring selection pressures or cause-and-effect relationships that pushed the alleles underlying an adaptation systematically upward in frequency until they became species-typical or reached a frequency-dependent equilibrium” (Tooby & Cosmides, 2015, p. 25). Each adaptation would have a corresponding specialized EEA with which the adaptation is coordinated to promote a behavior that enhanced survival and reproductive success within those environmental conditions. The EEA is not a specific time or place, but it contains the reliably recurring environmental challenges and opportunities that gave rise to the adaptation. Thus, an evolutionary psychology program of research generally tests hypotheses about an adaptive psychological mechanism that enables a specific behavior, and uses knowledge and assumptions about the EEA to generate hypotheses about how the adaptation (i.e., proximate psychological mechanism) might work to produce the behavior. Furthermore, this approach can be used to forward hypotheses about how an adaptation that evolved to function for one purpose can be exapted and applied to a different purpose (Andrews, Gangestad, & Matthews, 2002; Buss, Haselton, Shackelford, Bleske, & Wakefield, 1998). The distinction between adaptations and exaptations may be especially important in understanding the emergence of indirect reciprocity, and how the phylogenetically older psychological mechanisms that evolved for direct reciprocity could be exapted to enable indirect reciprocity.

In the following sections, we break down a system of indirect reciprocity into its most simple elements—three persons in a social network. We discuss specific potential adaptive challenges and opportunities in the EEA for each person in this network and hypothesize about possible adaptations that motivate fitness-enhancing behaviors to resolve those adaptive problems.

Emergence of Indirect Reciprocity in the EEA

Humans lived in small hunter–gatherer groups prior to the advent of agriculture, and it is thought that many human adaptations for co-

operation have arisen from reliably recurring opportunities and challenges before and during this period. Research comparing humans to chimps and bonobos suggests that a common ancestor may have already possessed some key adaptations for cooperation, such as for direct reciprocity—to help others who are helpful to you, and not help those who did not help you (De Waal, 2008; Jaeggi, Stevens, & Van Schaik, 2010; Warneken & Tomasello, 2006). Adaptations for direct reciprocity could have provided the foundation for indirect reciprocity to emerge in human societies.

Direct reciprocity can be an effective strategy to maintain cooperation in small groups in which people will interact with each other in the future, can observe everyone’s behavior, and share a history with each interaction partner. However, direct reciprocity may face difficulties in sustaining cooperation in larger groups, or at least indirect reciprocity would enable people to more effectively avoid costly interactions with noncooperators (even during the first encounter), and to capture even greater benefits from cooperation by netting not only direct but also indirect benefits in larger groups. Furthermore, language was likely a key ability that amplified the benefits of indirect reciprocity. Language enabled people to communicate their own social interaction experiences with many others, and this information could be used as an input to learn about others’ past behavior, to update reputations, and to condition cooperation (Dunbar, 2004). Thus, as human groups expanded in size, this increased the frequency of people having valuable first-encounter interactions and decreased the ability to directly observe all possible interaction partners. These changes in the social ecology, along with an enhanced ability for language, were key conditions that amplified the indirect benefits of cooperation and paved the way for indirect reciprocity, thereby enabling natural selection to shape psychological mechanisms functionally specialized for this structure of social interactions.

How did indirect reciprocity become a major force shaping human social behavior? One critical action in a system of indirect reciprocity involves one person cooperating or not with another person, and this would have been oc-

curing deep into our ancestral past, and beyond a common ancestor we share with the other great apes. Therefore, it is possible that indirect reciprocity takes hold when people learn about others' reputation and condition their behavior toward others based on that reputation (as opposed to previous direct experience or benefits). As mentioned earlier, humans likely had adaptations for direct reciprocity, and these preexisting psychological mechanisms could have been exapted to acquire input from others' experiences shared via language. Language enabled people to communicate their experiences with many others, and if people conditioned their cooperation toward the actor based on this input, then this enabled opportunities for people to behave in ways to affect their reputations and receive indirect benefits. This perspective predicts that at least some adaptations for direct reciprocity, such as abilities for cheater detection and welfare tradeoffs (Cosmides, 1989; Cosmides & Tooby, 1992; Sznycer, Delton, Robertson, Cosmides, & Tooby, 2019), could use language as input to condition cooperation and partner selection.

