The psychology of partner choice

Justin W. Martin, Liane Young, Katherine McAuliffe

Department of Psychology, Boston College, Chestnut Hill, MA

Correspondence: justinwmartin@gmail.com (J.W. Martin)

Word count: 7,966

Keywords: partner choice; cooperation; punishment

Abstract

Partner choice captures the idea that individuals exist in a biological market of potential partners, and we can therefore choose or reject our social partners. While prior work has principally explored the functional basis of partner choice, here we focus on its mechanistic basis, motivated by a surge of recent work exploring the psychology underlying partner choice decisions. This work demonstrates that partner choice is predictably sensitive to a number of factors, including 1) a potential partner's generosity and fairness, 2) cooperative disposition, 3) moral decision-making, and 4) intentions. We then broaden our scope, first reviewing work suggesting that, in some cases, the psychology underlying partner choice may be distinct from other responses to a partner's behavior. We then discuss work demonstrating the sensitivity of partner choice decisions to market characteristics as well as work that illuminates the neural, ontogenetic and phylogenetic basis of partner choice. We conclude by highlighting outstanding questions and suggest directions for future research.

The importance of partner choice

Human success – as a species and as individuals – depends upon our ability to interact with others: To work together, to help and be helped and to form social bonds. Equally important are the mechanisms that exist to maintain these interactions. Theoretical work has outlined a number of such mechanisms, including indirect reciprocity (Alexander, 1987), direct reciprocity (Trivers, 1971), kin selection (Hamilton, 1964; all reviewed in Rand & Nowak, 2013), punishment (Boyd & Richerson, 1992; Fehr & Gächter, 2002; Guala, 2012; Henrich et al., 2010; Yamagishi, 1986) and partner choice (Barclay, 2016; Baumard, André, & Sperber, 2013; Hammerstein & Noë, 2016; Noe & Hammerstein, 1994). And, empirical work has shed light on the psychology supporting many of these mechanisms supporting successful interactions (Raihani & Bshary, 2015; Rand & Nowak, 2013; Warneken, 2017). However, until recently, less has been known about the psychological underpinnings of partner choice. Our goal in this review is to discuss recent work on the psychology of partner choice and to encourage further work on this emerging topic.

At the most fundamental level, partner choice is the ability to leave or reject a partner (Barclay, 2016). Individuals exist in a marketplace of potential partners (a biological market; Hammerstein & Noe, 1994), and this leads market dynamics—supply and demand—to influence the formation of partnerships. Broadly, this yields three main goals for individuals: Attracting partners, choosing partners, and maintaining partners (Barclay, 2013). In this review, we focus on the latter two capacities: How we choose and maintain partners (see Barclay, 2013, 2016 for a discussion of how to attract partners). More specifically, we evaluate our relative options and choose the best

partners we can. Once a partnership is formed, we end or continue it depending on the relative quality of our outside options. Such decisions may be made based on characteristics of the population (e.g. the presence of relatively more skillful or cooperative partners) as well as characteristics of individuals. Here, within this latter category, our primary focus is on internal characteristics that are relevant to an individual's social normative behavior (in the parlance of person perception, those that lie along the "warmth" dimension; Fiske, Cuddy, & Glick, 2007) and those that may also be relevant for moral evaluation, though we also offer a brief discussion of internal characteristics beyond this focus.

Figure 1: The four major questions about partner choice. The four major questions about partner choice, from a levels of analysis perspective (Tinbergen, 1963). At the top are questions regarding the proximate mechanisms of partner choice; on the bottom are questions regarding ultimate explanations for partner choice. While other work has focused on a functional account of partner choice (Barclay, 2013, 2016; Baumard et al., 2013), our review focuses principally on a mechanistic account of partner choice. We also briefly discuss its ontogenetic and phylogenetic basis.

Theoretical work on partner choice in humans has mainly investigated partner choice from a *why* perspective (Tinbergen, 1963): for instance, considering the implications of partner choice for cooperation (Barclay, 2013, 2016; Misyak, Melkonyan, Zeitoun, & Chater, 2014; Warneken, 2017), the evolution of fairness (Baumard et al., 2013) and moral religions (Baumard & Boyer, 2013). Here, we primarily take a *how* perspective, focusing on the mechanistic basis of choosing partners and maintaining partnerships in humans (Figure 1). Drawing on recent evidence from a range of fields – including evolutionary biology, evolutionary psychology, moral psychology, behavioral economics, developmental psychology and judgment and decision-making – we show that partner choice is supported by a suite of identifiable mechanisms. In particular, we highlight four factors that partner choice is sensitive to: Indications of 1) generosity and fairness, 2) cooperative disposition, 3) a partner's moral decision-making and 4) a partner's intentions. The sensitivity of partner choice to these factors provides insight into the psychological mechanisms underlying partner choice decisions. We argue that these mechanisms appear to be, in some cases, importantly different from those regulating social interactions by other means.

We then expand the focus of this review in important ways. First, we consider the extent to which the psychology underlying partner choice is unique or shared with other ways of responding to others' behavior, using sensitivity to intentions and outcomes as a test case. Second, we review work investigating how the influence of the personal characteristics highlighted earlier can be modulated by market characteristics. We then review evidence on the neural correlates of partner choice. Next, we additionally provide evidence that partner choice is deeply rooted in both phylogeny and

development, with signatures of partner choice emerging across a range of animal taxa and in infancy in humans. Finally, we briefly touch on the consequences of partner choice and conclude by suggesting promising avenues for new research on partner choice¹.

Many modes of partner choice

Partner choice has been studied using a number of different paradigms across a variety of domains. Here, we bring these paradigms together under one heading and, in so doing, we hope to provide researchers with a menu of options for studying partner choice in the future (see Figure 2).

The key feature of partner choice paradigms that we focus on here is that the target individual is deciding whether or not to continue or enter into a new relationship with another individual. We focus principally on contexts involving resource distribution,

¹ We reviewed a range of articles when writing this article. Our main focus was on recent work (within the past 5 years), as (1) other reviews on partner choice exist and are referenced in this the article and (2) we are interested in current approaches to this topic. We conducted our search with 3 main criteria. First, we targeted empirical work that involves resource distribution. For instance, mate selection can be thought of as a special case of partner choice (Buss & Schmitt, 1993; Clutton-Brock & McAuliffe, 2009; Dall, Giraldeau, Olsson, McNamara, & Stephens, 2005; McNamara & Houston, 1986; Noe & Hammerstein, 1994; Rusbult, Zembrodt, & Gunn, 1982), but one that we consider beyond the scope of the current review. Second, we prioritized incentivized contexts, where participants' earnings are dependent upon their choices, though we include especially relevant work in non-incentivized contexts (e.g. Lammers et al., 2017). Third, we focused on cases in which a single individual was making a choice about interacting (or not interacting) with another single individual (generally in comparison to one or more other individuals). We do this because this is a paradigm case of partner choice (Barclay, 2013, 2016). Thus, we focus less on cases in which groups are deciding whether or not to exclude an individual, though such contexts are relevant; we include especially relevant work that falls into this category (e.g. Liddell & Kruschke, 2014; Page et al., 2005; Rockenbach & Milinski, 2011). Our literature search involved the search terms "partner choice", "partner selection", "choice AND cooperation", "trust game", "partner switching", and "economic game AND partner" and was conducted using PsycInfo and Google Scholar. For relevant articles, we then searched their cited references, using the same categories. The search was conducted in November and December, 2017.

where the choice of partner will affect how much one can earn and is thus an impactful one for participants. We do this partly out of necessity: Most of the existing work on partner choice has been in these contexts. However, the incentivized nature of these decisions gives particular weight to any inferences drawn from them. This is especially important in the domain of social interaction, given the fact that the factors we say we care about are sometimes not the ones that influence our judgments or behavior (Blake, McAuliffe, & Warneken, 2014; Carlsmith, Darley, & Robinson, 2002; Cushman, Young, & Hauser, 2006). Moreover, the fact that these paradigms generally involve resource distribution does not indicate that they are uniform. They include studies framed as highly de-contextualized interactions (Raihani & Barclay, 2016) as well as those explicitly described to participants as relationships in a hunter-gatherer society (Eisenbruch & Roney, 2017). And, they investigate partner choice in response to simple descriptions of past behavior (e.g. Everett, Pizarro, & Crockett, 2016) as well as in response to observed, concrete behavior (e.g. people assign either themselves or their partners to an onerous task (Simpson & Harrell, 2013) or donate some amount to charity (Fehrler & Przepiorka, 2016)).

Figure 2: The many modes of partner choice. The many modes of partner choice. (a) Choosing between two potential partners. (b) Interacting with a partner and then choosing to either continue the partnership or switch to a new partner. (c) Entering into an interaction (e.g., trust game) or staying out of the interaction, based on some information about the potential partner. (d) Rejection behavior by members of a group.

Table 1. *Economic games described in this review and their description.*

<u>Game</u>	<u>Description</u>
Dictator Game (DG)	Player One is given an endowment of a resource and can give any amount of their endowment to Player Two. Player Two is a passive recipient.
Trust Game (TG)	Player One is given an endowment of a resource and can give some or all of their endowment to Player Two. Any amount sent to Player Two is multiplied by a specified factor (often 3). Player Two can then return any amount of the resource they receive to Player One.
Prisoner's Dilemma (PD)	Player One and Player Two each decide to either pay a small cost to deliver a larger benefit to the other (i.e. cooperate) or to earn a resource for themselves at a cost of a resource to the other (i.e. to defect).
Public Goods Game (PGG)	A group of players (often 4) are each given an endowment of a resource. Each can give some or all of their endowment to a group pot. The amount of resources in the group pot is multiplied (often by 1-2x) and divided evenly among all players (including those who did not contribute to the group pot).

