



# Can episodic memory deter cheating and promote altruism?

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## Abstract

Episodic memory gives us the ability to mentally travel back in time to revisit and relive past experiences. In recent years, there has been an increased interest in the function of episodic memory. According to the orthodox view, episodic memory should be considered a part of a constructive system that simulates the future for sophisticated foresight and flexible planning. In this paper, I offer a novel alternative view. I argue that episodic memory provides invaluable information about the past behavior of others, allowing us to identify reliable and trustworthy partners while avoiding dealing with cheaters. Theoretical models demonstrate that cooperation in groups can be maintained if potential partners use information about an individual's past behavior to guide their behavior toward that individual. In these reputation-based models of human cooperation, individuals with a history of cheating are ostracized, whereas those with a history of cooperative behavior flourish. Against this theoretical background, it is possible to see a function of episodic memory in facilitating information exchange about others, helping group members make effective partner choices, and avoiding the risk of interacting with cheaters. If correct, episodic memory may have played a significant role in the evolution of human cooperation.

**Keywords** Cooperation · Altruism · Indirect reciprocity · Gossip · Reputation · Memory sharing · Vicarious learning · Vicarious memory

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## 1 Introduction

Episodic memory is the conscious recollection of specific personal experiences in particular places and times, such as a conversation with a boss at work or a vacation with friends in Las Vegas. Episodic memory system enables us to mentally travel back in time to revisit and relive past experiences (Tulving, 1983). Episodic memory is often contrasted with semantic memory, which is knowledge about the world, such as the fact that there are many casinos in Las Vegas. Although there is some debate about precisely defining the distinction between episodic and semantic memory (McKoon et al., 1986), it is generally agreed that episodic memory is involved in the conscious recall of personal experiences, whereas semantic memory is concerned with factual knowledge. For example, one can semantically know that there are many casinos in Las Vegas without ever having been there, but episodically remember walking down the Strip at night and seeing the glamorous casinos firsthand.

But why do we remember? In recent years, there has been an increased interest in this question from various fields (Boyer, 2008; Schacter et al., 2011; De Brigard, 2013; Michaelian, 2016; Mahr & Csibra, 2018, 2020; Boyle, 2019). According to the orthodox answer, episodic memory is not for remembering the past as it has traditionally been thought; instead, it allows one to simulate the future (Schacter & Addis, 2007a; Schacter et al., 2007; Suddendorf & Corballis, 2007; De Brigard, 2013; Michaelian, 2016). Simulationists argue that to understand what an episodic memory system does for an individual, we need to consider it as part of a constructive simulation process. Schacter and Addis (2007b) suggest that constructive episodic simulation uses bits and pieces from past experiences to construct possible future, fictional, or even counterfactual scenarios to guide decision-making. In a similar vein, Suddendorf and Corballis (2007) argue that past episodes provide a store of possible scenarios whose combination allows sophisticated foresight and, therefore, flexible planning. De Brigard (2013) goes as far as to claim that the function of episodic memory is not retrospective, but rather prospective.

However, it is possible to approach the function of episodic memory from a different perspective by asking what it does for a group rather than for an individual. I argue that this innocuous move makes it possible to develop compelling theoretical possibilities that have not yet been considered. When viewed from a higher vantage point, the social nature of episodic memory becomes apparent. People do not just remember the past; they also share what they remember with others (see Hirst & Echterhoff, 2012, for a review). This ubiquitous memory sharing<sup>1</sup> activity is highly likely to have functional significance.

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<sup>1</sup> I employ the term ‘memory sharing’ as an umbrella term for the complex phenomenon of recounting past experiences to others. This complex act necessitates the coordinated interplay of numerous cognitive capacities, extending beyond episodic memory retrieval. Narrative construction, comprehension, linguistic proficiency, imaginative faculties, and social-communicative abilities all play critical roles in successful memory transmission. However, it is the transmitted memory content itself that holds the primary functional significance for my investigation. Consequently, I focus my inquiry on the act of sharing memories, rather than on the broader spectrum of cognitive processes involved. However, a complete evolutionary account of memory sharing must ultimately consider the broader spectrum of cognitive processes involved, including these extended capacities.