Once humans were able to share information with each other, then use that information to condition their cooperation, this form of structured interactions would have enabled natural selection to operate on functionally specialized abilities to (1) condition behavior to acquire indirect benefits, (2) share information to acquire direct benefits (since gossip has value to interaction partners), and (3) evaluate gossip and use it to select cooperative partners and condition cooperation. An important line of future research may consider understanding what adaptations for direct reciprocity have been exapted for indirect reciprocity and which, if any, adaptations are unique to indirect reciprocity. This line of research will need to clearly delineate the different adaptive challenges of a system of indirect reciprocity. Figure 14.2 displays the essential components of a system of indirect reciprocity and identifies distinct adaptive challenges that can occur for different persons within the network. Next, we discuss the different adaptive problems, some hypothesized solutions, and relevant research on these topics.

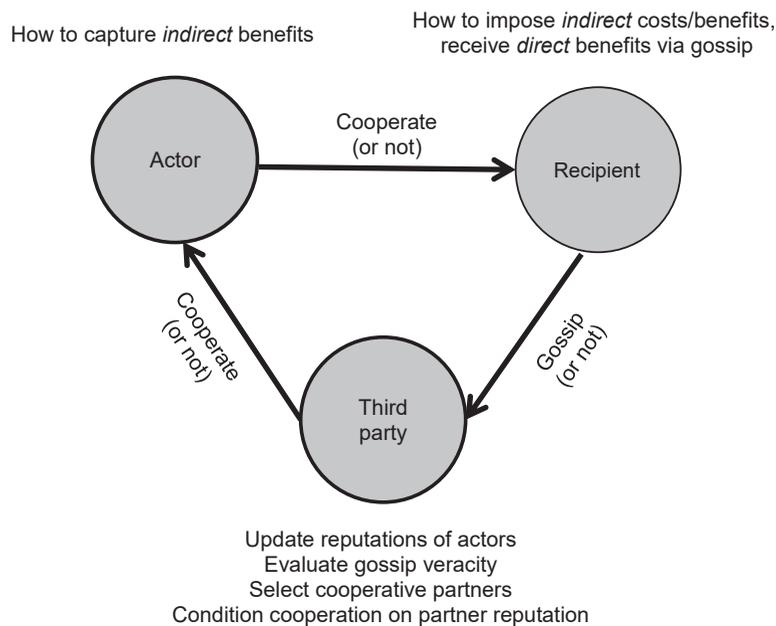


FIGURE 14.2. Indirect reciprocity and adaptive problems faced by the actor, recipient, and third party.

Managing a Cooperative Reputation (the Actor)

In a system of indirect reciprocity, cooperative people can capture indirect benefits from others and avoid ostracism in social interactions, and this can offset the cost of cooperation. Thus, conditioning cooperation in ways to acquire these benefits and avoid these costs could be a reliably recurring adaptive challenge. A generalized learning system would have difficulty in solving this problem because indirect benefits can be incredibly challenging to anticipate, and the rewards of one's cooperative behavior can occur a long distance in time from the actual cooperative behaviors. In fact, to anticipate these indirect benefits, people would need to understand that the recipient would evaluate their behavior positively, remember their behavior, share that information with others—and especially others with whom the actor would meet and interact in the future, that the recipients of the gossip would use that information to form an evaluation of the actor, that the recipients of gossip would meet them in the future and condition their behavior on that information, and that the benefit received from that future interaction would be larger than the cost of the present cooperation. Previous research suggests that people find this difficult to do, even when they obtain very explicit information about how their actions affect the recipient, that the recipient will communicate with a third person, and that the third person has a chance to select them as a partner (and to possibly reward them with a larger benefit). For example, Wu, Balliet, and Van Lange (2015b) conducted three studies in which participants knew (or not) that a recipient of their generous behavior could gossip about their behavior to a third person, and that this third person could use that information to condition his or her own behavior toward them in a future interaction. Although participants were more cooperative when they knew their behavior would be gossiped about, this increase in cooperation was not explained by the participants' expectation that the third person would be kind to them in a future interaction. Perhaps the problem of identifying opportunities to cooperate to acquire indirect benefits is better solved by a functionally specialized ability to use *cues* in social interactions that would identify situa-

tions in which people could often acquire greater indirect benefits for their cooperation.

Social network structures can provide some insights about situations that may result in greater indirect benefits. Recent work has revealed that several characteristics are reliably recurring in social networks in large-scale modern societies, as well in small-scale hunter-gatherer societies (Apicella, Marlowe, Fowler, & Christakis, 2012; Hamilton, Milne, Walker, Burger, & Brown, 2007; Hill et al., 2011; McGlohon, Akoglu, & Faloutsos, 2011; Porter, Mucha, Newman, & Warmbrand, 2005). Two of these social network properties are that (1) social networks are “small” and (2) some people are better connected than others. Specifically, in most social networks, it takes very few connections to travel from one node to another, so gossip and reputational information can easily spread widely throughout a social network. Furthermore, the number of network connections any single individual has in a social network is unevenly distributed, with some people having more network connections than others. If these properties of social networks did indeed covary with the probability of actions translating into indirect benefits, then it might be possible that natural selection would favor an ability to condition cooperation on the social network properties of an interaction partner (or any observer of one's behavior).