Perhaps the most representative paradigm is when a participant chooses between two (or more) potential partners for an economic interaction, whether that be a trust game (see Table 1 for a description of this and other economic games referenced here) (Bornhorst, Ichino, Kirchkamp, Schlag, & Winter, 2010; Bostyn & Roets, 2017; Everett et al., 2016; Fehrler & Przepiorka, 2016; Pleasant & Barclay, 2018), a prisoner's dilemma (Aksoy, 2015), or a dictator game (Hardy & Van Vugt, 2006; Raihani & Barclay, 2016). Closely related are contexts in which participants interact with a partner and decide whether they would like to play an economic game with that partner again or with a different partner, either in a subsequent dyadic context (Barclay & Willer, 2007; Coricelli, Fehr, & Fellner, 2004; Eisenbruch & Roney, 2017; Gross, Leib, Offerman, & Shalvi, 2018; Martin & Cushman, 2015; Sylwester & Roberts, 2010, 2013) or a group context (Liddell & Kruschke, 2014; Page, Putterman, & Unel, 2005; Rockenbach & Milinski, 2011). We note that these group exclusion decisions have been previously studied under the heading of ostracism. While our principal interest is in the decision of one individual to partner (or not) with another, decisions by individuals in a group context to exclude another member can nevertheless inform our understanding of partner choice.

Some studies have asked participants whether they would like to enter into a trust game with an individual based on some information about that individual (Barclay, 2006; Fehrler & Przepiorka, 2013; Jordan, Hoffman, Bloom, & Rand, 2016; Jordan, Hoffman, Nowak, & Rand, 2016; Lammers, Gast, Unkelbach, & Galinsky, 2017; Przepiorka & Liebe, 2016; Simpson & Harrell, 2013). The choice here is not which of two individuals to interact with, but a decision between staying out of the game (and

keeping one's endowment) and entering into a game with the potential partner. Finally, some studies have looked at rejection behavior by groups in non-economic social contexts (van der Lee, Ellemers, Scheepers, & Rutjens, 2017) and at preferences for avoiding individuals in non-economic contexts (Kemper & Newheiser, 2017).

In children, while measures are necessarily less sophisticated and less specific to partner choice (e.g. social evaluation can be different from partner choice), they nevertheless can serve as early signatures of partner choice. For instance, children can choose between two puppets about whom they have some information (Hamlin, 2013; Hamlin, Wynn, Bloom, & Mahajan, 2011; Woo, Steckler, Le, & Hamlin, 2017), or choose to take an item from one puppet or another (Lucca, Pospisil, & Sommerville, 2018; Tasimi & Wynn, 2016). They can also be given a resource to distribute between two partners (A. Dahl, Schuck, & Campos, 2013; Kenward & Dahl, 2011) or asked which of two partners they like more (Shaw, DeScioli, & Olson, 2012).

Characterizing the psychology underlying partner choice

These paradigms have yielded a number of important insights, allowing us to offer a preliminary characterization of the psychological mechanisms underlying partner choice. We organize this characterization around four main features of individuals that are relevant to their social normative behavior (see Figure 3). Of course, this is not an exhaustive list of factors partner choice could be sensitive to, and we conclude with a brief discussion of features beyond these four. Moreover, these factors are related – for instance, generosity and cooperative disposition co-vary (Peysakhovich, Nowak, &

Rand, 2014). Thus, this division should not be taken to imply a bright-line demarcation between them. Rather, focusing on these factors is a useful way of conceptually dividing the space of features partner choice is sensitive to.

We choose partners who have been generous and fair

Much work suggests that partner choice is sensitive to signals of generosity and fairness. For instance, we appear to choose partners who donate to others (Fehrler & Przepiorka, 2013, 2016) or give to others in a dictator game (Przepiorka & Liebe, 2016). We prefer partners who are generous to us (Eisenbruch & Roney, 2017; Hackel, Doll, & Amodio, 2015) and as well as to others (Raihani & Barclay, 2016). This applies both when the generosity cannot be repaid by the participant (Hackel et al., 2015; Raihani & Barclay, 2016) and when it can (Eisenbruch & Roney, 2017).

However, there are constraints on and moderators of the influence of generosity and fairness on partner choice decisions. While we prefer those who behave altruistically, this preference is much stronger when we learn that *others* (i.e. not the focal individual) generally behave consistently in that context. That is, when we learn that people other than the focal individual behave inconsistently (equally likely to be selfish or cooperative) or consistently (either only selfish or only cooperative) in this context, we prefer those who have behaved altruistically in the consistent context (Lammers et al., 2017). And, there is individual variability in preferences for the generosity of potential partners. For instance, though the majority of individuals prefer those who donate, some subjects appear to instead choose partners who did not

donate as much, potentially to avoid feeling any sort of obligation to give more to these individuals (Fehrler & Przepiorka, 2016). Finally, preferences for generosity in others can be goal-dependent. When choosing someone to judge us, we prefer an altruistic individual when we previously behaved fairly and a selfish individual when we previously behaved unfairly (Melnikoff & Bailey, 2018). Thus, preferences for fairness and generosity in partners are nuanced and vary across context and individual.

Figure 3: How partner choice decisions are made. A schematic of how partner choice decisions are made. (a) First, individuals for consideration are selected out of a population of “outside options”. (b) The subsequent partner choice decision is guided by four key factors: Indications of 1) generosity, 2) cooperative disposition, 3) a partner’s moral decision-making and 4) a partner’s intentions. (c) Finally, the cooperative interaction takes place.

Individuals care about whether someone has been generous or not when selecting them as a partner, but there are two reasons why this information might be important. One possibility is that those who are generous provide greater material benefits or rewards. On the other hand, generosity might signal a deeper prosocial disposition, indicating that this individual will reliably be prosocial in a variety of contexts. Recent work has demonstrated that both factors matter. When presented with potential partners that are equally fair, individuals do choose those who can deliver greater benefits (Raihani & Barclay, 2016). However, when these two sources of information are in tension - when forced to choose between a stingy but wealthy individual and a generous but poor individual - a partner's demonstrated generosity has a much bigger influence on how we choose partners than benefits delivered (Hackel et al., 2015; Raihani & Barclay, 2016).

In sum, while individuals generally choose those who are generous and fair as partners more than those who are stingy or selfish, these preferences can be nuanced and influenced by individual differences and contextual factors.

We choose partners who have been cooperative

We also choose partners who have been cooperative². We prefer those who play cooperatively or contribute more, both in group contexts (e.g. a public goods game) (Hardy & Van Vugt, 2006; Page et al., 2005; Pleasant & Barclay, 2018; Sylwester &

² Here we focus on cooperation as being potentially more strategic than generosity: We are generous in contexts in which we expect no return from the cost we pay, whereas in cooperative contexts there may be some expectation of reciprocation. However, this distinction is mainly one of convenience – cooperation and generosity are strongly related (Peysakhovich et al., 2014).

Roberts, 2010) and dyadic contexts (Barclay & Willer, 2007; Bornhorst et al., 2010; Coricelli et al., 2004; Lammers et al., 2017), and we exclude those who contribute the least (Rockenbach & Milinski, 2011). We pick cooperative individuals for subsequent cooperative interactions (Hardy & Van Vugt, 2006; Pleasant & Barclay, 2018; Sylwester & Roberts, 2010), and they receive more in subsequent partner choice contexts (Hardy & Van Vugt, 2006; Sylwester & Roberts, 2013; but see Barclay, 2004). But, there are potential limits to the influence of a cooperative disposition on partner choice: Holding past cooperative behavior constant, we prefer in-group members as future partners over out-group members (Aksoy, 2015).

When deciding whether to interact with someone by investing money in them (in a trust game), participants care about whether this potential partner was previously willing to pay costs to provide benefits to others (Jordan, Hoffman, Nowak, et al., 2016). And again, similar to signals of generosity, previous work has investigated the degree to which benefits delivered versus cooperative intent matter more. While benefits delivered do influence partner choice decisions, what appears to matter more is signals of a cooperative disposition (Eisenbruch & Roney, 2017).

We choose partners based on how they make moral decisions

It is perhaps unsurprising that we choose to interact with cooperative and generous partners. We appear to also care about the moral decisions our partners make, in somewhat surprising ways.

For instance, we care about the content of potential partners' moral decisions. In certain contexts, we prefer partners who make deontological choices rather than utilitarian ones (Bostyn & Roets, 2017; Everett, Faber, Savulescu, & Crockett, 2018; Everett et al., 2016). And, we prefer to avoid those who commit purity violations, relative to those who have harmed others or broken a social norm (Kemper & Newheiser, 2017). This is consistent with work demonstrating that we view those who commit purity violations as having particularly abnormal or atypical underlying desires (Chakroff & Young, 2015). In the context of choosing a partner, this abnormal underlying disposition may mean that this agent is likely to behave in counter-normative ways and is thus someone to avoid as a partner. However, preferences for moral decision making can take a back seat to other considerations – when presented with a task in which a dishonest partner leads to a better chance of higher payoffs for the dyad, individuals will switch away from honest partners and toward dishonest partners (Gross et al., 2018).