Evolutionary psychologists and biologists have long been puzzled by the remarkable altruistic tendency toward non-relatives in human societies. Altruistic acts are costly to perform but confer benefits to another individual. In all other eusocial species, such as bees, ants, and termites, well-organized societies are based on close kinship among individuals. Kin selection, however, cannot explain human altruistic behavior among unrelated individuals. According to a compelling line of research, groups can successfully cooperate if potential partners make decisions about future interactions based on information about a person's past behavior (Alexander, 1987; Fehr & Fischbacher, 2003; Nowak & Sigmund, 1998; Panchanathan & Boyd, 2004; Leimar & Hammerstein, 2001). In these indirect reciprocity models, you help me, and I will help someone else in the future. At first, indirect reciprocity seems susceptible to exploitation by cheaters. However, indirect reciprocity has a critical feature that discourages exploitation from the outset. According to this model, I return the favor because I will not get any help if it becomes known that I do not help anyone. Therefore, I return the favor to avoid incurring a reputation cost. In these types of models, cheaters are ostracized and therefore pay a long-term cost for their behavior, whereas individuals with a history of cooperative behaviors, reap the benefits of their altruistic behavior. Against this theoretical backdrop, I argue that it is possible to see a social function of episodic memory in facilitating information exchange about other individuals. Episodic memories carry invaluable information about the past deeds of other individuals, which can be used to anticipate their future behaviors.

It would be helpful to clarify the term "function" before proceeding. The philosophical literature on the concept of function in scientific theorizing is vast and diverse, and there is no universally agreed-upon definition. However, to simplify matters, I will focus on two different senses of the concept of function. The first is the causal-role approach to functions pioneered by Robert Cummins (1975, 1983). This approach suggests that functional ascriptions to a capacity are closely tied to the system in which they occur. The functional analysis of capacities is based on their causal role within the containing system, and the performance of a capacity is explained in terms of the capacities of its component processes and the manner in which they are organized. The second is the etiological approach to functions based on natural selection (Millikan, 1989; Neander, 1991). Although there are differences between these etiological accounts, they generally share the common idea that the function of a capacity should be explained by its occurrence in a particular population through the process of natural selection.

The etiological function of memory remains a captivating and complex question that has engaged researchers for decades. However, an exhaustive exploration of the evolutionary history of episodic memory falls outside the scope of this paper. Such an endeavor would necessitate delving into limited historical evidence regarding the origin of episodic recollection and assessing the interplay of numerous relevant cognitive capacities, including narrative construction, comprehension, linguistic proficiency, and social-communicative skills, each playing a crucial role in successful memory transmission. Therefore, I focus on a more modest aim: a functional analysis of memory sharing, with a focus on its potential adaptive roles. This analysis primarily aims to elevate understudied and underrepresented memory sharing phenomenon to its rightful place as an important causal role function of episodic memory. Addi-

tionally, it seeks to reassess standard evolutionary scenarios proposed for episodic memory by considering the implications of this previously neglected causal role function.

The paper is organized as follows. Section 2 begins a functional analysis of memory sharing, considering the individual as the unit of analysis. I argue that memory sharing allows individuals to learn from the experiences of others at low cost and high reward. This is because memory sharing allows individuals to avoid the need to experience events firsthand, which can be risky and costly. In addition, memory sharing can provide individuals with information that they would not otherwise have access to. In Sect. 3, I focus on groups as a unit of analysis. I show how vicarious learning through memory sharing can inform effective partner choices and thereby encourage norm-abiding behaviors at the group level. This is because memory sharing allows individuals to learn about the norm violations of potential partners. Additionally, memory sharing can help to build trust and cooperation within groups. Finally, I will consider various evolutionary scenarios to discuss why episodic memory might be adaptive, given the causal role that memory sharing plays. I argue that episodic memory may have evolved to allow individuals to learn from the experiences of others and to make better decisions about whom to trust and cooperate with.

## 2 Vicarious learning: extension of personal experience

Humans rely on frequent and varied cooperation with others for survival and welfare. Although cooperation is beneficial in the long run, cheating can provide short-term advantages. Therefore, individuals should be vigilant in their partner selection. It has been hypothesized that the increasing importance of cooperation in human evolution has created pressure to select effective collaborative partners and avoid cheaters (Baumard et al., 2013; Tomasello et al., 2012; Cosmides & Tooby, 1992, 2005). We must be cautious about cheaters who exploited us in the past while remembering those who are helpful and can be counted on in future times of need. Therefore, learning about other group members' past behavior must have had a significant payoff in our ancestral past.

People obtain information about other individuals' past deeds through various sources, some direct and some hearsay. The more time you spend with someone, the better you get to know that person. Therefore, personal observations, particularly those based on firsthand experience, offer a reliable way to get to know an individual (Frith & Frith, 2006). Over time, if you witness a person displaying cooperative behaviors, such as fairly sharing resources or helping a weak family member, you can expect that engaging with such an individual would be beneficial in the long run. However, if you notice an individual who acts in an exploitative and non-cooperative manner, such as stealing resources or breaking an agreement, it would be best to avoid or be cautious in dealing with that person. As many researchers have pointed out, remembering those with a history of cheating can be adaptive in social groups (Mealey et al., 1996; Bell & Buchner, 2009; Oda & Nakajima, 2010).