In order for this to be possible, there would need to be cues that reliably covary across social interactions that could be used to indicate which situations are more likely to translate into indirect benefits. Cues that a person is either connected to one's social network or that the person is well connected within one's social network could both indicate opportunities for indirect benefits (Wu et al., 2016c). Previous research indicates that people extended greater cooperation and generosity to a person who could communicate to a future interaction partner (Wu et al., 2015), and that people were more generous toward others who could communicate with a greater number of their possible future interaction partners (Wu et al., 2016c). Thus, initial evidence provides support for the idea that cues that covary with network properties may be used to condition cooperation to acquire indirect benefits. Similarly, Yamagishi, Jin, and Ki-

yonari (1999) suggested that people use group membership as a cue of a shared social network, and that cooperation with ingroup members is a strategy to acquire indirect benefits.

Another possible cue for indirect benefits is observability. Observers may select or avoid an actor based on the observed behavior, and observers may also gossip about what they have witnessed. Prior research indicates that reducing anonymity tends to increase cooperation (Andreoni & Petric, 2004; Wang et al., 2017), and researchers have argued that this effect may be due to reputational concerns (e.g., Sparks & Barclay, 2013). Watching eyes, such as a pair of eyes on a computer screen when people are making decisions, have been found to enhance generosity and cooperation (Haley & Fessler, 2005). Recent meta-analyses, however, have either found no effect of eye cues (Northover, Pedersen, Cohen, & Andrews, 2017) or discovered only a few situations in which the effect may be found. For example, eye cues only increase the probability of giving but not the overall level of generosity (Nettle et al., 2013), only increase cooperation after brief exposure (Sparks & Barclay, 2013), and the eyes need to be open and attentive (Manesi, Van Lange, & Pollet, 2016). Furthermore, it may be that observability affects cooperation via a different process than reputation. For example, the presence of others may serve as a cue of being mutually dependent on another person (Balliet, Tybur, & Van Lange, 2017). Observability is certainly a central issue in indirect reciprocity that may have enabled a simple form of indirect reciprocity prior to the existence of language and sharing gossip about others. Future research can attempt to better understand how anonymity and observability influence behaviors that are aimed at reputation management, while controlling and accounting for alternative explanations.

Two interrelated issues for future research on reputation management are (1) how to manage several dimensions of reputation and (2) how the social ecology shapes the strategies people use to manage their reputation. Modeling and experimental research on cooperation has tended to focus on how people can form cooperative reputations, but reputations can be multifaceted and track many other traits and characteristics of people (e.g., dominance, competence, and

mate value). Recent work in our lab had people describe their daily-life events about which they either shared or received gossip (Dores Cruz et al., 2018). We found that the gossip people reported in their daily lives covers a broad range of personal characteristics that fall into the six broad dimensions of personality (i.e., Honesty–Humility, Emotionality, Extroversion, Agreeableness, Conscientiousness, Openness to Experience) and the major dimensions of social perception (i.e., warmth, competence, dominance, and morality). One adaptive challenge in managing one's reputation is to understand how a behavior would be evaluated along each of these dimensions, as well as what characteristics would be of value to future interaction partners. Moreover, little is understood about how reputation management strategies vary across social ecologies. One possibility is that variation across societies in the opportunity costs of forming new relationships (Thomson et al., 2018) relates to how much people will invest in a cooperative reputation and which traits people attempt to communicate to others.

Gossip and Reputation Sharing (the Recipient)

People engage in actions that directly affect others' outcomes, and these actions can spark recipient evaluations and behaviors in response to these actions and outcomes—a topic that has been widely studied as moral evaluations, judgment, and behavior (e.g., Skowronski & Carlston, 1987). From an evolutionary perspective, humans may have evolved strategies in social interactions to increase the chance of future benefits and reduce potential future costs. These strategies would function to shape others' behavior that can affect one's outcomes. One strategy is to directly reciprocate benefits and costs. For example, when an individual is mistreated, he or she may experience anger, which mobilizes direct confrontation that can function to adjust the transgressors' actions in future encounters (e.g., become more cooperative; Sell, Tooby, & Cosmides, 2009). An alternative strategy is to share information with others who will confer benefits and impose costs on the actor. For example, a person who is exploited in an interaction can share this experience with a third party, who then may decide against selecting

the actor as a future cooperative partner. Here we focus on the adaptive challenges of when and how to share information about others' behavior (e.g., gossip).