Beyond the content of others' moral decisions, we also care about the strength of partners' moral standards. We choose partners with strong and inflexible moral standards over those with weak or flexible moral standards, and in fact we prefer those with stronger moral standards than our own (Simpson & Harrell, 2013; van der Lee et al., 2017). And we care about whether individuals are willing to enforce norms: We invest more money in individuals who previously punished selfishness on behalf of a victim (i.e. as a third-party) (Barclay, 2006; Jordan, Hoffman, Bloom, et al., 2016). This appears to be specific to partner choice decisions: Third-party helpers are rewarded more than third-party punishers (Barclay & Raihani, 2016). And, the third-party nature

of such norm enforcement may be important: Those who punish in a public goods game, in which group members are neither clearly impartial third-parties nor victims, are not preferentially picked for interactions (Rockenbach & Milinski, 2011).

Thus, when selecting a partner for a future interaction, we care about the kinds of moral decisions they make: The way they treat others, the kinds of moral preferences they hold and how strongly they hold them, and their concern for moral norms.

We choose partners based on their intentions (rather than the outcomes they cause)

As discussed above, in a variety of contexts investigating a variety of factors, adult partner choice decisions are influenced by the intent with which a partner has behaved and less by the material benefits delivered (Eisenbruch & Roney, 2017; Hackel et al., 2015; Liddell & Kruschke, 2014; Martin & Cushman, 2015; Raihani & Barclay, 2016). Even among children, intentions play an important role: Children around eight to ten months of age preferentially choose to interact with agents who accidentally cause harm relative to agents who intentionally cause harm (for a review see Van de Vondervoort & Hamlin, 2016; Hamlin, 2013; Woo et al., 2017). This early incorporation of information about intentions may be unique to partner choice – other judgments do not show such intent sensitivity until later in life. For instance, when children around the age of 4 and 5 are asked about deserved punishment, their judgments focus to a larger degree on the outcome that was caused (Cushman, Sheketoff, Wharton, & Carey, 2013; Nobes, Panagiotaki, & Bartholomew, 2016; but see Van de Vondervoort &

Hamlin, 2017). Punishment judgments do not attain adult levels of incorporation of information about intentions until 12 years of age (Gummerum & Chu, 2014). Of course, this relative difference in the weighting of intention information could be due to differences in the methods used, precluding strong conclusions. Nevertheless, these results do suggest that there is an early-emerging capacity for choosing between individuals that incorporates information about their mental states in a manner similar to adults, whereas other responses to a partner's behavior do not begin to look adult-like until much later in development. Thus, in terms of the processes partner choice is sensitive to, information about others' intentions appears to be weighted more than information about the outcomes they cause, potentially across the lifespan.

We choose partners based on features outside social normative behavior

Features beyond those related to social normative behavior (those on the “competence” dimension; Fiske et al., 2007) also influence partner choice. As discussed above, although intent to deliver benefits carries greater weight, we do select those who are wealthy, either when that wealth is directly relevant to how much we can earn presently (Hackel et al., 2015; Raihani & Barclay, 2016) or when it is a more general signal (Nelissen & Meijers, 2011). Partner selection is also influenced by the ability to deliver benefits, whether through reputation or prestige (for a review see Henrich & Gil-White, 2001). Finally, we care about a partner's ability to generate benefits, both when this is framed around luck (e.g. being endowed with a greater ability

to generate wealth) or skill, although to a greater extent in the latter case (Eisenbruch & Roney, 2017).

The psychological distinctiveness of partner choice

Our highlighting of signals of generosity and fairness, cooperative disposition, a partner's moral decision-making and a partner's intentions as important to partner choice does not necessarily mean that they are *uniquely* important for partner choice. Indeed, it is likely that some mechanisms are more uniquely related to partner choice, whereas others are less so. Next, we consider when and why we might expect the mechanisms supporting partner choice to be psychologically distinct. Here, we use the functional purpose of partner choice as a guide. To the extent that partner choice serves a particular function—one that may be different from other ways of responding to a partner's behavior—we may expect the mechanisms supporting partner choice to be relatively distinct. In particular, we focus on punishment – sometimes studied under the heading of partner control (Bshary & Grutter, 2002; Fruteau, Lemoine, Hellard, van Damme, & Noë, 2011; Martin & Cushman, 2015; Schino & Aureli, 2015) – as an alternative to partner choice, one which has been traditionally emphasized as a response to others' behavior (Clutton-Brock & Parker, 1995; Trivers, 1971). From a functional perspective, punishment may exist to change others' behavior (Clutton-Brock & Parker, 1995; Martin & Cushman, 2016; Trivers, 1971), engage in costly signaling (Barclay, 2006; Jordan, Hoffman, Bloom, et al., 2016) or enforce norms (Boyd & Richerson, 1992; Fehr & Gächter, 2002; Henrich et al., 2010; Yamagishi, 1986).

However, punishment does not serve to select partners and so may serve as a strong contrast with partner choice.

One possibility is that partner choice and punishment are supported by the same set of mechanisms – if each is utilized to ensure we are surrounded by cooperative individuals, for example, they may stem from the same decision-making process. Indeed, some past work has described or investigated punishment and partner choice as part of the same continuum, with partner choice viewed as a severe form of punishment (Cinyabuguma, Page, & Putterman, 2005; Feinberg, Willer, & Schultz, 2014; Hoffman & Goldsmith, 1999; Kerr et al., 2009; Liddell & Kruschke, 2014; Schulz, 2016; Seymour, Singer, & Dolan, 2007). However, partner choice and punishment represent very different routes to ensuring the presence of cooperative partners: Partner choice is used to select and be selected as the best partner, whereas punishment is used to make others behave more cooperatively. Given these different proximate targets, these two responses could in fact be supported by distinct underlying mechanisms.

A well-studied feature of punishment decisions is their particular sensitivity to the presence of bad outcomes, studied in the literature as outcome bias or moral luck (for a review see Martin & Cushman, 2016). Whereas we do not view agents who accidentally cause harm as behaving particularly wrong, we do view them as worthy of punishment (Cushman, 2008). In contrast, outcomes on their own do not appear to matter as much when choosing a partner. As discussed above, when researchers have pitted information about benefits delivered (a salient outcome) against information about an agent's intended generosity and asked participants to choose a partner, a partner's

demonstrated generosity has a much bigger influence (Eisenbruch & Roney, 2017; Hackel et al., 2015; Raihani & Barclay, 2016). This is true even in contexts in which preferentially weighting generosity over reward is suboptimal (Hackel et al., 2015).

These results suggest that the inputs important to selecting partners are different from the inputs important to punishing. Recent work has directly investigated this: in both a dyadic economic game (Martin & Cushman, 2015) and a variant of the public goods game (Liddell & Kruschke, 2014), the decider's intent and the outcome they caused were dissociated using a stochastic mechanism. Participants responded to the decider's choice and the outcome by either applying punishment or engaging in partner choice. In both studies, punishment and partner choice were applied differently: Partner choice decisions were less sensitive to outcomes than were punishment decisions. Instead, partner choice was conditioned principally on how the partner intended to play. In other words, in response to the same inputs, punishment and partner choice are applied differently, potentially suggesting that punishment and partner choice are subserved by distinct underlying processes.

The distinctiveness of partner choice has been supported by recent developmental evidence as well. If partner choice and punishment are supported by distinct underlying processes, we might expect them to emerge in development differently. In particular, given the importance of information about intentions in making partner choice decisions, we might expect sensitivity to intentions to emerge first in partner choice. Indeed, recent work demonstrates that when children are asked to make judgments about punishment and partner choice while actors' intentions and

outcomes caused are varied, partner choice decisions demonstrate sensitivity to intentions at an earlier age than punishment (Martin, Leddy & McAuliffe, in prep).

Thus, we find that, in both adults and children, punishment and partner choice decisions are distinct. Partner choice decisions are conditioned more on agents' intentions than the outcomes they cause relative to punishment decisions, and this sensitivity to intentions emerges earlier for partner choice decisions than punishment decisions. Combined, these results support the idea that the psychological processes supporting punishment and partner choice are distinct in important ways.

Market influences on personal characteristics

Market characteristics can have an important influence on how sensitive we are to personal characteristics (Bednarik, Fehr, & Semmann, 2014; Debove, Andre, & Baumard, 2015; Fehrler & Przepiorka, 2016; Lammers et al., 2017; Rockenbach & Milinski, 2011). For instance, when many outside individuals ("proposers") compete to partner with a solitary chooser, the chooser can weight information about generosity heavily, whereas this is less true when there are equal numbers of choosers and proposers (Debove et al., 2015). When generosity varies within a market (indicated by donations to charity), participants choose partners who are more generous, even though more generous individuals are not necessarily better partners in this context (Fehrler & Przepiorka, 2016). In a market where partner choice is more costly, individuals are more sensitive to previous cooperativeness, relative to markets in which partner choice is less costly or free (Bednarik et al., 2014). And, a partner's past

behavior matters less for partner choice in markets in which we know that individuals behave inconsistently relative to markets in which we know that individuals behave consistently across partners (Lammers et al., 2017). Finally, in a market where punishment is possible, relative to one where punishment is not possible, those who punish are not preferentially chosen as partners (Rockenbach & Milinski, 2011), even those we do prefer those who punish in other contexts (Barclay, 2006; Jordan, Hoffman, Bloom, et al., 2016). Thus, the social context or market in which we find ourselves influences the features of partners that we care about, across a number of features and a number of market manipulations.