Although personal observations offer a reliable way to get to know an individual, they are severely limited by time and circumstance. It is not possible to stay updated

about others solely through first-hand experience. Two or more people cannot be in each other's sight for all 24 h of the day, and there are many instances where we remain unaware of what others are doing. Instead, direct observations of an acquaintance are typically fleeting, fragmentary, and intermittent. To compensate for the limitations of direct observation, people can rely on the past experiences of acquaintances who have been in a position to gain direct or indirect knowledge about others.

Indeed, people seem to spend a significant amount of time doing just that: sharing their memories with others every day (Hirst & Echterhoff, 2012). Recounting past events is an everyday human activity. For example, a diary study found that 62% of the events recorded by participants had already been shared with others by the end of the day they occurred (Pasupathi et al., 2009). People not only share their own experiences but also pass on information about others' experiences'. In one study, 33 college students visited a hospital morgue as part of a class, and within ten days, almost 900 people had heard about the visit through cascading levels of sharing. This included the people the morgue visitors told (primary sharing), the people their friends told (secondary sharing), and the people their friends' friends told (tertiary sharing) (Harber & Cohen, 2005).

Vicarious memories, referring to recollections of specific past episodes recounted by another individual (Pillemer et al., 2015), exhibit striking similarities to episodic memories in both psychological and neurological domains. Although vicarious memories involve the recollection of events not personally experienced, they share key characteristics with episodic memories, including vivid imagery, strong emotional and physical responses, and lasting influence (Pillemer et al., 2015).

It seems that humans not only can reconstruct their own experiences, but they can also co-construct others' experiences. In fact, the brain network used to construct episodic memories is also used to construct vicarious memories (Chen et al., 2017; Zadbod et al., 2017). The neural patterns elicited by the mental construction of vicarious memories based on the recounting of past events resemble those found in the brain of the individual who experienced the actual events. It seems that neurologically, whether constructed memory is self-initiated or other-initiated, does not make much difference. Or, to put it in simulationist terms, we can simulate others' experiences as much as we can simulate our own.

Simulating others' experiences can be useful for selecting cooperative partners and avoiding cheaters because it allows one to learn from others' experiences. First-hand monitoring of an individual's actions has a limited scope. However, vicarious memories offer a powerful alternative for learning about the past deeds of others that can help individuals fill in gaps in their observations. Through recounting past experiences, the eyes and memories of other group members are mobilized to complement our observations and memories. Vicarious memories provide an indirect route to learning about significant social events in one's group. Vicarious memories make it possible to learn about the actions of another individual, even in situations where you were not present.

Although there is good evidence that memory sharing is a prevalent human activity, this is not enough to show that sharing memories offers an indirect route to significant social events in one's group. If memories are used to learn about the past deeds of others, memory sharing should be particularly about events concerning other people,

rather than any ordinary past event. In other words, memory sharing cannot inform partner choices unless these shared memories are about potential partners.

And this is, in fact, what we find: Human communities are awash with constant chatter about the past deeds of other people. This ubiquitous phenomenon has been studied under the notorious heading of ‘gossip.’ Unsurprisingly, gossip has always been a pervasive feature of human societies across different times and places. Anthropologists and other researchers have documented its practice all over the world, from the !Kung Bushmen of West Africa (Lee, 1969) to the Kabana people of Papua New Guinea (McPherson, 1991) to students in a London university (Dunbar et al., 1997). Various analyses of daily speech show that as much as two-thirds of general speaking time is devoted to gossip (Dunbar, 1993; Haviland, 1977). People are obsessed with talking about the private dealings of other people. But this obsession makes evolutionary sense, given the importance of predicting the behavior of others to select effective collaborative partners.

Gossip is often considered unreliable for partner choices because it can be malicious. However, research suggests that malicious gossip may be more of a stereotype than a common occurrence. Robbins and Karan (2020) recently conducted a large-scale study of social interactions in real-world settings using a portable device worn by participants to automatically record sound from their surroundings at regular intervals. This allowed them to create a detailed record of what people were talking about and observe gossip naturalistically. Their findings suggest that malicious gossip is far less common than commonly believed. Instead, most gossip is relatively benign and involves sharing social information about shared acquaintances.