Human communication via language greatly expands the human capacity to obtain knowledge about others in their social networks. People often talk about other people, and this is pervasive across small- and large-scale societies (see Dunbar, 2004). Previous theory has suggested that humans may use language strategically to communicate information about others, and especially absent third parties. For example, people who have been treated poorly by another could directly aggress against that person or impose harm on him or her, but this is a strategy that is exposed to the costs of retaliation. Instead, people could share information about that person's past behavior with others in the absence of the actor, and the recipients of that information could then impose costs on the actor (i.e., indirect aggression; Archer & Coyne, 2005) or avoid the person in the future. Humans may have a functionally specialized ability to share information about others in ways that increase the likelihood that benefits and costs occur to others because the behavior

could indirectly enhance an individual's reproductive fitness by further enhancing the fitness of a cooperative ally or reducing the fitness of a previously uncooperative exchange partner (Molho, Tybur, Van Lange, & Balliet, 2020).

Talking about others, especially in their absence, is known as gossip. Unfortunately, gossip has not received extensive research attention, perhaps because it has been widely viewed as a trivial social behavior of little consequence. Thus, when and how people gossip about others is an understudied topic of research, and this is unfortunate given that theory of indirect reciprocity provides a functional account of gossip in regulating social relationships and that people around the world engage in this behavior.

Research over the past few decades has approached and defined gossip in many different ways (for an overview of definitions, see Table 14.2). Common themes across these definitions are that gossip involves communicating information about an absent third party (or at least the third party is not knowledgeable of the information exchanged). Other approaches have emphasized that the communicated information must contain some evaluative content (e.g., Foster, 2004) and that the communication must be

TABLE 14.2. Definitions of Gossip

Reference	Definition of <i>gossip</i>
Dunbar (2004)	"conversation about social and personal topics" (p. 109)
Feinberg, Cheng, & Willer (2012)	"sharing of evaluative information about an absent third party" (p. 25)
Fine & Rosnow (1978)	"a topical assertion about personal qualities or behavior, usually but not necessarily formulated on the basis of hearsay, that is deemed trivial or nonessential within the immediate social context" (p. 161)
Fonseca & Peters (2017)	"the class of speech that transmits information about the behaviors and attributes of third parties" (p. 254)
Foster (2004)	"the exchange of personal information (positive or negative) in an evaluative way (positive or negative) about absent third parties" (p. 83)
Hess & Hagen (2006)	"personal conversations about reputation-relevant behavior" (p. 339)
Noon & Delbridge (1993)	"the process of informally communicating value-laden information about members of a social setting" (p. 25)
Piazza & Bering (2008)	"the mechanism by which social information (derived from direct experience) gets transmitted to absent third parties" (p. 172)
Wittek & Wielers (1998)	"the provision of information by one person (ego) to another person (alter) about an absent third person (tertius)" (p. 189)

informal (Noon & Delbridge, 1993). Yet previous theory of indirect reciprocity does not specify that the information communicated needs to be evaluative; it could simply be factual, and neither should it have to be informal. In fact, formal evaluations, such as an employer giving an evaluation of an employee, is an institutionalization of gossip—organizations understand the functional benefits of gossip in terms of selecting and retaining cooperative allies. We take the perspective that gossip is the sharing of information about a third party who is not knowledgeable about the information exchange. Such gossip does not need to be evaluative; it can be simply factual and can be either formal or informal.

There are several adaptive problems of gossip, such as when, how, and with whom to gossip to impose costs or benefits on an actor. First, people may gossip in ways that amplify the benefits and costs to the actor. People may strategically share gossip with others who will have future interactions with the target of gossip, and thus may be especially likely to share gossip with ingroup members or people who are connected to their social network. People may share gossip in a way that communicates attributes (e.g., competence, trustworthiness) of the target that would make him or her especially (un)desirable as a cooperation partner to others. People could have an ability to understand when to share facts versus evaluations, and when to exaggerate certain evaluations of the target.

Second, people may use gossip as a resource in exchange for other direct benefits from the recipients of gossip. From the perspective of indirect reciprocity, gossip can be a valuable resource that enables others to select mutually beneficial, cooperative allies and avoid costly encounters with noncooperators. Thus, people should be willing to reciprocate the benefits received from gossip. Indeed, previous work has indicated that exchanging gossip can enhance trust, reciprocity, and social bonding (Peters, Jetten, Radova, & Austin, 2017). Furthermore, sharing highly negative gossip about others could make the gossiper even more vulnerable and, indeed, people tend to share negative gossip only when they trust the recipient (Ellwardt, Wittek, & Wielers, 2012; Grosser, Lopez-Kidwell, & Labianca, 2010). An interesting possibility is that

sharing negative gossip could especially help to further build trust and bonding between individuals.