Market characteristics also impact our consideration of a potential partner's ability to generate benefits (Eisenbruch & Roney, 2017; Raihani & Barclay, 2016). First, when wealth is stable – we know a partner will start with the same pot of money across trials – we weight information about a partner's past fair behavior more heavily, choosing a partner who is poor but fair over a partner who is rich but selfish (though only by a small margin) (Raihani & Barclay, 2016). This preference is drastically increased when wealth is unstable, suggesting that in variable contexts – relative to stable contexts - we care more about how a partner *intends* to treat us (Raihani & Barclay, 2016). Second, our preferences for partners who are better at generating wealth are sensitive to whether the market is one in which skill vs. luck is highlighted (Eisenbruch & Roney, 2017). When success in a market is described as dependent on skill, we choose partners who can generate more benefits than when market success is described as dependent on luck (Eisenbruch & Roney, 2017). However, it remains the case that, in a market where individuals vary on how generous they are and how

effective they are at generating benefits, information about generosity is prioritized in selecting partners (Eisenbruch & Roney, 2017).

Neural correlates of partner choice

In the final sections of this review, we broaden our focus, first by discussing work on the neural correlates of partner choice. While these neural correlates remain poorly understood, related work has investigated how individuals choose interaction partners in the Trust Game (TG) (for a review see Tzieropoulos, 2013; Delgado, Frank, & Phelps, 2005; King-Casas et al., 2005; Krueger et al., 2007). The investor in the TG faces a type of partner choice decision: They can either keep their endowment – in effect rejecting an interaction with the potential partner – or decide to enter into the interaction. Work on the neural basis of these decisions has yielded two main findings. First, activity in the striatum tracks with the trustworthiness of the potential partner, with higher activity for less-trusted individuals (Tzieropoulos, 2013). Second, paracingulate and cingulate cortices support the mentalizing necessary to anticipate a partner's behavior (Tzieropoulos, 2013). Other related work largely corroborates these results. In one study, participants made partner choice decisions in two different domains (Yokoyama, Sugiura, Yamamoto, Nejad, & Kawashima, 2017). Across both, choice behavior was associated with activity in posterior cingulate cortex and the right temporoparietal junction. In another study, participants chose between potential partners for an economic game on each trial (Hackel et al., 2015). Partners varied in demonstrated cooperative disposition and the amount of reward they could deliver. Activity in

ventromedial prefrontal cortex coded for the difference in generosity between chosen versus non-chosen partners (Hackel et al., 2015). And, participants who weighted generosity higher in their choices had larger differential activity in ventromedial prefrontal cortex (vmPFC). Given the role of vmPFC in representing decision-related value signals, this suggests that vmPFC combines information about reward value and generosity when making a partner choice decision. Indeed, similar vmPFC activation was found in other work comparing social vs. non-social partner choice (Heijne, Rossi, & Sanfey, 2017). Here, participants chose one of four possible partners or slot machines that varied in expected value provided on each trial. Activity in vmPFC was highest for staying with the previously chosen partner in the social condition relative to the non-social condition. In total, though limited research on the neural basis of partner choice decisions exists, the results implicate a number of regions – including the striatum, paracingulate and cingulate cortices, ventromedial prefrontal cortex and temporoparietal junction - in the core processes underlying partner choice decisions.

Partner choice has deep developmental and evolutionary roots

Recent work suggests that partner choice has deep roots in human psychology, by probing both the breadth of partner choice across nonhuman animal species and the development of partner choice in children.

Phylogenetic roots of partner choice

Work on partner choice in animals has approached it from both functional (Bull & Rice, 1991) and proximate mechanism (Schino & Aureli, 2015) perspectives. Partner choice (in a potentially cooperative context) has been observed in ravens (Asakawa-Haas, Schiestl, Bugnyar, & Massen, 2016), a variety of primate species - including chimpanzees (Engelmann & Herrmann, 2016; Engelmann, Herrmann, & Tomasello, 2015; Melis, Hare, & Tomasello, 2006; Molesti & Majolo, 2016; Suchak, Eppley, Campbell, & de Waal, 2014; Suchak et al., 2016), capuchin monkeys (Sabbatini, De Bortoli Vizioli, Visalberghi, & Schino, 2012) and vervet monkeys (Fruteau, Lemoine, Hellard, van Damme, & Noë, 2011; reviewed in Schino & Aureli, 2015) – wasps (Grinsted & Field, 2017) and fish (reviewed in Dugatkin & Wilson, 1993; Bshary & Grutter, 2002; Bshary & Schäffer, 2002; Vail, Manica, & Bshary, 2014). For instance, when chimpanzees are presented with an adapted version of the trust game, they preferentially choose to cooperate with those who have previously been cooperative (Engelmann et al., 2015). This taxonomic breadth appears comparable to punishment (Clutton-Brock & Parker, 1995; Riehl & Frederickson, 2016), which has been found in chimpanzees (Jensen, Call, & Tomasello, 2007; Koyama, Caws, & Aureli, 2006; Suchak et al., 2016), rhesus macaques (Hauser, 1992) and fish (Bshary & Grutter, 2002; Raihani, Grutter, & Bshary, 2010). In primates, relationship quality is a large determinant of partner choice decisions (Asakawa-Haas et al., 2016; Engelmann & Herrmann, 2016; Sabbatini et al., 2012; Suchak et al., 2014). However, when demonstrated cooperative tendency has been manipulated, partner choice is also sensitive to these signals (Engelmann et al., 2015; Suchak et al., 2014; but see (Sabbatini et al., 2012). The comparative breadth of partner choice and punishment is

interesting, given the potential difference in costs borne by those engaging in these behaviors: Whereas punishment invariably/commonly involves a cost to the one enacting it, partner choice may, by contrast, carry an immediate benefit. For instance, if the current partner is not as productive, skillful or cooperative as potential other partners, interacting with a new partner / engaging in partner choice may be immediately beneficial. Given this asymmetry in associated costs, we may expect partner choice to be more phylogenetically widespread than punishment, and future work should explore this question.

While comparative work demonstrates the widespread existence of partner choice in the animal kingdom, it does not provide strong clues as to the mechanisms supporting these decisions. For this, we can turn to evidence from the development of partner choice in children.

Ontogenetic roots of partner choice

Signatures of partner choice appear early in development. Eight to ten-month olds choose those who accidentally cause harm over those who intentionally cause harm (Hamlin, 2013; Woo et al., 2017) and prefer those who act positively toward prosocial individuals and act negatively toward antisocial individuals (Hamlin et al., 2011). Children also appear to incorporate information about fairness in partner choice decisions in relatively sophisticated ways. Children at 13 months of age can already use information about distributions a third party makes to others to inform their social evaluations: After observing a third party distribute resources either equally or

unequally, infants prefer to interact with (e.g. accept a toy from) someone who distributes fairly (Lucca et al., 2018). And, infants are willing to give up resources to interact with someone who helps others rather than harms others (Tasimi & Wynn, 2016). However, there are limits to these generalizations: Infants do prefer those who are consistently prosocial over those who are consistently anti-social, but evince no preference when individuals are not completely consistent (Steckler, Woo, & Hamlin, 2017). By around 2 years of age, children prefer to help those who have helped others over those who have harmed others (A. Dahl et al., 2013), though this partiality competes with preferences for equality (Kenward & Dahl, 2011). By the age of 6, children's preferences for fairness must be reconciled with preferences for favoritism toward themselves, and this preference for favoritism is increased in competitive contexts (Shaw et al., 2012).

Recent work has begun to probe the development of partner choice decisions more directly (Martin, Leddy, & McAuliffe, in prep). Here, children were presented with vignettes in which a protagonist's intentions and the outcome they caused were varied. That is, the protagonist could either intend harm or not, and could cause harm or not. For half of the experiment, children were asked whether engaging in punishment was appropriate and for the other half they were asked whether engaging in partner choice was appropriate. When assessing punishment, results mirrored prior work: Decisions were sensitive to outcomes early in life and only demonstrated sensitivity to intentions with development (Cushman et al., 2013; Hebble, 1971; Imamoglu, 1975; Nobes et al., 2016; Nobes, Panagiotaki, & Pawson, 2009; Zelazo, Helwig, & Lau, 1996). When assessing partner choice, a different pattern emerged. By 5 years of age, children were

sensitive to whether a protagonist intended harm. Thus, we find that punishment and partner choice emerge in development differently: Partner choice decisions are sensitive to intentions at an earlier age than punishment decisions.

These results relate to past work on the development of children's moral judgments. For instance, prior work has found that preschoolers' judgments of moral character (a judgment similar to partner choice) pattern with their punishment judgments (Van de Vondervoort & Hamlin, 2017). However, children in this study were presented with cases in which intentions and outcomes were matched: A protagonist either both intended and produced a bad outcome or intended and produced a good outcome. Consistent with this, we find that punishment and partner choice judgments are similar in the case of intentional harm. This pattern of results nicely illustrates the point that punishment and partner choice decisions are often similar, and only distinct in cases in which the factors they are sensitive to differ. Thus, future work should continue probing these responses, focusing in particular on cases in which these responses may be teased apart.