In addition, the spread of false or misleading gossip is limited by several mechanisms, including triangulation and deterrence. Triangulation refers to the process of collecting information from multiple sources to improve its reliability. As Emler (2001) suggests, triangulation allows people to compare news reports, refine their assessments, and identify dishonest informants. Deterrence refers to the risk of being punished for spreading false information. As Giardini (2012) argues, people are less likely to spread false information if they fear losing credibility or being retaliated against by the receiver of the information or the person about whom the gossip is spread. Therefore, triangulation and deterrence mechanisms jointly work to curtail the spread of false or misleading gossip.

A peculiar feature of gossip lies in the abundance of first-hand testimony. Although gossip can be based on different sources, the exchange is especially fruitful when it refers to the first-hand testimony of one of the participants, what happened to them, what they saw or heard, and so forth. This is an essential difference between gossip and rumor. Gossip tends to be based on first-hand testimony, whereas no first-hand account of an event can be a rumor, but it may later turn into a rumor if it spreads through many informants (Coady, 2012). People gossip about past events that they have epistemic authority over, whereas rumors lack such authority. It is episodic memory that provides gossip with that epistemic authority.

Several researchers have emphasized that a sense of ownership is part and parcel of episodic memory. Dokic (2014) takes the sense that a memory is “first-hand” as a crucial component of the distinctive phenomenology of episodic recollection. In his view, when we remember an experience, we have an auto-noetic sense that this

memory originates directly from our experience. Michaelian (2016) suggests that this autooetic sense of ownership might arise from a process monitoring mechanism. Mahr and Csibra (2018) propose that autooesis acts as a marker between information with first-hand experience instead of some other source in communicative exchanges.

There are differences between these views, but they all share the idea that the sense of ownership is an integral aspect of episodic recollection that allows one to discriminate between first-hand and second-hand information. However, they differ in why distinguishing first- and second-hand information is essential. For Michaelian, this allows one to determine whether remembered events occurred and distinguish memory from imagination. For Mahr and Csibra, the autooetic sense of ownership enables us to distinguish cases in which we can assert epistemic authority for our testimony from instances in which we cannot. I agree with Mahr and Csibra that distinguishing first-hand and second-hand information is especially valuable in social contexts, given that we acquire information about others from both of these sources. Autooesis acts as a “witness trump card” (Henry & Craver, 2018) in communicative exchanges. It signals to others that the speaker has a first-hand testimony of what happened. And gossip proliferates on precisely these kinds of first-hand testimonies.

While Mahr and Csibra (2020) and my perspectives on episodic memory in social life converge in some respects, a crucial divergence lies in the distinct causal roles we attribute to it. Mahr and Csibra emphasize its role in testimony, arguing that it enables us to communicate past experiences and negotiate crucial social facts such as who owes what to whom, who has wronged whom, who owns what, and so forth. These social facts are often intangible, and leave no physical traces; therefore, testimony is essential for communicating and sharing knowledge about them. This process allows us to coordinate our own and others’ commitments, entitlements, and accountabilities. In other words, testimony functions primarily to track and justify claims to the structure of our social relationships.

Mahr and Csibra (2020) take the existence of social facts for granted and focus on explaining how these social facts can be transmitted and maintained. However, it is essential to consider how cooperation originates in the first place so that individuals are able to form stable social relationships that give rise to these social facts. Group living is a necessary condition for the development of social facts and institutions. Promises, agreements, and marriages cannot exist without cooperation among group members already in place. While Mahr and Csibra argue that testimony may play an important role in social life, I argue that memory sharing actually plays a more fundamental role in determining who to cooperate with and who to avoid, and ensuring that the rules of cooperation are not violated. As I argue in more detail in Sect. 4, all of these factors contribute to the development of group living. Once group living is established, memory sharing might acquire new roles in transmitting and maintaining social facts, as Mahr and Csibra suggest.



### 3 Partner choice: evaluation based on social norms

In the previous section, I began my functional analysis to identify the causal roles of memory sharing by focusing on the individual as my unit of analysis. This investigation revealed that memory sharing offers a low-cost, high-reward vicarious learning process for individuals. It is beneficial for everyone, other things being equal, to share what they remember about the past deeds of others as a substitute for direct observation. This extension of personal experience allows individuals to learn about the misdeeds, misdemeanors, or deviant behaviors of others, even in contexts where they were absent. In this section, I will widen my scope and consider groups as my unit of analysis. I will investigate what happens at the group level when individuals can vicariously learn from each other by taking an epidemiological approach (Sperber, 1996) to memory sharing. I will argue that vicarious learning fuels effective partner choices at the group level.