Third, people may gossip in ways that reduce the likelihood of exposure and retaliation from the target of gossip. How would people avoid the cost of retaliation for being exposed for gossiping? People should be sensitive to the qualities of the relationship between the recipient and the target of gossip. In particular, people may be less likely to share negative gossip about targets who are genetically related to the recipient or close to the recipient. Moreover, certain qualities of the recipient may increase the chance of detection, such as the person being well connected within a social network, untrustworthy, or highly dominant. In addition, certain qualities of the target, such as how well connected the target is in his or her social network, and his or her prestige and standing within the group, may also increase the chance of detection.

Reputation Updating, Partner Selection, and Conditional Cooperation (Third Party)

Previous modeling work has clearly displayed that sharing information about others' behavior in a social network can promote the evolution of cooperation, and we recognize at least three adaptive problems for the recipients of gossip (i.e., third parties): (1) how to update an actor's reputation based on new information, (2) how to use reputation to select and avoid partners, and (3) how to use others' reputations to condition their own cooperation.

Reputation has been discussed and defined in many ways across different literatures (for some prominent definitions, see Table 14.3). Across these definitions, there are some key similarities and differences. Reputation can be thought to involve information that is shared about a person among multiple people. The information is usually about some attribute of the person, and possibly a corresponding evaluation of that attribute. Many scholars theorize that reputation exists at a collective level of analysis and refers to a shared belief and evaluation of a person (Anderson & Shirako, 2008; Emler, 1990). However, most research also acknowledges that an individual's evaluation of another's actions can contribute to shaping that person's reputa-

tion in the mind of the individual, and if shared with others, then the individual's evaluation contributes to the collectively shared evaluation of that person. Reputation is meaningfully tied to social status, prestige, and one's standing in a social group (Tedeschi & Melburg, 1984). Indeed, future research can more clearly delineate the uniqueness of reputation beyond these existing constructs and situate reputation in the nomological net of existing constructs in psychology.

One adaptive problem is how to form a reputation of the actor based on his or her actions toward the recipient. The actor's reputation would ideally enable the third party to avoid being exploited by a noncooperator and facilitate selecting cooperative partners for mutually beneficial exchange. Initial models of indirect reciprocity tested a simple rule of assessing reputation called *image scoring* (Nowak & Sigmund, 1998b). To assess an image score, people just kept track of whether someone was cooperative (+1) or noncooperative (-1) with others in prior interactions, then cooperate with others having a positive image score. However, this reputation-updating strategy may be too simple and actually punishes a person who defects (i.e., refuses to cooperate) with another person having a negative image score. An additional strategy that has been modeled in previous work is called *standing strategy* (i.e., assigning a negative reputation only to someone who fails to cooperate with a cooperator; see Yamamoto, Okada, Uchida, & Sasaki, 2017). Although this strategy places greater demands on memory to update reputational scores, the standing strategy does not impose punishment on people who do not cooperate with others who have been uncooperative in the past, and thus can distinguish between justified and unjustified noncooperators.

Some prior research has tested whether humans use image scoring or standing strategy to update reputations. Milinski, Semmann, Bakker, and Krambeck (2001) conducted an experiment to observe how people behave toward others who cooperate, or not, with a noncooperative person. They found that participants who did not cooperate with a noncooperative person were defected on in subsequent interactions. This was taken as evidence that the

people did not take into account the interaction partner's reputation but used a simpler updating rule based on an actors' behavior (cooperate or not). In contrast, Bolton, Katok, and Ockenfels (2005) found that while providing information about a partner's past behavior (i.e., image scoring) increased cooperation, there was an even higher increase in cooperation when participants were provided with second-order information (i.e., the partner's previous partner's past action), which suggests that standing strategy exists. Thus, it is still uncertain whether people follow a more complicated reputation-updating rule like a standing strategy. It has been argued that image scoring is a simpler heuristic that avoids the problem of recursive reasoning, for example, that a person should know his or her partner's (say, person *A*) previous behavior toward person *B*, person *B*'s previous actions toward person *C*, person *C*'s actions toward person *D*, person *D*'s actions toward person *E*, and so on. If any single interaction is missing, then a person cannot adequately use a standing strategy to update the reputation of a partner, so this could result in an image scoring heuristic as a useful, though imperfect, shortcut. That said, an evolved ability to update reputational information may circumvent these problems by only searching and using input from first-order and second-order information, and not attempt to secure all the information about the history of interactions (which is likely an insurmountable computational problem). Future research is necessary to better understand how humans update reputations.