Thus, in adults, children and animals (at least non-human primates), partner choice decisions are affected by a partner's demonstrated cooperative tendencies. This is not to say that this is expressed similarly in all cases: Whereas children and adults are sensitive to a partner's adherence to fairness norms, this has not been demonstrated in animals. However, this behavioral consistency across species may suggest that at least some of the psychology underlying partner choice may also be conserved across species.

Consequences of partner choice

Engagement in partner choice is just one side of the equation – partner choice also has consequences for those who are rejected. Exploring these consequences yields insights into the functional purpose of partner choice. One such functional purpose is to promote cooperation. Being rejected can lead individuals to become more cooperative with subsequent partners (Coricelli et al., 2004). This is especially true when communication and gossip are possible (Feinberg et al., 2014; Strømmland, Tjøtta, & Torsvik, 2016) and is less likely when punishment is also possible (Pleasant & Barclay, 2018). Further, the mere option of engaging in partner choice (even when it only occurs infrequently) leads group members to be more cooperative (Bednarik et al., 2014; Wu, Balliet, & Van Lange, 2016), although partner choice appears less effective at encouraging cooperation when it can occur unilaterally rather than by mutual decision (Hauk & Nagel, 2000). Being chosen for an interaction by a partner (versus being randomly assigned) leads one to be more willing to accept less advantageous offers from that partner (Falco, Albinet, Rattat, Paul, & Fabre, 2019). Finally, being excluded and then re-included by a group leads to greater risk-taking on behalf of that group (E. Dahl, Niedbala, & Hohman, 2019). However, there is also conflicting evidence. Being excluded can lead individuals to avoid those who are excluding them (e.g. in an extended version of cyberball; Driscoll, Barclay, & Fenske, 2017). In other words, we return a potential partner's rejection with our own rejection. And, there are some examples where partner choice does not lead to higher levels of cooperation (Barclay &

Raihani, 2016). How do we resolve these conflicting findings? One potential mediator of the influence of partner choice is the number of partners involved: Partner choice appears to most effectively encourage cooperation in contexts of multiple partners (Bednarik et al., 2014; E. Dahl et al., 2019; Feinberg et al., 2014; Strømmland et al., 2016; Wu et al., 2016) and work less well in a dyadic context (Barclay & Raihani, 2016). This is consistent with the idea that partner choice is most effective in the presence of outside options, or other (potentially more cooperative) partners (Baumard et al., 2013; Debove et al., 2015). Another mediator of the influence of partner choice appears to be future oriented thinking: Those who are more future oriented become more cooperative following rejection, whereas those who are less future oriented become less cooperative (Balliet & Ferris, 2013). In sum, future research should explore the influence of partner choice on the one not chosen, especially focusing on delineating contexts in which rejection encourages versus discourages cooperation.

Outstanding questions

A large number of questions remain about the psychology underlying partner choice. Here, we highlight a few of the most pressing and interesting avenues for future research. First, what is the role of reasoning in partner choice? Are partner choice decisions mainly supported by implicit or explicit processes? Second, are partner choice and punishment subserved by distinct neural computations? We have reviewed research exploring the neural correlates of partner choice, but it is unclear to what extent these are shared with other kinds of responses or unique to partner choice.

Third, to what extent is partner choice influenced by group psychology? Are we particularly harsh when making a partner choice decision about in-group transgressors, or are we instead more lenient? Fourth, are there individual differences in the tendency to engage in partner choice relative to other responses (e.g. punishment)? Do individuals have a preferred method for dealing with transgressors and if so, how strong is this preference? Fifth, what is the scope of the functional consequences partner choice has? For instance, do individuals learn from partner choice, both when personally rejected and when observing others being rejected? Does this tendency to gather information from partner choice decisions vary across individuals? Sixth, how does partner choice vary cross-culturally? Much work suggests that the use of punishment varies across cultures (Barrett et al., 2016; Henrich et al., 2010, 2006; Herrmann, Thöni, & Gächter, 2008) – does the use of partner choice similarly vary? Seventh, how did partner choice first evolve in humans? As a mechanism for mate selection and then subsequently for selection of cooperative partners, or vice versa? Or did these capacities evolve relatively separately, as some have suggested (Hrdy, 2011). And, do distinct psychological mechanisms support partner choice in distinct contexts (e.g. when selecting a mate versus a cooperative partner)? Eighth, what is the relationship between the development of partner choice and the development of theory-of-mind capacities? That is, to the extent that partner choice is particularly sensitive to intentions, we might expect these capacities to be tightly coupled. However, no research has explored this question.

Conclusions

Potential partners exist in a biological market; in this market, we evaluate our options and decide who to partner with and who to avoid. Our partner choice decisions have important consequences, yet, until recently, the psychology supporting them has been poorly understood. Here, we reviewed a recent surge of evidence on the proximate mechanisms involved in partner choice decisions. Drawing on research from a range of fields, we showed that these partner choice decisions are supported by a suite of identifiable mechanisms focused on individuals' social normative behavior. Partner choice is sensitive to signals of partners' generosity and fairness, their cooperative disposition, their moral decision-making, and their intentions. We then reviewed evidence that sensitivity to these factors may be modulated by social context and highlighted some initial evidence that the process underlying partner choice may be unique. Finally, we provided evidence that partner choice is observed across a range of animal species, emerges early in human development and has important consequences for those who are rejected as partners. By aggregating and summarizing existing work on the psychology underlying partner choice, we hope to spur new research on remaining questions on this emerging topic. A better understanding of the psychology of partner choice will deeply inform theoretical accounts of the forces governing cooperation and social behavior in humans.

Acknowledgements

We thank Nichola Raihani for feedback on earlier versions of this manuscript.

References

- Aksoy, O. (2015). Effects of Heterogeneity and Homophily on Cooperation. *Social Psychology Quarterly*, 78(4), 324–344. <https://doi.org/10.1177/0190272515612403>
- Alexander, R. (1987). *The biology of moral systems*. Aldine Transaction.
- Asakawa-Haas, K., Schiestl, M., Bugnyar, T., & Massen, J. J. M. (2016). Partner Choice in Raven (*Corvus corax*) Cooperation. *PLOS ONE*, 11(6), e0156962. <https://doi.org/10.1371/journal.pone.0156962>
- Balliet, D., & Ferris, D. L. (2013). Ostracism and prosocial behavior: A social dilemma perspective. *Organizational Behavior and Human Decision Processes*, 120(2), 298–308. <https://doi.org/10.1016/j.obhdp.2012.04.004>
- Barclay, P. (2004). Trustworthiness and competitive altruism can also solve the “tragedy of the commons.” *Evolution and Human Behavior*, 25(4), 209–220. <https://doi.org/10.1016/j.evolhumbehav.2004.04.002>
- Barclay, P. (2006). Reputational benefits for altruistic punishment. *Evolution and Human Behavior*, 27(5), 325–344. <https://doi.org/10.1016/j.evolhumbehav.2006.01.003>
- Barclay, P. (2013). Strategies for cooperation in biological markets, especially for humans. *Evolution and Human Behavior*, 34(3), 164–175. <https://doi.org/10.1016/j.evolhumbehav.2013.02.002>
- Barclay, P. (2016). Biological markets and the effects of partner choice on cooperation and friendship. *Current Opinion in Psychology*, 7, 33–38. <https://doi.org/10.1016/j.copsyc.2015.07.012>
- Barclay, P., & Raihani, N. J. (2016). Partner choice versus punishment in human Prisoner’s Dilemmas. *Evolution and Human Behavior*, 37(4), 263–271.

<https://doi.org/10.1016/j.evolhumbehav.2015.12.004>

Barclay, P., & Willer, R. (2007). Partner choice creates competitive altruism in humans.

Proceedings. Biological Sciences / The Royal Society, 274(December 2006), 749–753. <https://doi.org/10.1098/rspb.2006.0209>

Barrett, H. C., Bolyanatz, A., Crittenden, A. N., Fessler, D. M. T., Fitzpatrick, S., Gurven, M., ... Laurence, S. (2016). Small-scale societies exhibit fundamental variation in

the role of intentions in moral judgment. *Proceedings of the National Academy of Sciences*, 113(17), 4688–4693. <https://doi.org/10.1073/pnas.1522070113>

Baumard, N., André, J.-B., & Sperber, D. (2013). A mutualistic approach to morality: the

evolution of fairness by partner choice. *The Behavioral and Brain Sciences*, 36(1), 59–78. <https://doi.org/10.1017/S0140525X11002202>

Baumard, N., & Boyer, P. (2013). Explaining moral religions. *Trends in Cognitive*

Sciences, 17(6), 272–280. <https://doi.org/10.1016/j.tics.2013.04.003>

Bednarik, P., Fehl, K., & Semmann, D. (2014). Costs for switching partners reduce

network dynamics but not cooperative behaviour. *Proceedings of the Royal Society B: Biological Sciences*, 281(1792), 20141661–20141661.

<https://doi.org/10.1098/rspb.2014.1661>

Blake, P. R., McAuliffe, K., & Warneken, F. (2014). The developmental origins of

fairness: the knowledge–behavior gap. *Trends in Cognitive Sciences*, 1–3.