Prior to embarking on the epidemiological investigation of memory transmission, it is essential to provide historical context by contrasting the contemporary framework of partner choice models with the earlier dominant paradigm of partner control models, as outlined by Baumard et al. (2013). Traditionally, models focused on the challenge of controlling partners and ensuring fair exchanges. This partner control approach assumes individuals have assigned partners and must develop punishment mechanisms to incentivize cooperation. Early models, like the iterated Prisoner's Dilemma, exemplify this perspective by focusing on strategies like tit-for-tat to punish defectors and encourage cooperation (Axelrod & Hamilton, 1981).

However, a paradigm shift has emerged with the development of partner choice models. These models recognize that individuals often have the agency to select their partners, and this choice plays a crucial role in promoting cooperation. Instead of solely focusing on preventing cheating through punishment or other control mechanisms, partner choice models emphasize the importance of choosing and being chosen as the right partner for a successful and mutually beneficial relationship (Bull & Rice, 1991; Noë et al., 1991; Roberts, 1998). This shift signals a critical change in perspective: individuals are no longer passive recipients of partnerships but rather autonomous decision-makers who can select collaborators based on their individual needs, preferences, and prior knowledge about potential partners. This choice-based approach offers a more nuanced understanding of cooperation, highlighting the role of individual agency, mutual benefit, and the dynamic nature of partnership formation and dissolution.

The epidemiological approach to studying memory transmission among group members involves documenting and clarifying the spread of memories. One of its fundamental principles is that merely examining the transferred items is insufficient to comprehend social transmission mechanisms. According to Sperber (1996), it is crucial to consider both psychological and ecological factors when determining which options are most likely to be successful. Both of these factors also play a role in the transmission of memories. While the psychology of human beings plays a significant role in determining which memories are likely to appeal to an individual, social ecology is also an essential factor in determining which memories are likely to appeal to a group. Memories can be shared and transmitted from one person to



another, and some memories can spread rapidly and extensively, potentially impacting entire groups. As we shall see, the type of memories that are most shared by individuals with our specific psychology differs significantly from the type of memories that are commonly observed at the group level.

The psychological examination of memory sharing suggests that emotional memories are more likely to be transmitted because of several factors. First, emotional memories are salient, a well-established phenomenon in the literature. It has been demonstrated that emotions play a crucial role in all stages of the memory process, from encoding to consolidation and retrieval (as reviewed in Holland & Kensinger, 2010). There is a vast and comprehensive body of literature on emotional memories that highlights the impact of emotion on all aspects of memory, including its low-level neurological mechanisms. As a result, when individuals recall a past experience, it is more likely to be an emotional experience.

Another factor appears to contribute to the higher likelihood of sharing these salient emotional memories. Research has shown that when individuals experience emotions, they tend to share them in most cases (80-95%) (as reviewed by Rimé et al., 1992, Rimé et al., 1998, and Rimé, 2009). At its essence, the act of sharing memories appears to be driven by emotional arousal, which creates a desire to communicate the source of the experience. This widespread phenomenon can occur in the hours, days, weeks, and even months following an emotional episode. The act of sharing emotions usually begins shortly after experiencing them and tends to occur repeatedly, with more intense emotions being shared more frequently and for longer durations. Various events can trigger different emotions in individuals. For instance, one may experience negative emotions after receiving a parking ticket, or positive emotions after receiving a promotion. Rimé and his colleagues' extensive research suggests that people share most events they experience, regardless of whether they evoke positive or negative emotions. As a result, past experiences that are shared with others are often emotional in nature.

Overall, the psychological factors involved in memory sharing suggest that emotions play a significant role in determining which memories are likely to be shared with others. Individuals share memories emotionally because they are salient or because emotional arousal creates an urge to share. However, it is striking that these mundane emotional events are not reshared by their listeners. Ecological factors paint a different picture of memory sharing at the group level. In other words, memory sharing does not correlate with emotional sharing at the group level. Instead, groups tend to transmit a particular subset of episodes in which social expectations are breached. What fuels retelling is not just the goodness or badness of events or mere emotionality but instead their rightness or wrongness. For instance, Mesoudi et al. (2006) found that a story about a student's affair with a married professor is more likely to be retained in communication chains than a story about a student oversleeping and missing a lecture. Oversleeping, while potentially detrimental to the individual, does not necessarily violate established ethical codes or societal norms. Conversely, an affair between a married professor and a student constitutes a violation of professional ethics and potentially legal codes. This violation carries significant social and professional ramifications, making the story more noteworthy and thus more likely to be shared and remembered. Therefore, it is not mere emotional arousal per se but

emotions arising from violations of social expectations that actually compel listeners to retell (Harber & Cohen, 2005). These kinds of past events that violate expectations are not only retold but, are also better remembered (Bell et al., 2012). While individuals might be content to share their good and bad memories indiscriminately, group members are more concerned about the rightness or wrongness of actions, which leads to cascading levels of sharing. This selective sharing process allows a student's oversleeping rant to end with his confidants while a married professor's relationship with his student is retold and thereby becomes social news.