People may also spread false information about others. There can be possible benefits to an individual to manipulate gossip to derogate competitors and enhance one's relative standing in a social network (Barkow, 1992; Emler, 1990). Moreover, gossip can also contain errors that occur during communication (Hess & Hagen, 2006). In order for indirect reciprocity to promote cooperation, people need to be able to accurately assess others' reputations. Thus, one adaptive problem is assessing the veracity of gossip. Hess and Hagen conducted several experiments to test cues of gossip veracity and found that people perceive gossip to be more accurate (1) when they receive the same information from multiple independent sources

TABLE 14.3. Definitions of Reputation

Reference	Definition of reputation
Anderson & Shirako (2008)	“the set of beliefs, perceptions, and evaluations a community forms about one of its members” (p. 320)
Emler (1990)	“that set of judgments a community makes about the personal qualities of one of its members” (p. 171)
Milinski (2016)	“the current standing the person has gained from previous investments or refusal of investments in helping others” (p. 1)
Stiff & Van Vugt (2008)	“socially shared information about a potential interaction partner” (p. 156)
Whitmeyer (2000)	“an attribute attached to actors (or perhaps objects) that signals that they are more or less likely to be desirable for some sort of interaction than those without the attribute” (p. 189)
Wu, Balliet, & Van Lange (2016b)	“a set of collective beliefs, perceptions, or evaluative judgments about someone among members within a community” (p. 351)

and (2) when there is no detectable conflict or competition between the gossipier and the target of gossip. Thus, it seems that people use cues that enable them to assess the accuracy of gossip, and this could be an adaptation that enabled more accurate updating of others' reputations and better selection of cooperative partners.

Innovative Directions for Future Research

Social Learning, Reputation, and Indirect Reciprocity

Societies and groups can have social norms of cooperation, that is, a shared set of beliefs that people should cooperate, and that noncooperation will result in negative evaluations, punishment, and ostracism from group members (Fehr & Fischbacher, 2004). Learning social norms and the punishment of counternormative behavior may account for why people choose to cooperate with others who are cooperative and choose to defect with or ostracize noncooperators. From this perspective, people copy, mimic, and learn the common (and successful) behaviors they observe from ingroup members (Henrich & Boyd, 2001)—and can be biased to especially learn from prestigious group members (Chudek, Heller, Birch, & Henrich, 2012). This approach offers hypotheses about when people will choose to cooperate, and the motivations

they have for cooperating, that differ from reputation-based indirect reciprocity.

For example, when people are part of a group that contains a majority of noncooperative members, a social norm perspective would predict that people would learn to defect. However, what would happen in this situation when a group member interacts with a newcomer to the group who has a cooperative reputation? To examine this issue, Romano and Balliet (2017) assigned participants to a group in which other group members were always noncooperative or cooperative with a newcomer to the group. They also manipulated whether the newcomer was always cooperative or not in previous interactions. A social norm learning approach predicts that people should follow the majority group member behavior, but this research found that people condition their behavior on their partner's past (and expected future) behavior (i.e., their partner's reputation). Moreover, when people did conform to their group members' behavior (i.e., behaving as though conforming to a social norm), they reported doing so because they were concerned about their reputation in the group. Thus, people were conforming to group member behavior in order to avoid being negatively evaluated by ingroup members. These findings suggest that the psychological mechanisms of indirect reciprocity may have greater influence on decisions to cooperate than the psychological mechanisms underlying the

learning of social norms. Future research can further test the contrasting predictions of theories about social norms and indirect reciprocity, with a focus on distinguishing the psychological mechanisms that are hypothesized to underlie each of these phenomena.

One line of inquiry can test to what extent a general learning ability can account for how people cooperate to acquire indirect benefits. For example, humans could have a general learning ability that identifies when their behavior can translate into good or bad reputational outcomes, and so indirect benefits and costs. However, reputational consequences of one's current actions often occur in the distant future, and this presents a challenge for leaning about how one can adjust his or her behavior to maintain a cooperative reputation. Instead, humans may have decision rules or heuristics that help them solve exactly this problem. People may use cues that are reliably associated with indirect costs and benefits, then condition their behavior on these cues. Future research can contrast a reinforcement learning account of reputation management, with an alternative account of functionally specialized decision rules that rely on cues that can be associated with indirect benefits.