<https://doi.org/10.1016/j.tics.2014.08.003>

Bornhorst, F., Ichino, A., Kirchkamp, O., Schlag, K. H., & Winter, E. (2010). Similarities

and differences when building trust: The role of cultures. *Experimental Economics*, 13(3), 260–283. <https://doi.org/10.1007/s10683-010-9240-x>

- Bostyn, D. H., & Roets, A. (2017). Trust, trolleys and social dilemmas: A replication study. *Journal of Experimental Psychology: General*, 146(5), e1–e7.
<https://doi.org/10.1037/xge0000295>
- Boyd, R., & Richerson, P. (1992). Punishment allows the evolution of cooperation (or anything else) in sizable groups. *Ethology and Sociobiology*, 195, 171–195.
- Bshary, R., & Grutter, A. S. (2002). Asymmetric cheating opportunities and partner control in a cleaner fish mutualism. *Animal Behaviour*, 63(3), 547–555.
<https://doi.org/10.1006/anbe.2001.1937>
- Bshary, R., & Schäffer, D. (2002). Choosy reef fish select cleaner fish that provide high-quality service. *Animal Behaviour*, 63(3), 557–564.
<https://doi.org/10.1006/anbe.2001.1923>
- Bull, J. J., & Rice, W. R. (1991). Distinguishing mechanisms for the evolution of cooperation. *Journal of Theoretical Biology*, 149(1), 63–74.
[https://doi.org/10.1016/S0022-5193\(05\)80072-4](https://doi.org/10.1016/S0022-5193(05)80072-4)
- Buss, D. M., & Schmitt, D. P. (1993). Sexual Strategies Theory : An Evolutionary Perspective on Human Mating, 100(2), 204–232.
- Carlsmith, K., Darley, J., & Robinson, P. (2002). Why do we punish?: Deterrence and just deserts as motives for punishment. *Journal of Personality and Social Psychology*, 83(2), 284–299. <https://doi.org/10.1037/0022-3514.83.2.284>
- Chakroff, A., & Young, L. (2015). Harmful situations, impure people: An attribution asymmetry across moral domains. *Cognition*, 136, 30–37.
<https://doi.org/10.1016/j.cognition.2014.11.034>
- Cinyabuguma, M., Page, T., & Putterman, L. (2005). Cooperation under the threat of

- expulsion in a public goods experiment. *Journal of Public Economics*, 89(8 SPEC. ISS.), 1421–1435. <https://doi.org/10.1016/j.jpubeco.2004.05.011>
- Clutton-Brock, T., & McAuliffe, K. (2009). Female Mate Choice in Mammals. *The Quarterly Review of Biology*, 84(1), 3–27. <https://doi.org/10.1086/596461>
- Clutton-Brock, T., & Parker, G. (1995). Punishment in animal societies. *Nature*, 373, 209–216.
- Coricelli, G., Fehr, D., & Fellner, G. (2004). Partner selection in public goods experiments. *Journal of Conflict Resolution*, 48(3), 356–378. <https://doi.org/10.1177/0022002704264143>
- Cushman, F. (2008). Crime and punishment: Distinguishing the roles of causal and intentional analyses in moral judgment. *Cognition*, 108(2), 353–380. <https://doi.org/10.1016/j.cognition.2008.03.006>
- Cushman, F., Sheketoff, R., Wharton, S., & Carey, S. (2013). The development of intent-based moral judgment. *Cognition*, 127(1), 6–21. <https://doi.org/10.1016/j.cognition.2012.11.008>
- Cushman, F., Young, L., & Hauser, M. (2006). The role of conscious reasoning and intuition in moral judgment. *Psychological Science*, 17(12), 8.
- Dahl, A., Schuck, R. K., & Campos, J. J. (2013). Do young toddlers act on their social preferences? *Developmental Psychology*, 49(10), 1964–1970. <https://doi.org/10.1037/a0031460>
- Dahl, E., Niedbala, E. M., & Hohman, Z. P. (2019). Loving the Group That Denies You First: Social Identity Effects of Ostracism Before Inclusion. *Personality and Social Psychology Bulletin*, 45(2), 284–299. <https://doi.org/10.1177/0146167218784901>

- Dall, S., Giraldeau, L., Olsson, O., McNamara, J., & Stephens, D. (2005). Information and its use by animals in evolutionary ecology. *Trends in Ecology & Evolution*, 20(4), 187–193. <https://doi.org/10.1016/j.tree.2005.01.010>
- Debove, S. S., Andre, J.-B., & Baumard, N. (2015). Partner choice creates fairness in humans. *Proceedings of the Royal Society B*, 282(1808), 20150392. <https://doi.org/10.5061/dryad.6v4c0>
- Delgado, M. R., Frank, R. H., & Phelps, E. A. (2005). Perceptions of moral character modulate the neural systems of reward during the trust game. *Nature Neuroscience*, 8(11), 1611–1618. <https://doi.org/10.1038/nn1575>
- Driscoll, R. L., Barclay, P., & Fenske, M. J. (2017). To be spurned no more: The affective and behavioral consequences of social and nonsocial rejection. *Psychonomic Bulletin & Review*, 24(2), 566–573. <https://doi.org/10.3758/s13423-016-1114-6>
- Dugatkin, L. A., & Wilson, D. S. (1993). Fish behaviour, partner choice experiments and cognitive ethology. *Reviews in Fish Biology and Fisheries*, 3(4), 368–372. <https://doi.org/10.1007/BF00043386>
- Eisenbruch, A. B., & Roney, J. R. (2017). The Skillful and the Stingy: Partner Choice Decisions and Fairness Intuitions Suggest Human Adaptation for a Biological Market of Cooperators. *Evolutionary Psychological Science*. <https://doi.org/10.1007/s40806-017-0107-7>
- Engelmann, J. M., & Herrmann, E. (2016). Chimpanzees Trust Their Friends. *Current Biology*, 26(2), 252–256. <https://doi.org/10.1016/j.cub.2015.11.037>
- Engelmann, J. M., Herrmann, E., & Tomasello, M. (2015). Chimpanzees trust

- conspecifics to engage in low-cost reciprocity. *Proceedings of the Royal Society B: Biological Sciences*, 282(1801), 20142803–20142803.
<https://doi.org/10.1098/rspb.2014.2803>
- Everett, J. A. C., Faber, N. S., Savulescu, J., & Crockett, M. J. (2018). The costs of being consequentialist: Social inference from instrumental harm and impartial beneficence. *Journal of Experimental Social Psychology*, 79(August), 200–216.
<https://doi.org/10.1016/j.jesp.2018.07.004>
- Everett, J. A. C., Pizarro, D. A., & Crockett, M. J. (2016). Inference of trustworthiness from intuitive moral judgments. *Journal of Experimental Psychology: General*, 145(6), 772–787. <https://doi.org/10.1037/xge0000165>
- Falco, A., Albinet, C., Rattat, A.-C., Paul, I., & Fabre, E. (2019). Being the chosen one: social inclusion modulates decisions in the ultimatum game. An ERP study. *Social Cognitive and Affective Neuroscience*, 14(2), 141–149.
<https://doi.org/10.1093/scan/nsy118>
- Fehr, E., & Gächter, S. (2002). Altruistic punishment in humans. *Nature*, 415(6868), 137–140. <https://doi.org/10.1038/415137a>
- Fehrler, S., & Przepiorka, W. (2013). Charitable giving as a signal of trustworthiness: Disentangling the signaling benefits of altruistic acts. *Evolution and Human Behavior*, 34(2), 139–145. <https://doi.org/10.1016/j.evolhumbehav.2012.11.005>
- Fehrler, S., & Przepiorka, W. (2016). Choosing a partner for social exchange: Charitable giving as a signal of trustworthiness. *Journal of Economic Behavior and Organization*, 129, 157–171. <https://doi.org/10.1016/j.jebo.2016.06.006>
- Feinberg, M., Willer, R., & Schultz, M. (2014). Gossip and ostracism promote

cooperation in groups. *Psychological Science*, 25(3), 656–664.

<https://doi.org/10.1177/0956797613510184>

Fiske, S. T., Cuddy, A. J. C., & Glick, P. (2007). Universal dimensions of social cognition: warmth and competence. *Trends in Cognitive Sciences*, 11(2), 77–83.

<https://doi.org/10.1016/j.tics.2006.11.005>

Fruteau, C., Lemoine, S., Hellard, E., van Damme, E., & Noë, R. (2011). When females trade grooming for grooming: testing partner control and partner choice models of cooperation in two primate species. *Animal Behaviour*, 81(6), 1223–1230.

<https://doi.org/10.1016/j.anbehav.2011.03.008>

Grinsted, L., & Field, J. (2017). Market forces influence helping behaviour in cooperatively breeding paper wasps. *Nature Communications*, 8, 13750.

<https://doi.org/10.1038/ncomms13750>

Gross, J., Leib, M., Offerman, T., & Shalvi, S. (2018). Ethical Free Riding: When Honest People Find Dishonest Partners. *Psychological Science*, 29(12), 1956–1968.

<https://doi.org/10.1177/0956797618796480>

Guala, F. (2012). Reciprocity: weak or strong? What punishment experiments do (and do not) demonstrate. *The Behavioral and Brain Sciences*, 35(1), 1–15.