An epidemiological approach to memory sharing reveals that people do not share memories haphazardly. On the contrary, sharing memories about others appears to be quite systematic: groups collectively remember and share past episodes when a member violates a social norm. Norms are rules that govern the behavior of individuals based on social expectations about how to act in a particular situation (Bicchieri, 2005). They commonly conflict with self-centered interests, such as situations in which cooperation, reciprocity, fairness, or actions that require foregoing personal benefits are expected. Social norms can encompass several areas, including social interactions, communication, etiquette, values, and beliefs. For our purposes, the most relevant aspect of social norms pertains to their evaluative nature. Social norms provide rules that guide behavior, but they are also used as a standard against which behaviors are evaluated. They provide a framework against which behavior is judged as appropriate or inappropriate, acceptable or unacceptable.

When individuals violate social norms, their behavior is evaluated according to the expectations set by the norms of their social group. In this regard, vicarious memories are particularly suited to evaluate the actions of absent others. Imagining what happened is like an experience replay for those who were not present to visualize how the events unfolded. Vicarious memories allow spectators to analyze what had taken place, similar to post-game analysis by sports commentators. Individuals can systematically inspect events using collaborative simulations, reviewing and advancing through them scene-by-scene. This allows for the interpretation and evaluation of why certain actions were inappropriate based on what is expected in a particular situation. To comprehend the motives behind a specific action, onlookers make inferences about the mental state of the person who committed the act. The transgressions are often juxtaposed with counterfactual scenarios, in which the perpetrator is evaluated on the basis of what they should have said or done differently. The process can be quite intricate and serves as a way to assess the actions of individuals who are not present, with the goal of uncovering the motives behind those actions. Therefore, the act of sharing memories includes an evaluative component that enables individuals to create psychological profiles of their fellow group members. These profiles contribute to the overall reputation of each group member.

In this section, I argued that vicarious learning leads to effective partner choices at the group level. This claim might seem difficult to justify, given that more efficient alternatives exist for learning about others. For instance, it is also possible to learn about others' character traits through trait descriptions. Why do we need to simulate experiences about others when we can learn about their personality traits more easily? Why do we need vicarious learning when we can learn about others through personality traits or other generic means? This is an essential question that any account

proposing an adaptive function for episodic memory should be able to answer: What can episodic memory do that cannot be done by semantic memory?

Episodic and semantic memory should be considered complementary rather than competing with each other. Personality traits describe an individual's typical pattern of behavior across different situations and over time. Klein et al. (2009) provide evidence and argue that episodic memories are used to form, update, and constrain these trait summaries. In their study, only one encounter with an unfamiliar person was sufficient to form a trait summary of that person. Therefore, even though personality traits offer an efficient way to learn about others, individual episodes are still required to extract these trait summaries. Klein et al. (2009) also argue that past experiences are essential for maintaining the accuracy of trait summaries. Trait summaries should be constantly updated as new information becomes available; otherwise, they would become obsolete. In addition, episodes that contradict a trait summary can restrict its scope of generalization. Klein et al. suggest that combining semantic and episodic memory in this way provides the best of both worlds. Semantic trait summaries allow us to make quick judgments, but specific past episodes about that person provide more accurate information and insights into exceptions to the rule.

In addition to the arguments presented by Klein et al. (2009), I think past episodes provide invaluable information about a person's norm compliance across different contexts as well. The epidemiological approach to memory sharing suggests that newsworthy episodes in which a social norm is breached can spread within a group. These memories are newsworthy in the sense that they inform others about a breach of social norms, letting them know when someone does something they should not have done. Vicarious learning precisely furnishes such memories about others' right or wrong actions. Moreover, simulating past events plays a vital role in evaluating newsworthy memories. In these types of exchanges, compliance or noncompliance with social norms is evaluated by assessing the perpetrator's mental state in that particular situation. Hence, vicarious learning concerns how individuals' compliance with norms fluctuates across different circumstances.