Indirect Reciprocity from a Developmental Perspective

As we discussed earlier, humans may have evolved abilities that enable reputation-based indirect reciprocity, and this proposition has inspired several researchers to examine when these abilities emerge through development. Field research making observations at a school playground has documented that 5- to 6-year-old children are more likely to receive help after having previously helped another child (Kato-Shimizu, Onishi, Kanazawa, & Hinobayashi, 2013). Such notable field observations present immense challenges in ruling out alternative interpretations, such as direct reciprocity and the effects of the history of the relationships between the children.

However, lab research has also documented that young children display indirect reciprocity. Olson and Spelk (2008) presented 3½-year-olds a puppet story with a protagonist who had to

decide how to divide resources among other puppets. The participants learned that one of the other puppets had previously helped other puppets, while another puppet decided against helping someone in the past. They found that the children recommended that the protagonist give more to the puppet that had previously been helpful, compared to the puppet that did not help previously, suggesting that children at this age engage in indirect reciprocity. Similarly, Kenward and Dahl (2011) found that 4½-year-olds, but not 3-year-olds, would decide to give more resources to a puppet that had previously helped another puppet, compared to a puppet that was a hindrance to another puppet. Importantly, across both studies, children only distributed resources as would be expected according to indirect reciprocity when they were forced to decide how to distribute unequal resources (e.g., three cookies between two persons). However, when they could divide the resources equally (e.g., two cookies between two persons), they preferred dividing the resources equally between helpers and nonhelpers. Such field and lab studies suggest that children at a young age, and potentially even 3 years old, are motivated to give more benefits to others whom they observed to be helpful to others in previous occasions.

Interestingly, the cognitive and motivational mechanisms of indirect reciprocity may emerge even earlier in development. Previous research has found that even 10-month-old infants seem to expect third parties to behave positively toward someone who has behaved in an egalitarian way in a previous interaction, compared to someone who behaved unfairly (Meristo & Surian, 2013). There is a need for future research along these lines on the development of specific cognitive and motivational abilities that underlie indirect reciprocity.

Do Reputations Transcend Group Boundaries?

Social networks often contain clusters of individuals who have strong ties to each other, and these clusters can be considered groups. Yamagishi and colleagues (1999) have claimed that reputational benefits of cooperation may be contained within groups. According to a bound-

ed generalized reciprocity perspective, groups contain a system of reputation-based indirect reciprocity, and humans have evolved a decision heuristic to be more cooperative with ingroup members than with outgroup members, in order to enhance their cooperative reputation and to avoid being ostracized from the group. Previous research using minimal group paradigm has supported this claim through the observation that ingroup favoritism in cooperation only occurs when people have common knowledge of each other's group membership (Balliet, Wu, & De Dreu, 2014; Yamagishi et al., 1999). When participants have unilateral knowledge of group membership (i.e., participants knew their partners' group membership, but also learned that their partners did not know their own group membership), they could not gain reputational benefits—costs from their behavior, and so they did not discriminate in cooperation between ingroup and outgroup members. A recent meta-analysis of the literature on ingroup favoritism indeed found that people only cooperated more with ingroup than with outgroup members when there was common knowledge, but this ingroup favoritism completely disappeared in the unilateral knowledge condition (Balliet et al., 2014). This work is complemented by research showing that 5-year-old children invest in a positive reputation with ingroup, but not outgroup, members (Engelmann, Over, Herrmann, & Tomasello, 2013).

Theory and research suggest that reputational benefits of cooperation are contained within groups, or at least that people have a reputation management strategy that is conditional on group membership. However, research supporting this view has mostly relied on the common knowledge paradigm to manipulate whether actions can have reputational consequences. Other research using different methodologies has resulted in the conclusion that people care about their reputation when interacting with both ingroup *and* outgroup members (Romano, Balliet, & Wu, 2017; Semmann, Krambeck, & Milinski, 2005). Romano, Balliet, and Wu (2017) conducted five studies in which they manipulated both partner group membership (using minimal and natural groups) and cues of reputation (e.g., anonymity, gossip) via several methods, and found that reputation promoted

cooperation during interactions with both ingroup and outgroup members. Additionally, a large-scale study across 17 societies attempted to replicate the previous work by Yamagishi and colleagues (1999) testing how common/unilateral knowledge affected ingroup favoritism in cooperation (Romano, Balliet, Yamagishi, & Liu, 2017). This study manipulated partner nationality (own country vs. one of 16 other countries) and common (vs. unilateral) knowledge of partner group membership, and found that these two factors did not interact to predict cooperation as would be expected by the bounded generalized reciprocity theory. However, common knowledge (and also reputational benefits) promoted cooperation with both ingroup and outgroup members.