<https://doi.org/10.1017/S0140525X11000069>

Gummerum, M., & Chu, M. T. (2014). Outcomes and intentions in children's, adolescents', and adults' second- and third-party punishment behavior. *Cognition*, 133(1), 97–103. <https://doi.org/10.1016/j.cognition.2014.06.001>

Hackel, L. M., Doll, B. B., & Amodio, D. M. (2015). Instrumental learning of traits versus rewards: dissociable neural correlates and effects on choice. *Nature Neuroscience*,

18(9). <https://doi.org/10.1038/nn.4080>

Hamilton, W. D. (1964). The genetical evolution of social behaviour. II. *Journal of Theoretical Biology*, 7(1), 17–52. [https://doi.org/10.1016/0022-5193\(64\)90039-6](https://doi.org/10.1016/0022-5193(64)90039-6)

Hamlin, J. K. (2013). Failed attempts to help and harm: intention versus outcome in preverbal infants' social evaluations. *Cognition*, 128(3), 451–474.

<https://doi.org/10.1016/j.cognition.2013.04.004>

Hamlin, J. K., Wynn, K., Bloom, P., & Mahajan, N. (2011). How infants and toddlers react to antisocial others. *Proceedings of the National Academy of Sciences*.

<https://doi.org/10.1073/pnas.1110306108>

Hammerstein, P., & Noë, R. (2016). Biological trade and markets. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 371(1687), 20150101.

<https://doi.org/10.1098/rstb.2015.0101>

Hardy, C. L., & Van Vugt, M. (2006). Nice guys finish first: The competitive altruism hypothesis. *Personality and Social Psychology Bulletin*, 32(10), 1402–1413.

<https://doi.org/10.1177/0146167206291006>

Hauk, E., & Nagel, R. (2000). *Choice of Partners in Multiple Two-Person Prisoner's Dilemma Games*. *Journal of Conflict Resolution* (Vol. 45).

<https://doi.org/10.1177/0022002701045006004>

Hauser, M. D. (1992). Costs of deception: cheaters are punished in rhesus monkeys (*Macaca mulatta*). *Proceedings of the National Academy of Sciences*, 89(24),

12137–12139. <https://doi.org/10.1073/pnas.89.24.12137>

Hebble, P. W. (1971). The development of elementary school children's judgment of intent. *Child Development*, 42(4), 1203. <https://doi.org/10.2307/1127804>

- Heijne, A., Rossi, F., & Sanfey, A. G. (2017). Why we stay with our social partners: Neural mechanisms of stay/leave decision-making. *Social Neuroscience*, 00(00), 1–13. <https://doi.org/10.1080/17470919.2017.1370010>
- Henrich, J., Ensminger, J., McElreath, R., Barr, A., Barrett, C., Bolyanatz, A., ... Ziker, J. (2010). Markets, religion, community size, and the evolution of fairness and punishment. *Science (New York, N.Y.)*, 327(5972), 1480–1484. <https://doi.org/10.1126/science.1182238>
- Henrich, J., & Gil-White, F. J. (2001). The evolution of prestige: freely conferred deference as a mechanism for enhancing the benefits of cultural transmission. *Evolution and Human Behavior*, 22(3), 165–196. [https://doi.org/10.1016/S1090-5138\(00\)00071-4](https://doi.org/10.1016/S1090-5138(00)00071-4)
- Henrich, J., McElreath, R., Barr, A., Ensminger, J., Barrett, C., Bolyanatz, A., ... Ziker, J. (2006). Costly punishment across human societies. *Science (New York, N.Y.)*, 312(5781), 1767–1770. <https://doi.org/10.1126/science.1127333>
- Herrmann, B., Thöni, C., & Gächter, S. (2008). Antisocial punishment across societies. *Science*, 319(5868), 1362–1367. <https://doi.org/10.1126/science.1153808>
- Hoffman, M. B., & Goldsmith, T. H. (1999). The Biological Roots of Punishment *. *Ohio State Journal of Criminal Law*, 271(1991), 627–641.
- Hrdy, S. (2011). *Mothers and Others*. Belknap Press of Harvard University Press. <https://doi.org/10.2307/j.ctv5rf3wk.13>
- Imamoglu, E. O. (1975). Children's Awareness and Usage of Intention Cues. *Child Development*, 46(1), 39–45. <https://doi.org/10.2307/1128831>
- Jensen, K., Call, J., & Tomasello, M. (2007). Chimpanzees are vengeful but not spiteful.

- Proceedings of the National Academy of Sciences of the United States of America*, 104, 13046–13050. <https://doi.org/10.1073/pnas.0705555104>
- Jordan, J. J., Hoffman, M., Bloom, P., & Rand, D. G. (2016). Third-party punishment as a costly signal of trustworthiness. *Nature*, 530(7591), 473–476. <https://doi.org/10.1038/nature16981>
- Jordan, J. J., Hoffman, M., Nowak, M. A., & Rand, D. G. (2016). Uncalculating cooperation is used to signal trustworthiness. *Proceedings of the National Academy of Sciences*. <https://doi.org/10.1017/CBO9781107415324.004>
- Kemper, N. S., & Newheiser, A. (2017). To Confront or to Avoid. *Social Psychological and Personality Science*. <https://doi.org/10.1177/1948550617722831>
- Kenward, B., & Dahl, M. (2011). Preschoolers Distribute Scarce Resources According to the Moral Valence of Recipients' Previous Actions. *Developmental Psychology*, 47(4), 1054–1064. <https://doi.org/10.1037/a0023869>
- Kerr, N. L., Rumble, A. C., Park, E. S., Ouwerkerk, J. W., Parks, C. D., Gallucci, M., & van Lange, P. A. M. (2009). "How many bad apples does it take to spoil the whole barrel?": Social exclusion and toleration for bad apples. *Journal of Experimental Social Psychology*, 45(4), 603–613. <https://doi.org/10.1016/j.jesp.2009.02.017>
- King-Casas, B., Tomlin, D., Anen, C., Camerer, C. F., Quartz, S. R., & Montague, P. R. (2005). Getting to Know You: Reputations and Trust in a Two-Person Economic Exchange. *Science*, 308(5718), 78–83. <https://doi.org/10.1126/science.1108062>
- Koyama, N. F., Caws, C., & Aureli, F. (2006). Interchange of grooming and agonistic support in chimpanzees. *International Journal of Primatology*, 27(5), 1293–1309. <https://doi.org/10.1007/s10764-006-9074-8>

- Krueger, F., McCabe, K., Moll, J., Kriegeskorte, N., Zahn, R., Strenziok, M., ... Grafman, J. (2007). Neural correlates of trust. *Proceedings of the National Academy of Sciences*, 104(50), 20084–20089.
<https://doi.org/10.1073/pnas.0710103104>
- Lammers, J., Gast, A., Unkelbach, C., & Galinsky, A. D. (2017). Moral Character Impression Formation Depends on the Valence Homogeneity of the Context. *Social Psychological and Personality Science*, 194855061771458.
<https://doi.org/10.1177/1948550617714585>
- Liddell, T. M., & Kruschke, J. K. (2014). Ostracism and fines in a public goods game with accidental contributions: the importance of punishment type. *Judgement and Decision Making*, 9(6), 523–547.
- Lucca, K., Pospisil, J., & Sommerville, J. A. (2018). Fairness informs social decision making in infancy. *PLoS ONE*, 1–14. <https://doi.org/10.17605/OSF.IO/WZX39>
- Martin, J. W., & Cushman, F. (2015). To Punish or to Leave: Distinct Cognitive Processes Underlie Partner Control and Partner Choice Behaviors. *PLOS ONE*, 10(4), e0125193. <https://doi.org/10.1371/journal.pone.0125193>
- Martin, J. W., & Cushman, F. (2016). The adaptive logic of moral luck. In J. Sytsma & W. Buckwalter (Eds.), *The Blackwell Companion to Experimental Philosophy* (pp. 190–202). Malden, MA: Wiley-Blackwell.
- McNamara, J. M., & Houston, A. I. (1986). The Common Currency for Behavioral Decisions. *The American Naturalist*, 127(3), 358–378.
<https://doi.org/10.1086/284489>
- Melis, A. P., Hare, B., & Tomasello, M. (2006). Chimpanzees Recruit the Best

Collaborators. *Science*, 311(5765), 1297–1300.

<https://doi.org/10.1126/science.1123007>

Melnikoff, D. E., & Bailey, A. H. (2018). Preferences for moral vs. immoral traits in others are conditional. *Proceedings of the National Academy of Sciences*, 201714945. <https://doi.org/10.1073/pnas.1714945115>

Misyak, J. B., Melkonyan, T., Zeitoun, H., & Chater, N. (2014). Unwritten rules: Virtual bargaining underpins social interaction, culture, and society. *Trends in Cognitive Sciences*, 18(10), 512–519. <https://doi.org/10.1016/j.tics.2014.05.010>

Molesti, S., & Majolo, B. (2016). Cooperation in wild Barbary macaques: factors affecting free partner choice. *Animal Cognition*, 19(1), 133–146. <https://doi.org/10.1007/s10071-015-0919-4>

Nelissen, R. M. A., & Meijers, M. H. C. (2011). Social benefits of luxury brands as costly signals of wealth and status. *Evolution and Human Behavior*, 32(5), 343–355. <https://doi.org/10.1016/j.evolhumbehav.2010.12.002>

Nobes, G., Panagiotaki, G., & Bartholomew, K. J. (2016). The influence of intention, outcome and question-wording on children's and adults' moral judgments. *Cognition*, 157(December), 190–204. <https://doi.org/10.1016/j.cognition.2016.08.019>

Nobes, G., Panagiotaki, G., & Pawson, C. (2009). The influence of negligence, intention, and outcome on children's moral judgments. *Journal of Experimental Child Psychology*, 104(4), 382–397. <https://doi.org/10.1016/j.jecp.2009.08.001>

Noe, R., & Hammerstein, P. (1994). Biological Markets : Supply and Demand Determine the Effect of Partner Choice in Cooperation , Mutualism and Mating\ . *Behavioral*

Ecology & Sociobiology, 35(1), 1–11.