Personality traits are generally considered as stable and enduring qualities that shape an individual's behavior and personality over time. In contrast, norm compliance is highly variable and can easily change depending on an individual's mental state and the specific situations in which they find themselves. The mental state of an individual is a critical determinant of their degree of adherence to social norms. Emotions such as anger, resentment, envy, or particular desires can increase the likelihood of violating norms, whereas fear, guilt, and pride can reinforce an individual's adherence to norms. An individual's adherence to social norms in a given situation can be significantly influenced by their values and beliefs as well. However, other factors, such as the situation in which the individual finds themselves, can also considerably impact their level of norm compliance. For example, in public settings, individuals may be more likely to adhere to social norms because of the fear of social disapproval or punishment. On the other hand, in private settings, individuals may feel more comfortable disregarding certain norms since they are not subject to public scrutiny. Similarly, in work settings, the norms and rules governing behavior may differ from those in other settings. Therefore, many critical variables affect an individual's norm compliance (Morris & Cushman, 2018). As a result, to predict an individual's future

norm compliance, it is essential to consider the complex interplay between their mental states and the various settings in which they operate.

Personality traits and vicarious learning are complementary approaches to learning about others rather than competing with each other. Personality traits offer insights into a person's typical behaviors and tendencies, providing valuable information about what one can generally expect from them. Nonetheless, personality traits are limited in their ability to encompass the vast range of individual differences in adherence to social norms. Therefore, an alternative approach that relies on prior actions is more viable. Through sharing memories and past experiences, group members acquire valuable insights into how individuals conform to social norms across various mental states and situations. Consequently, vicarious learning is a more effective approach for selecting collaborative partners and avoiding the risk of interacting with cheaters.

#### 4 Why is episodic memory adaptive?

So far, I have provided a functional analysis to identify a causal role of memory sharing. First, I focused on the individual as a containing system. Viewed from an individualistic perspective, memory sharing offers individuals a low-cost, high-reward vicarious learning process. A first-hand experience with a cheater can be costly, whether it is a betrayal, a broken promise, an unpaid debt, or something else. However, sharing memories provides the benefits of often hard-won information about others' actions without incurring the costs of obtaining this information firsthand. Second, I adopted an epidemiological approach to memory sharing and focused on groups as a containing system. This investigation reveals how memory sharing can inform effective partner choices. Groups share memories about norm compliance and evaluate how individuals adhere to social norms by analyzing the mental states of the person who acted in that situation. Partners known for conforming to norms are more likely to receive cooperation from individuals, and such reputations can be established and sustained through shared memories and evaluation of others' conduct.

We are now in a position to address the evolutionary function of episodic memory, which is a much more challenging task. While addressing the evolutionary function of episodic memory presents a fascinating and complex challenge, its exploration would require delving into limited historical evidence and evaluating numerous cognitive capacities, including narrative construction, comprehension, linguistic proficiency, and social-communicative skills, each of which plays a vital role in successful memory transmission. Given the scope of this paper, I will instead focus on a more modest aim: briefly assessing the merits of potential evolutionary scenarios in light of the previously identified causal role function of memory sharing.

Schulz and Robins (2022) review four possible evolutionary scenarios for simulationist views. In the first scenario, episodic memory and future simulations can have distinct evolutionary histories as distinct traits. In the second and third scenarios, one of them can be a by-product of the other. In the last scenario, both could be non-selected aspects of another trait. According to Schulz and Robins, the second scenario, in which episodic memory is a byproduct of selectively advantageous

future simulation, is the most likely evolutionary scenario. This is based on two main reasons. First, navigating social environments requires a suite of social cognitive abilities that consider other people's perspectives and evaluate the consequences of different actions. Second, emotional reactions to future simulations can serve as a valuable guide to advantageous ways of acting in those scenarios.

Note that all of the scenarios that Schultz and Robins consider involve natural selection occurring at the individual level. Obviously, this is a plausible assumption, as most psychological traits are thought to be selected for the fitness benefits they confer on individuals. However, if episodic memory played a role in the evolution of human cooperation, perhaps we should also consider scenarios involving multilevel selection (Wilson & Sober, 1994). Group selection remains a contentious topic, with ongoing research and debate persisting since Darwin's time (Okasha, 2006, provides a balanced review of the controversy). However, modernized multilevel selection theory has renewed interest in this area, highlighting its potential influence in specific evolutionary scenarios, such as the evolution of altruism.

The evolution of altruism is paradoxical. Altruistic behaviors cannot be selected according to the principles of natural selection because, by definition, they do not confer benefits on an individual. In "The Origin of Species," Darwin identified this paradox as the most formidable challenge to his theory. In a famous passage from "The Descent of Man," he notes that while virtuous individuals may not have a noticeable advantage over those who are less virtuous within their own social group, tribes consisting of virtuous individuals would strongly outcompete other tribes. Darwin believed that this would amount to natural selection.