It is unclear why these studies result in inconsistent findings, and there is a need for future work to closely examine how reputation and reputational benefits can generalize across groups. This issue can inform why people might discriminate in favor of their ingroup, which can not only result in benefits for the ingroup but also provoke conflict between groups (De Dreu, & Balliet, & Halevy, 2014). Furthermore, if reputation transcends group boundaries, then it may be wielded as a tool to reduce intergroup discrimination.

Individual Differences in Reputation Management

Although reputation-based indirect reciprocity could result in universal human adaptations, there may be individual differences in how these mechanisms would operate to produce behavior. For example, people may not display similar levels of concern for their reputations, and they may not invariably cooperate in response to cues that their behavior can lead to indirect benefits. Some personality traits (e.g., social value orientation, prevention focus, and chronic public self-awareness) are likely to account for potential variation in reputation management.

There exist stable individual differences in the weighting of own and others' outcomes during interdependent decision-making tasks, with some people (e.g., proselves) only valuing their own welfare, and other people (e.g., prosocials)

displaying a positive valuation of both self and others' outcomes (Van Lange, 1999; Van Lange, Otten, De Bruin, & Joireman, 1997). While prosocials tend to be generally more cooperative than proselfs in both economic games and real-world situations (Balliet, Parks, & Joireman, 2009; Van Lange, Schippers, & Balliet, 2011), proselfs have been found to be strategically more cooperative in situations with cues that their behavior can lead to potential future indirect benefits (e.g., the presence of third-party observers or potential for gossip), compared to an anonymous situation (Feinberg, Willer, Stellar, & Kellner, 2012; Simpson & Willer, 2008; Wu et al., 2015; Wu, Balliet, & Van Lange, 2016c). Thus, proself individuals can be more strongly influenced to cooperate when their reputations are at stake.

Individual differences in *prevention focus*—one's general tendency to minimize negative outcomes and prevent losses (Higgins, 1998)—can also shape strategies of reputation management. Some initial evidence reveals that prevention-focused individuals tend to generally show greater concern for their reputations (Cavazza, Guidetti, & Pagliaro, 2015) and also donate more money when they are exposed to subtle cues of watching eyes (Pfattheicher, 2015). In addition, people with a strong chronic public self-awareness also tend to behave more prosocially in response to cues of being watched (Pfattheicher & Keller, 2015). While some previous research has been done on individual differences in gossip (Nevo, Nevo, & Derech-Zehavi, 1993), very little research has examined individual differences in the context of indirect reciprocity, and several candidate traits include Honesty–Humility, Dark Triad, Forgiveness, and Revengefulness (see Thielmann, Spadaro, & Balliet, 2020).

Conclusions

Humans possess a remarkable ability to coordinate and cooperate to produce public goods. Biologists and psychologists believe that this ability has its roots in the phylogeny of our species. Indeed, natural selection can favor cooperative strategies that result in direct *and* indirect benefits of cooperation. Thus, indirect

reciprocity may have shaped human abilities to evaluate others' behavior (e.g., person perception, moral judgment) and to engage in certain social behaviors (e.g., reputation and impression management, partner selection, and conditional cooperation) to acquire these benefits. In this chapter, we have discussed several fitness-relevant adaptive problems (e.g., capturing indirect benefits, strategically sharing gossip, and selecting cooperative partners and avoiding exploitation by free riders) that can occur when social interactions are structured according to indirect reciprocity. Specifying these adaptive problems can be useful in generating hypotheses about how the mind might work to solve these problems, and we proposed several possibilities, many of which require future research and empirical scrutiny.

Several agent-based models discussed in this chapter support the idea that indirect reciprocity could have influenced the evolution of human cooperation. And here we reported an abundance of evidence, from both the field and lab, that people engage in behaviors that can be recognized as indirect reciprocity. We believe the most exciting next steps on this topic involve identifying the proximate psychological processes underlying these behaviors. In this regard, bridging evolutionary models of indirect reciprocity and social psychology should be exceptionally useful in generating hypotheses to test in behavioral experiments. Specifically, psychologists can use these evolutionary models of ultimate mechanisms as inspiration to develop and test hypotheses about the proximal cognitive and motivational processes that underlie the human ability for indirect reciprocity. Another topic may focus on the broader circumstances that may limit or facilitate the workings of indirect reciprocity. For example, it is unclear whether people cooperate to secure a good reputation among outgroup members. Such issues could illuminate and extend classic topics in social psychology, such as stereotyping, discrimination, and impression formation. We predict that the next decade will witness a cascade of work on gossip, reputation, and reputation-based cooperation, thereby increasing our understanding about how humans evolved to become such a cooperative species.

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