Page, T., Putterman, L., & Unel, B. (2005). Voluntary association in public goods experiments: Reciprocity, mimicry and efficiency. *Economic Journal*, 115(506), 1032–1053. <https://doi.org/10.1111/j.1468-0297.2005.01031.x>

Peysakhovich, A., Nowak, M. a, & Rand, D. G. (2014). Humans display a “cooperative phenotype” that is domain general and temporally stable. *Nature Communications*, 5, 4939. <https://doi.org/10.1038/ncomms5939>

Pleasant, A., & Barclay, P. (2018). Why Hate the Good Guy? Antisocial Punishment of High Cooperators Is Greater When People Compete to Be Chosen. *Psychological Science*, 095679761775264. <https://doi.org/10.1177/0956797617752642>

Przepiorka, W., & Liebe, U. (2016). Generosity is a sign of trustworthiness-the punishment of selfishness is not. *Evolution and Human Behavior*, 37(4), 255–262. <https://doi.org/10.1016/j.evolhumbehav.2015.12.003>

Raihani, N. J., & Barclay, P. (2016). Exploring the trade-off between quality and fairness in human partner choice. *Royal Society Open Science*, 3(11), 160510. <https://doi.org/10.1098/rsos.160510>

Raihani, N. J., & Bshary, R. (2015). The reputation of punishers. *Trends in Ecology & Evolution*, 1–6. <https://doi.org/10.1016/j.tree.2014.12.003>

Raihani, N. J., Grutter, A., & Bshary, R. (2010). Punishers benefit from third-party punishment in fish. *Science*, 67.

Rand, D. G., & Nowak, M. A. (2013). Human cooperation. *Trends in Cognitive Sciences*, 17(8), 413–425. <https://doi.org/10.1016/j.tics.2013.06.003>

Riehl, C., & Frederickson, M. E. (2016). Cheating and punishment in cooperative animal

- societies. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 371(1687), 20150090. <https://doi.org/10.1098/rstb.2015.0090>
- Rockenbach, B., & Milinski, M. (2011). To qualify as a social partner, humans hide severe punishment, although their observed cooperativeness is decisive. *Proceedings of the National Academy of Sciences*, 108(45), 18307–18312. <https://doi.org/10.1073/pnas.1108996108>
- Rusbult, C. E., Zembrodt, I. M., & Gunn, L. K. (1982). Exit, voice, loyalty, and neglect: Responses to dissatisfaction in romantic involvements. *Journal of Personality and Social Psychology*, 43(6), 1230–1242. <https://doi.org/10.1037/0022-3514.43.6.1230>
- Sabbatini, G., De Bortoli Vizioli, A., Visalberghi, E., & Schino, G. (2012). Food transfers in capuchin monkeys: an experiment on partner choice. *Biology Letters*, 8(5), 757–759. <https://doi.org/10.1098/rsbl.2012.0534>
- Schino, G., & Aureli, F. (2015). Reciprocity in group-living animals: partner control versus partner choice. *Biological Reviews*, 92(2), 665–672. <https://doi.org/10.1111/brv.12248>
- Schulz, J. F. (2016). The Churches' Bans on Consanguineous Marriages, Kin-Networks and Democracy. *SSRN Electronic Journal*, (2877828), 1–58. <https://doi.org/10.2139/ssrn.2877828>
- Seymour, B., Singer, T., & Dolan, R. (2007). The neurobiology of punishment. *Nature Reviews Neuroscience*, 8(4), 300–311. <https://doi.org/10.1038/nrn2119>
- Shaw, A., DeScioli, P., & Olson, K. R. (2012). Fairness versus favoritism in children. *Evolution and Human Behavior*, 33(6), 736–745. <https://doi.org/10.1016/j.evolhumbehav.2012.06.001>

- Simpson, B., & Harrell, A. (2013). Hidden paths from morality to cooperation: Moral judgments promote trust and trustworthiness. *Social Forces*, 91(4), 1529–1548.
<https://doi.org/10.1093/sf/sot015>
- Steckler, C. M., Woo, B. M., & Hamlin, J. K. (2017). The limits of early social evaluation: 9-month-olds fail to generate social evaluations of individuals who behave inconsistently. *Cognition*, 167, 255–265.
<https://doi.org/10.1016/j.cognition.2017.03.018>
- Strømmland, E., Tjøtta, S., & Torsvik, G. (2016). *Reciprocity Evolving: Partner Choice and Communication in a Repeated Prisoner's Dilemma*.
- Suchak, M., Eppley, T. M., Campbell, M. W., & de Waal, F. B. M. (2014). Ape duos and trios: spontaneous cooperation with free partner choice in chimpanzees. *PeerJ*, 2, e417. <https://doi.org/10.7717/peerj.417>
- Suchak, M., Eppley, T. M., Campbell, M. W., Feldman, R. A., Quarles, L. F., & de Waal, F. B. M. (2016). How chimpanzees cooperate in a competitive world. *Proceedings of the National Academy of Sciences*, 113(36), 10215–10220.
<https://doi.org/10.1073/pnas.1611826113>
- Sylwester, K., & Roberts, G. (2010). Cooperators benefit through reputation-based partner choice in economic games. *Biology Letters*, 6(5), 659–662.
<https://doi.org/10.1098/rsbl.2010.0209>
- Sylwester, K., & Roberts, G. (2013). Reputation-based partner choice is an effective alternative to indirect reciprocity in solving social dilemmas. *Evolution and Human Behavior*, 34(3), 201–206. <https://doi.org/10.1016/j.evolhumbehav.2012.11.009>
- Tasimi, A., & Wynn, K. (2016). Costly rejection of wrongdoers by infants and children.

- Cognition*, 151, 76–79. <https://doi.org/10.1016/j.cognition.2016.03.004>
- Tinbergen, N. (1963). On aims and methods of Ethology. *Animal Biology*, 55(4), 297–321. <https://doi.org/10.1163/157075605774840941>
- Trivers, R. L. (1971). The evolution of reciprocal altruism. *The Quarterly Review of Biology*, 46(1), 35–57. <https://doi.org/10.1086/406755>
- Tzieropoulos, H. (2013). The Trust Game in neuroscience: a short review. *Social Neuroscience*, 8(5), 407–416. <https://doi.org/10.1080/17470919.2013.832375>
- Vail, A. L., Manica, A., & Bshary, R. (2014). Fish choose appropriately when and with whom to collaborate. *Current Biology*, 24(17), R791–R793. <https://doi.org/10.1016/j.cub.2014.07.033>
- Van de Vondervoort, J. W., & Hamlin, J. K. (2016). Evidence for intuitive morality: Preverbal infants make sociomoral evaluations. *Child Development Perspectives*, 10(3), 143–148. <https://doi.org/10.1111/cdep.12175>
- Van de Vondervoort, J. W., & Hamlin, J. K. (2017). Preschoolers' social and moral judgments of third-party helpers and hinderers align with infants' social evaluations. *Journal of Experimental Child Psychology*, 164, 136–151. <https://doi.org/10.1016/j.jecp.2017.07.004>
- van der Lee, R., Ellemers, N., Scheepers, D., & Rutjens, B. T. (2017). In or out? How the perceived morality (vs. competence) of prospective group members affects acceptance and rejection. *European Journal of Social Psychology*, 47(6), 748–762. <https://doi.org/10.1002/ejsp.2269>
- Warneken, F. (2017). How Children Solve the Two Challenges of Cooperation. *Annual Review of Psychology*, (August 2017), 1–25. <https://doi.org/10.1146/annurev->

psych-122216-011813

Woo, B. M., Steckler, C. M., Le, D. T., & Hamlin, J. K. (2017). Social evaluation of intentional, truly accidental, and negligently accidental helpers and harmers by 10-month-old infants. *Cognition*, 168, 154–163.

<https://doi.org/10.1016/j.cognition.2017.06.029>

Wu, J., Balliet, D., & Van Lange, P. A. M. (2016). Gossip Versus Punishment: The Efficiency of Reputation to Promote and Maintain Cooperation. *Scientific Reports*, 6(1), 23919. <https://doi.org/10.1038/srep23919>

Yamagishi, T. (1986). The provision of a sanctioning system as a public good. *Journal of Personality and Social Psychology*, 51(1), 110–116.

<https://doi.org/10.1037/0022-3514.51.1.110>

Yokoyama, R., Sugiura, M., Yamamoto, Y., Nejad, K. K., & Kawashima, R. (2017).

Neural bases of the adaptive mechanisms associated with reciprocal partner choice. *NeuroImage*, 145, 74–81. <https://doi.org/10.1016/j.neuroimage.2016.09.052>

Zelazo, P. D., Helwig, C. C., & Lau, A. (1996). Intention, act, and outcome in behavioral prediction and moral judgment. *Child Development*, 67(5), 2478–2492.

<https://doi.org/10.2307/1131635>