Even if Schultz and Robins are correct that episodic memory evolved as a byproduct of our ability to simulate future actions to navigate social groups, its role could shift to an *exaptation* when group-level selection forces begin to operate. Once episodic memory is in place, groups that share their memories will have a distinct advantage over more private groups. In groups where memories are shared, group members would be able to make better-informed partner choices based on past reputation. Thus, everyone would be compelled to act more generously and less selfishly to avoid incurring reputation costs.

I think there is a more likely coevolution scenario than the byproduct scenario. For one, I am not convinced that episodic memory does not have any fitness-enhancing benefits. As mentioned earlier, Mahr and Csibra (2018, 2020) argue that episodic memory allows speakers to assert epistemic authority on past events to support reason-giving practices in communicative exchanges. Boyle (2019) argues that episodic memory is epistemically generative and includes information about currently irrelevant features of a situation that may subsequently become relevant. Schultz and Robins are not convinced that either of these views offers a viable fitness-enhancing benefit. I argue that episodic memory fuels vicarious learning, which allows us to gain insights into the past actions of others. Such a function is compatible with Schultz and Robins' suggestion that simulating the future is selectively advantageous for navigating complex social environments. It is difficult to fathom that any of these roles, whether employed individually or in combination, would not contribute to improving fitness.

It is more likely that episodic memory and future simulation co-evolved as part of a suite of social cognitive capacities. A growing body of evidence suggests that a group of brain regions, referred to as the default mode network, that is active in episodic recollection is also involved in other forms of future-oriented thinking, imagination, and theory of mind tasks (Hassabis & Maguire, 2007; Buckner & Carroll, 2007; Spreng et al., 2008). These types of evidence point toward a *core cognitive system* that underlies many higher social cognitive capacities, such as remembering, future thinking, imagination, mind-reading, and so on. It might be more fruitful to focus on the evolution of this core cognitive system rather than focusing on the evolution of individual capacities realized by it. Individual capacities, such as episodic memory, future simulation, mind-reading, imagination, and so forth, might co-evolve as part of the suite of capacities of this core cognitive system.

What might explain the evolution of the core cognitive system? Theorizing the function and evolution of the core cognitive system is in its infancy in cognitive sciences (see Addis, 2020 for a recent example), and the default network itself remains an enigma in neuroscience (Braga & Buckner, 2017). Therefore, I can only provide a preliminary sketch at this point. A growing body of work stresses the role of sociality in the evolution of unique cognitive capacities of humans that enable us to navigate the complex social environments that we inhabit and to build cooperative relationships with others in our group (Humphrey, 1976; Byrne & Whiten, 1989; Dunbar, 1998; Tomasello et al., 2005). The significance of sociality underscores the co-evolution of various cognitive capacities such as memory, prospective thinking, imagination, and mind-reading abilities, which likely evolved to enhance the fitness benefits associated with group living and cooperation. To establish cooperative relationships, one needs to possess a set of social cognitive abilities that enable us to recognize cooperative individuals and steer clear of individuals who are prone to deceitful behavior (Baumard et al., 2013). As I argued above, the actions of others in the past can provide insight into future behavior. In fact, predicting others based on their past behavior might be more reliable than using a generic folk psychological theory (Newen, 2015). However, relying solely on episodic memory cannot serve this purpose, because recollecting past events is not helpful unless coupled with an imaginative capacity to envision future possibilities. Moreover, memories based on direct observation are not enough either and need to be supplemented with second-hand observations and shared memories. As we have also seen, memory sharing creates incentives to perform norm-abiding acts to build a positive reputation and be seen as a cooperative partner. Therefore, in a group where memories are shared, norm-abiding behavior is encouraged, and cheaters are flagged. As Darwin noted, groups that encourage norm-abiding behaviors outcompete groups where cheaters are rampant.

## 5 Conclusion

In this paper, I argued that a causal-role function of episodic memory is to facilitate information exchange about the past deeds of other individuals, thereby helping group members to make effective partner choices and enforce norms. This causal-role function of episodic memory may also underlie its evolutionary function. Within

a group, memories serve as a means of revealing crucial reputation information concerning the past behavior of others. Memory sharing is often overlooked in psychological research, but it may underlie the etiological function of episodic memory. By acquiring knowledge of other individuals' past behavior, one can use such information to predict their future conduct. These informed partner choices have a cumulative impact, underscoring the importance of maintaining a positive reputation. A reputation for being cooperative can lead to fitness advantages such as acquiring resources and attracting mates, whereas a reputation for being selfish can yield the opposite outcomes.

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## Declarations

**Conflict of interest** The author declares that he has no conflict of interest.

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